Installing and Maintaining the 8010 Chassis and Components

NØRTEL
NETWORKS™

Copyright © 2002 Nortel Networks

Trademarks

Nortel Networks, the Nortel Networks logo, the Globemark, Unified Networks, BayStack, and Passport are trademarks of Nortel Networks.

Adobe and Acrobat Reader are trademarks of Adobe Systems Incorporated.

Intel is a trademark of Intel Corporation.

SanDisk is a trademark of SanDisk Corporation.

3Com is a trademark of 3Com Corporation.

The asterisk after a name denotes a trademarked item.

Statement of conditions

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

Nortel Networks 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.

International regulatory statements of conformity

This is to certify that the Nortel Networks 8000 Series chassis and components installed within the chassis were evaluated to the international regulatory standards for electromagnetic compliance (EMC) and safety and were found to have met the requirements for the following international standards:

- EMC - Electromagnetic Emissions – CISPR 22, Class A
- EMC - Electromagnetic Immunity – CISPR 24
- Electrical Safety – IEC 60950, with CB member national deviations

Further, the equipment has been certified as compliant with the national standards as detailed below.

National electromagnetic compliance (EMC) statements of compliance

FCC statement (USA only)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the Federal Communications Commission (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.

ICES statement (Canada only)

Canadian Department of Communications Radio Interference Regulations

This digital apparatus (8000 Series chassis and installed components) 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 (8000 Series chassis) 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.

CE marking statement (Europe only)

EN 55 022 statements

This is to certify that the Nortel Networks 8000 Series chassis and components installed within the chassis are shielded against the generation of radio interference in accordance with the application of Council Directive 89/336/EEC. 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.

EN 55 024 statement

This is to certify that the Nortel Networks 8000 Series chassis is shielded against the susceptibility to radio interference in accordance with the application of Council Directive 89/336/EEC. Conformity is declared by the application of EN 55 024 (CISPR 24).

EC Declaration of Conformity

This product conforms to the provisions of the R&TTE Directive 1999/5/EC.

VCCI statement (Japan/Nippon only)

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI) for information technology equipment. If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

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。

BSMI statement (Taiwan only)

This is a Class A product based on the standard of the Bureau of Standards, Metrology and Inspection (BSMI) CNS 13438, Class A.

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。

MIC notice (Republic of Korea only)

This device has been approved for use in Business applications only per the Class A requirements of the Republic of Korea Ministry of Information and Communications (MIC). This device may not be sold for use in a non-business application.

명　　칭 (모델명)：Switch (Passport 8600)
인　증　번　호：E-E011-02-0015 (A)
인증받은자의상호：Nortel Networks Ltd.
제　　조　　일：별도표기
제 조 자(제 조 국)：Nortel Networks Ltd.(미국)

National safety statements of compliance

CE marking statement (Europe only)

EN 60 950 statement

This is to certify that the Nortel Networks 8000 Series chassis and components installed within the chassis are in compliance with the requirements of EN 60 950 in accordance with the Low Voltage Directive. Additional national differences for all European Union countries have been evaluated for compliance. Some components installed within the 8000 Series chassis may use a nickel-metal hydride (NiMH) and/or lithium-ion battery. The NiMH and lithium-ion batteries are long-life batteries, and it is very possible that you will never need to replace them. However, should you need to replace them, refer to the individual component manual for directions on replacement and disposal of the battery.

NOM statement (Mexico only)

The following information is provided on the devices described in this document in compliance with the safety requirements of the Norma Oficial Méxicana (NOM):

Exporter:	Nortel Networks, Inc. 4655 Great America Parkway Santa Clara CA 95054 USA
Importer:	Nortel Networks de México, S.A. de C.V. Avenida Insurgentes Sur #1605 Piso 30, Oficina Col. San Jose Insurgentes Deleg-Benito Juarez México D.F. 03900 Tel: 52 5 480 2100 Fax: 52 5 480 2199
Input:	100 to 240 VAC, 50 to 60 Hz, 12 A max. per power supply –48 to –60 VDC, 29 A max. per power supply single supply, two supply or two + one redundant supply configurations

Información NOM (unicamente para México)

La información siguiente se proporciona en el dispositivo o en los dispositivos descritos en este documento, en cumplimiento con los requisitos de la Norma Oficial Méxicana (NOM):

Exportador:	Nortel Networks, Inc. 4655 Great America Parkway Santa Clara, CA 95054 USA
Importador:	Nortel Networks de México, S.A. de C.V. Avenida Insurgentes Sur #1605 Piso 30, Oficina Col. San Jose Insurgentes Deleg-Benito Juarez México D.F. 03900 Tel: 52 5 480 2100 Fax: 52 5 480 2199

Embarcar a:	100 to 240 V CA, 50 to 60 Hz, 12 A max. por fuente de poder
	–48 to –60 V CD, 29 A max. por fuente de poder
	una fuente, dos fuentes o dos + configuraciones de una fuente redundante

Nortel Networks Inc. software license agreement

This Software License Agreement ("License Agreement") is between you, the end-user ("Customer") and Nortel Networks Corporation and its subsidiaries and affiliates ("Nortel Networks"). PLEASE READ THE FOLLOWING CAREFULLY. YOU MUST ACCEPT THESE LICENSE TERMS IN ORDER TO DOWNLOAD AND/OR USE THE SOFTWARE. USE OF THE SOFTWARE CONSTITUTES YOUR ACCEPTANCE OF THIS LICENSE AGREEMENT. If you do not accept these terms and conditions, return the Software, unused and in the original shipping container, within 30 days of purchase to obtain a credit for the full purchase price.

"Software" is owned or licensed by Nortel Networks, its parent or one of its subsidiaries or affiliates, and is copyrighted and licensed, not sold. Software consists of machine-readable instructions, its components, data, audio-visual content (such as images, text, recordings or pictures) and related licensed materials including all whole or partial copies. Nortel Networks grants you a license to use the Software only in the country where you acquired the Software. You obtain no rights other than those granted to you under this License Agreement. You are responsible for the selection of the Software and for the installation of, use of, and results obtained from the Software.

1.   Licensed Use of Software. Nortel Networks grants Customer a nonexclusive license to use a copy of the Software on only one machine at any one time or to the extent of the activation or authorized usage level, whichever is applicable. To the extent Software is furnished for use with designated hardware or Customer furnished equipment ("CFE"), Customer is granted a nonexclusive license to use Software only on such hardware or CFE, as applicable. Software contains trade secrets and Customer agrees to treat Software as confidential information using the same care and discretion Customer uses with its own similar information that it does not wish to disclose, publish or disseminate. Customer will ensure that anyone who uses the Software does so only in compliance with the terms of this Agreement. Customer shall not a) use, copy, modify, transfer or distribute the Software except as expressly authorized; b) reverse assemble, reverse compile, reverse engineer or otherwise translate the Software; c) create derivative works or modifications unless expressly authorized; or d) sublicense, rent or lease the Software. Licensors of intellectual property to Nortel Networks are beneficiaries of this provision. Upon termination or breach of the license by Customer or in the event designated hardware or CFE is no longer in use, Customer will promptly return the Software to Nortel Networks or certify its destruction. Nortel Networks may audit by remote polling or other reasonable means to determine Customer's Software activation or usage levels.   If suppliers of third party software included in Software require Nortel Networks to include additional or different terms, Customer agrees to abide by such terms provided by Nortel Networks with respect to such third party software.

2.   Warranty. Except as may be otherwise expressly agreed to in writing between Nortel Networks and Customer, Software is provided "AS IS" without any warranties (conditions) of any kind. NORTEL NETWORKS DISCLAIMS ALL WARRANTIES (CONDITIONS) FOR THE SOFTWARE, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABLITITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY WARRANTY OF NON-INFRINGEMENT. Nortel Networks is not obligated to provide support of any kind for the Software. Some jurisdictions do not allow exclusion of implied warranties, and, in such event, the above exclusions may not apply.

3.   Limitation of Remedies. IN NO EVENT SHALL NORTEL NETWORKS OR ITS AGENTS OR SUPPLIERS BE LIABLE FOR ANY OF THE FOLLOWING: a) DAMAGES BASED ON ANY THIRD PARTY CLAIM; b) LOSS OF, OR DAMAGE TO, CUSTOMER'S RECORDS, FILES OR DATA; OR c) DIRECT, INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS OR SAVINGS), WHETHER IN CONTRACT, TORT OR OTHERWISE (INCLUDING NEGLIGENCE) ARISING OUT OF YOUR USE OF THE SOFTWARE, EVEN IF NORTEL NETWORKS, ITS AGENTS OR SUPPLIERS HAVE BEEN ADVISED OF THEIR POSSIBILITY. The forgoing limitations of remedies also apply to any developer and/or supplier of the Software. Such developer and/or supplier is an intended beneficiary of this Section. Some jurisdictions do not allow these limitations or exclusions and, in such event, they may not apply.

4. General

a) If Customer is the United States Government, the following paragraph shall apply: All Nortel Networks Software available under this License Agreement is commercial computer software and commercial computer software documentation and, in the event Software is licensed for or on behalf of the United States Government, the respective rights to the software and software documentation are governed by Nortel Networks standard commercial license in accordance with U.S. Federal Regulations at 48 C.F.R. Sections 12.212 (for non-DoD entities) and 48 C.F.R. 227.7202 (for DoD entities).

b) Customer may terminate the license at any time. Nortel Networks may terminate the license if Customer fails to comply with the terms and conditions of this license. In either event, upon termination, Customer must either return the Software to Nortel Networks or certify its destruction.

c) Customer is responsible for payment of any taxes, including personal property taxes, resulting from Customer's use of the Software. Customer agrees to comply with all applicable laws including all applicable export and import laws and regulations.

d) Neither party may bring an action, regardless of form, more than two years after the cause of the action arose.

e) The terms and conditions of this License Agreement form the complete and exclusive agreement between Customer and Nortel Networks.

f) This License Agreement is governed by the laws of the country in which Customer acquires the Software. If the Software is acquired in the United States, then this License Agreement is governed by the laws of the state of New York.

Contents

Figures

Tables

Preface

The Nortel Networks* 8010 Chassis provides the physical enclosure for the 8000 Series modules. When switch modules are installed in the chassis, the resulting network switch provides a range of data speeds and high-performance switching and routing features.

This guide provides instructions for installing the 8010 Chassis in an equipment rack and for installing and replacing fan trays, power supplies, modules, gigabit interface converters, and media dependent adapters. This guide describes some of the routine tasks of operating the 8000 Series switch and includes technical specifications for the chassis and modules.

For a list of related publications, see the release notes that accompany your software.

Before you begin

This guide is intended for qualified service personnel who are installing the 8010 Chassis for the first time or who need to install or replace any of the customer-replaceable units (CRUs) in the chassis.

Before you install the 8010 Chassis, make sure that all network wiring has been installed on the premises using standard cable-system practices.

Text conventions

This guide uses the following text conventions:

italic text   Indicates new terms and book titles.

Hard-copy technical manuals

You can print selected technical manuals and release notes free, directly from the Internet. Go to the www.nortelnetworks.com/documentation URL. Find the product for which you need documentation. Then locate the specific category and model or version for your hardware or software product. Use Adobe* Acrobat Reader* to open the manuals and release notes, search for the sections you need, and print them on most standard printers. Go to Adobe Systems at the www.adobe.com URL to download a free copy of the Adobe Acrobat Reader.

You can purchase printed books and documentation sets from Vervante. To order printed documentation, go to Vervante at the www.vervante.com/nortel URL.

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:

Technical Solutions Center	Telephone
Europe, Middle East, and Africa	(33) (4) 92-966-968
North America	(800) 4NORTEL or (800) 466-7835
Asia Pacific	(61) (2) 9927-8800
China	(800) 810-5000

Additional information about the Nortel Networks Technical Solutions Centers is available from the www.nortelnetworks.com/help/contact/global URL.

An Express Routing Code (ERC) is available for many Nortel Networks products and services. When you use an ERC, your call is routed to a technical support person who specializes in supporting that product or service. To locate an ERC for your product or service, go to the http://www130.nortelnetworks.com/cgi-bin/eserv/common/essContactUs.jsp URL.

Chapter 1
8010 Chassis hardware components

The 8010 Chassis provides the physical enclosure for 8000 Series modules. When 8000 Series modules are installed in the chassis, the resulting switch provides high performance switching and routing functions for the network.

The 8010 Chassis consists of a sheet metal enclosure, a backplane, a power backplane, three bays for either AC or DC power supplies, and two fan trays for cooling. Figure 1 shows the location of customer-replaceable components in the chassis.

Figure 1   8010 Chassis and components
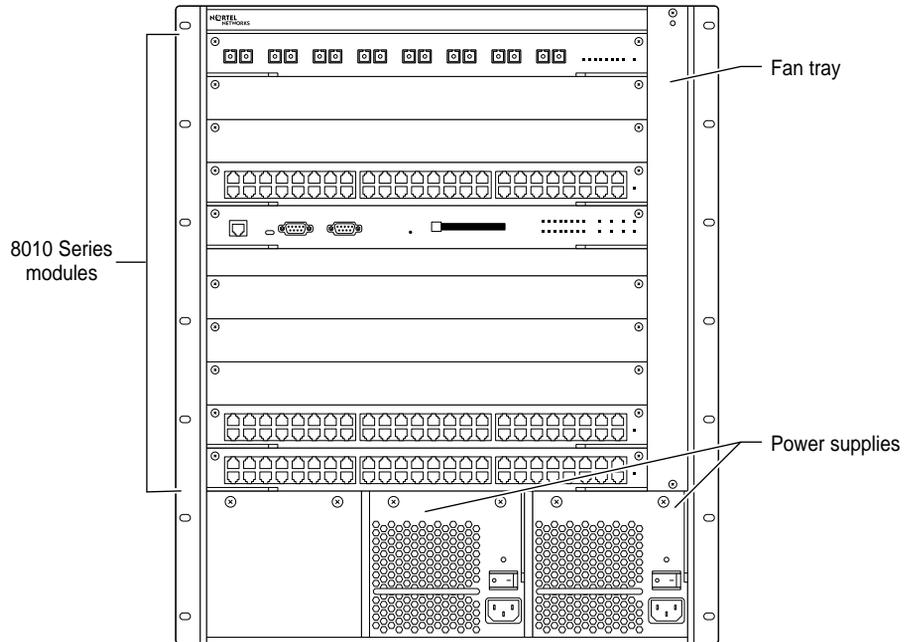
Chassis

The 8010 Chassis provides eight slots for installing I/O modules and two slots for installing either 8190SM switch management modules or 8691SF switch fabric modules. Slots are numbered from the top down.

You can install either 8100 or 8600 I/O switch modules in slots 1 through 4 and slots 7 through 10. Slots 5 and 6 are reserved for 8000 Series switch fabric or switch management modules.

8100 modules installed in slots 1 or 2 serve as a clock source for the entire chassis. Therefore, you must install a 8100 series module in either slot 1 or 2 to avoid traffic loss.

→ **Note:** 8000 Series software Release 3.2 and later does not support configurations of 8100 modules and 8600 modules installed within the same chassis.

Power supplies

The chassis provides three bays for installing power supplies. The following power supplies are available:

• 8004 AC Power Supply
• 8004 DC Power Supply

Each power supply provides 850 watts (W) of power for the switch. The number of power supplies required depends on the number of switch modules installed. You can also install an additional power supply for redundancy.

→ **Note:** The 8004 AC Power Supply is derated from 850 W to 780 W maximum output @ 100- 109 VAC input. See Appendix A, "Technical specifications for the 8010 Chassis," on page 185 for additional power supply technical specifications.

For complete information about the power supplies and instructions for installing them, see Chapter 5, "Installing power supplies," on page 91.

Fan tray

Two fan trays provide cooling for the chassis. Each fan tray contains eight high-capacity, multispeed fans and a control/monitor circuit board that communicates fan operating status and chassis temperature to the management software.

Chapter 2
8100 modules

The 8100 modules provide a full complement of switching capabilities in a 8010 Chassis. The 8100 modules include a switch management module and input/output (I/O) modules. For CPU system redundancy, you can install two management modules. A 8010 Chassis with installed 8100 modules constitutes a switch with distributed management and full redundancy.

The 8100 I/O modules support different types of Ethernet interfaces with different speeds and port types, including:

*   10/100 megabit per second (Mb/s) autonegotiating twisted pair Ethernet ports
*   100 Mb/s fiber Ethernet ports
*   1000 Mb/s Ethernet ports

This chapter introduces the 8100 modules and describes the LEDs on each module. It includes the following topics:

Table 1 lists the maximum port densities available with each type of Passport 8100 I/O module in the 8010 Chassis.

Table 1 Maximum port densities for 8100 modules

Module type	Port type	Maximum number of ports
8108GBIC	1000BASE-SX	64
	1000BASE-LX	64
	1000BASE-ZX	64
	1000BASE-XD	64
8116FX	100BASE-FX	128
8132TX	10BASE-T/100BASE-TX	256[1]
8148TX	10/100 Mb/s	384

1 Does not include ports on MDAs; for information about the MDAs, see Chapter 8, "Installing media dependent adapters on 8100 modules," on page 135.

8108GBIC Module

The 8108GBIC Module (Figure 2) is a single-slot I/O module that provides eight bays for installing any of four types of gigabit interface converters (GBICs).

Figure 2 8108GBIC Module

1 = Module LEDs
2 = GBIC bay
3 = GBIC port LEDs
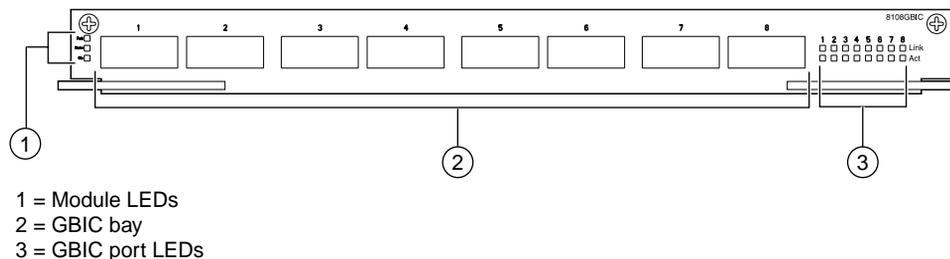
10353EA

The following four types of GBICs are supported:

- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-XD
- 1000BASE-ZX

The fiber ports on the GBICs allow you to make riser connections, server attachments, or interswitch links.

→ **Note:** Only GBICs qualified by Nortel Networks are supported for use in the 8108GBIC Module. For specific model numbers, refer to the Nortel Networks price list.

For more information about the GBICs and instructions for installing them, see Chapter 7, "Installing gigabit interface converters," on page 131.

Figure 3 shows the 8108GBIC Module LEDs.

Figure 3   8108GBIC Module LEDs
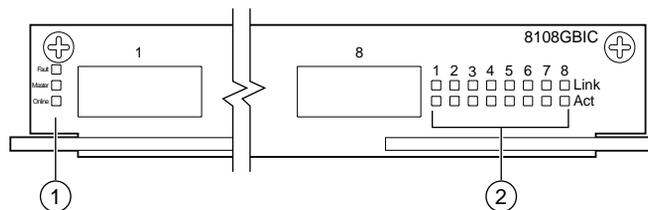
Table 2 describes the 8108GBIC Module LEDs.

Table 2 8108GBIC Module LEDs

Type	Label	Color/State	Meaning
Module	Fault	Amber/Steady	A diagnostics failure or hardware failure has been detected.
		Amber/Blinking	A chassis failure has been detected.
		Off	The system is functioning normally.
	Master	Green/Steady	The module is properly generating the system clock for the switch.
		Amber/Steady	The module has detected a system clock generation failure on its own circuitry.
		Off	The module is not providing the system clock for the switch. You can pull the module out of the chassis without resetting the switch.
	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module failed its power-on self-test.
		Off	The switch power is off, or the power has been turned on and the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.
Port	Activity	Green	The port is transmitting data.
		Off	No data activity is occurring.
	Link	Green	The port has established a link and is enabled.
		Off	The port has no link.

8116FX Module

The 8116FX Module (Figure 4) is a single-slot I/O module that provides 16 fiber optic 100 Mb/s ports that can operate in full- or half-duplex mode.

Figure 4 8116FX Module

9817EA
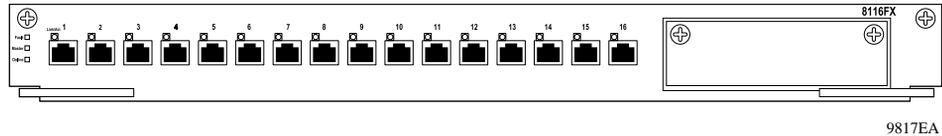
The 8116FX Module includes a slot for one of the following optional media dependent adapters (MDAs):

- 8100-4TX MDA—10BASE-T/100BASE-TX MDA (4-port copper)
- 8100-2FX MDA—100BASE-FX MDA (2-port multimode fiber with SC connectors)
- 8100-4FX MDA—100BASE-FX MDA (4-port multimode fiber with MT-RJ connectors)
- 450-1SX MDA—1000BASE-SX MDA (1-port shortwave gigabit fiber)
- 450-1SR MDA—1000BASE-SX MDA (1-port shortwave gigabit fiber with 1 redundant port)
- 450-1LX MDA—1000BASE-LX MDA (1-port longwave gigabit fiber)
- 450-1LR MDA—1000BASE-LX MDA (1-port longwave gigabit fiber with 1 redundant port)

For information about installing MDAs, see Chapter 8, "Installing media dependent adapters on 8100 modules," on page 135.

The port connectors on the 8116FX Module are MT-RJ connectors for use with multimode fiber optic cable.

Each port on the 8116FX Module has a bicolor LED that indicates link and activity status for the port. In addition, the module has three LEDs to indicate system operating conditions (Table 3). Figure 5 shows the locations of the LEDs.

Figure 5 8116FX Module LEDs

9818EA
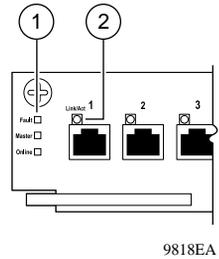
1 = Module LEDs
2 = Port LED

Table 3 8116FX Module LEDs

Type	Label	Color/State	Meaning
Module	Fault	Amber/Steady	A diagnostics failure or hardware failure has been detected.
		Amber/Blinking	A chassis failure has been detected.
		Off	The system is functioning normally.
	Master	Green/Steady	The module is properly generating the system clock for the switch. This LED indication is valid only when the module is installed in chassis slot 1 or 2.
		Amber/Steady	The module has detected a system clock generation failure on its own circuitry. This LED indication is valid only when the module is installed in chassis slot 1 or 2.
		Off	The module is not providing the system clock for the switch. You can pull the module out of the chassis without resetting the switch. (When the module is installed in any slot other than slot 1 or 2, the Master LED is always off.)
	Online	Green/Steady	The module is functioning normally and is in switching mode.
		Green/Blinking	The module is running diagnostic tests.
		Amber/Steady	The module is not in switching mode. Software incompatibility exists, or the module cannot communicate with the master module over the backplane.
		Off	The module is not receiving power or is administratively disabled.
Port	Link/Act	Green/Steady	The link is good.
		Green/Blinking	The link is good, and the port is transmitting or receiving traffic.
		Off	No link exists, or the port is disabled.

8132TX Module

The 8132TX Module (Figure 6) is a single-slot I/O module that provides 32 autosensing 10BASE-T/100BASE-TX switched ports with RJ-45 connectors. The ports have integrated LEDs to indicate port operation, and the module has three additional LEDs to indicate system operation.

Figure 6   8132TX Module
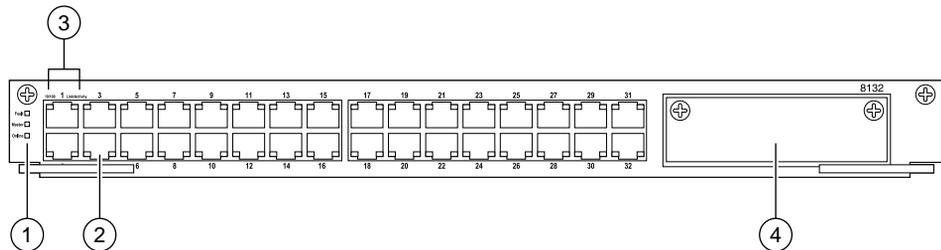
1 = Module LEDs   3 = Port LEDs
2 = 10/100BASE-TX port   4 = MDA slot

10295EA

An expansion slot allows you to install an MDA to provide additional port types. You can add 10/100BASE-T, 100BASE-FX, or Gigabit Ethernet ports by installing an optional MDA (see "MDA slot" on page 36). The MDAs support high-speed connections to servers, shared 100BASE-T hubs, or backbone devices.

Figure 7 shows the 8132TX Module LEDs.

Figure 7   8132TX Module LEDs

9120EA
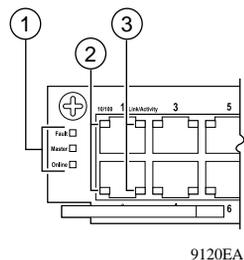
1 = Module LEDs
2 = Port speed LEDs
3 = Port Link/Activity LEDs

Table 4 describes the 8132TX Module LEDs.

Table 4   8132TX Module LEDs

Type	Label	Color/State	Meaning
Module	Fault	Amber/Steady	A diagnostics failure or hardware failure has been detected.
		Amber/Blinking	A chassis failure has been detected.
		Off	The system is functioning normally.
	Master	Green/Steady	The module is properly generating the system clock for the switch.
		Amber/Steady	The module has detected a system clock generation failure on its own circuitry.
		Off	The module is not providing the system clock for the switch. You can pull the module out of the chassis without resetting the switch.
	Online	Green/Steady	The module is functioning normally and is in switching mode.
		Green/Blinking	The module is running diagnostic tests.
		Amber/Steady	The module is not in switching mode. Software incompatibility exists, or the module cannot communicate with the master module over the backplane.
		Off	The module is not receiving power or is administratively disabled.
Port	10/100 (speed)	Green/Steady	The port is set to operate at 100 Mb/s.
		Off	The port is set to operate at 10 Mb/s.
	Link/ Activity	Green/Steady	The link is good.
		Green/Blinking	The link is good, and the port is transmitting or receiving traffic.
		Off	No link exists, or the port is disabled.

10BASE-T/100BASE-TX port connectors

The 8132TX Module provides 32 autosensing 10/100 Mb/s ports that support the IEEE.802.3 1998 Clause 28 autonegotiation standard. Each port can operate in full- or half-duplex mode. When a port is connected to another device that also supports the IEEE.802.3 1998 Clause 28 autonegotiation standard, the two devices negotiate the best speed and duplex mode of operation.

The port connectors are 8-pin modular RJ-45 connectors configured as media-dependent interface-crossover (MDI-X) connections. You can connect these ports to an MDI port (for example, a workstation or server) using a straight-through cable. If you are connecting to a device that does not have an MDI port, use a crossover cable (see "MDI and MDI-X connections" on page 203).

> **Note:** For 10 Mb/s connections, you can use Category 3, 4, or 5 copper unshielded twisted pair (UTP) cable. Use only Category 5 UTP cable to connect ports that will operate at 100 Mb/s.

MDA slot

The MDA slot allows you to install optional media dependent adapters (MDAs) that support a range of media types. The 8132TX Module supports the following MDAs:

- 8100-4TX MDA—10BASE-T/100BASE-TX MDA (4-port copper)
- 8100-2FX MDA—100BASE-FX MDA (2-port multimode fiber with SC connectors)
- 8100-4FX MDA—100BASE-FX MDA (4-port multimode fiber with MT-RJ connectors)
- 450-1SX MDA—1000BASE-SX MDA (1-port shortwave gigabit fiber)
- 450-1SR MDA—1000BASE-SX MDA (1-port shortwave gigabit fiber with 1 redundant port)
- 450-1LX MDA—1000BASE-LX MDA (1-port longwave gigabit fiber)
- 450-1LR MDA—1000BASE-LX MDA (1-port longwave gigabit fiber with 1 redundant port)

For information about installing MDAs, see Chapter 8, "Installing media dependent adapters on 8100 modules," on page 135.

8148TX Module

The 8148TX Module provides 48 autonegotiating 10/100 Mb/s ports (Figure 8). Each port can operate in full- or half-duplex mode. Autonegotiation circuitry automatically negotiates the highest possible data rate and the duplex operation possible with the attached device, if the attached device supports IEEE.802.3 1998 Clause 28 autonegotiation.

Figure 8   8148TX Module

1 = Module LEDs
2 = Port LEDs (x 48)
3 = 100BASE-FX ports
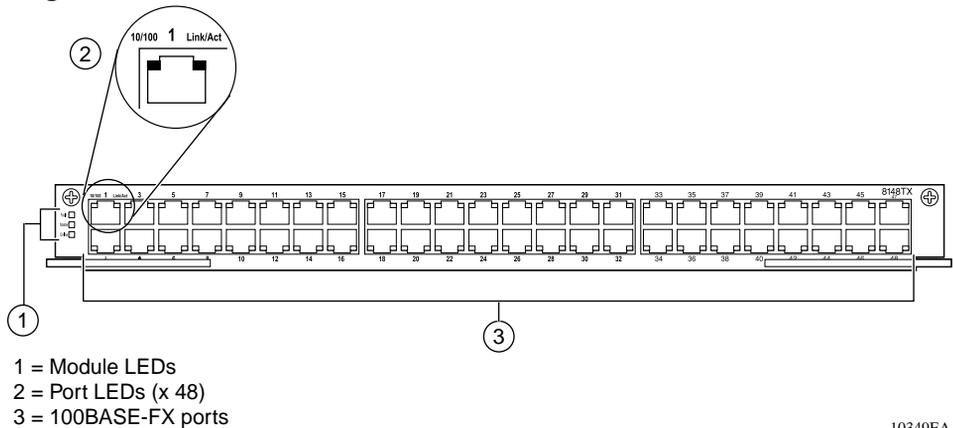
10349EA

The 8148TX Module uses 10BASE-T/100BASE-TX RJ-45 port connectors to connect to 10 Mb/s or 100 Mb/s Ethernet segments or nodes.

> ➡ **Note:** For 10 Mb/s connections, you can use Category 3, 4, or 5 copper unshielded twisted pair (UTP) cable. Use only Category 5 UTP cable to connect ports that will operate at 100 Mb/s.

The port connectors are modular RJ-45 connectors with MDI-X wiring. Each port can be connected to an MDI port (for example, a workstation or server) using a straight-through cable. If you are connecting to a device that does not have an MDI port, use a crossover cable (see "MDI and MDI-X connections" on page 203).

Figure 9 shows the 8148TX Module LEDs.

Figure 9 8148TX Module LEDs
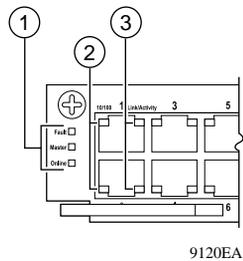
1=Module LEDs

2 = Port speed LEDs

3 = Port Link/Activity LEDs

Table 5 describes the 8148TX Module LEDs.

Table 5 8148TX Module LEDs

Type	Label	Color/State	Meaning
Module	Fault	Amber/Steady	A diagnostics failure or hardware failure has been detected.
		Amber/Blinking	A chassis failure has been detected.
		Off	The system is functioning normally.
	Master	Green/Steady	The module is properly generating the system clock for the switch.
		Amber/Steady	The module has detected a system clock generation failure on its own circuitry.
		Off	The module is not providing the system clock for the switch. You can pull the module out of the chassis without resetting the switch.
	Online	Green/Steady	The module is functioning normally and is in switching mode.
		Green/Blinking	The module is running diagnostic tests.
		Amber/Steady	The module is not in switching mode. Software incompatibility exists, or the module cannot communicate with the master module over the backplane.
		Off	The module is not receiving power or is administratively disabled.
Port	10/100 (speed)	Green/Steady	The port is set to operate at 100 Mb/s.
		Off	The port is set to operate at 10 Mb/s.
	Link/Activity	Green/Steady	The link is good.
		Green/Blinking	The link is good, and the port is transmitting or receiving traffic.
		Off	No link exists, or the port is disabled.

8190SM Module

The 8190SM Module (Figure 10) provides an onboard CPU for management of the 8100 modules. A 8010 Chassis with 8100 modules requires one 8190SM Module. The 8010 Chassis supports two 8190SM Modules in slots 5 and 6.

Figure 10   8190SM Module
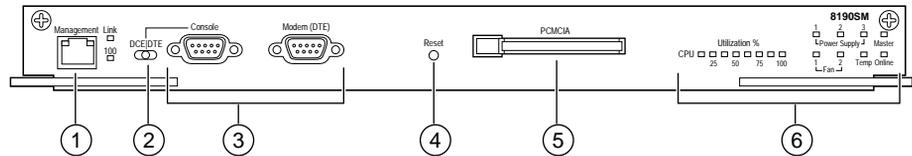
1 = Ethernet Management port
2 = DCE/DTE switch
3 = Console and Modem ports
4 = Reset button
5 = PCMCIA card slot
6 = Module LEDs

The 8190SM Module consists of a printed circuit board with status LEDs, a PCMCIA card slot, a management port, a console port, a modem port, a reset button, and a DCE/DTE switch for the console port (Figure 10).

Image, configuration, and log files are stored on the flash memory (onboard and PCMCIA) of the module. The Ethernet port on the module provides out-of-band management.

> **Note:** Nortel Networks recommends that you use the Ethernet port on the 8190SM Module for management instead of a switched port.

To enable redundant operation, install a 8190SM Module in both slots 5 and 6 of the chassis. If one CPU fails, control is automatically passed to the redundant 8190SM Module.

You can install the switch management module (8190SM Module) in the chassis with the switch fabric module (8691SF Module). The 8691SF Module provides layer 3 functionality for routing switch modules.

> → **Note:** 8000 Series software Release 3.2 and beyond does not support configurations of 8100 modules and 8600 modules installed within the same chassis.

Figure 11 shows the location of the LEDs on the 8190SM Module. Table 6 describes the 8132TX Module LEDs.

Figure 11 8190SM Module LEDs
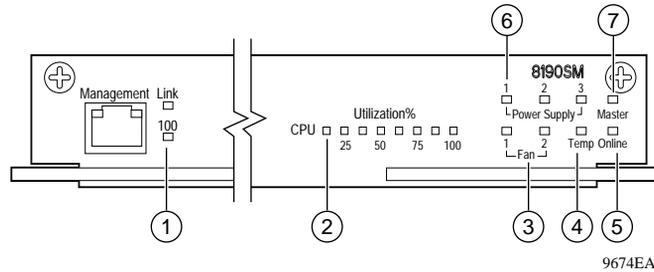
1 = Management port LEDs   5 = Online LED
2 = CPU utilization LEDs   6 = Power Supply LEDs
3 = Fan LEDs   7 = Master LED
4 = Temp LED

Table 6 8190SM Module LEDs

Label	Color/State	Meaning
Link	Green/Steady	The management port is connected, and the link is good.
	Off	There is no link to the management port.
100	Green/Steady	The management port is operating at 100 Mb/s.
	Off	The management port is operating at 10 Mb/s.
Utilization % (8 LEDs)	Green	The number of lit LEDs indicates the level of CPU activity.
Power Supply 1, 2, 3	Green/Steady	The specified power supply is operating normally.
	Amber/Steady	The specified power supply has a fault.
	Off	A power supply is not present in the specified bay, or the power supply in the specified bay is not turned on.
Fan 1, 2	Green/Steady	The specified fan is operating normally.
	Amber/Steady	The specified fan has failed.
Temp	Green/Steady	The temperature is normal for switch operation.
	Amber/Steady	The maximum operating temperature has been exceeded.

Table 6   8190SM Module LEDs (continued)

Label	Color/State	Meaning
Master	Green/Steady	The CPU subsystem on the module is up and in standby mode.
	Green/Blinking	The module is providing active CPU functions for the switch.
	Amber/Steady	The CPU subsystem is in a fault state.
	Off	The CPU subsystem on the module is performing diagnostics.
Online	Off	This LED is always off during operation of the 8190SM Module.

Ethernet management port

The Ethernet management port on the 8190SM Module is an MDI 10/100BASE-T port that allows out-of-band management of the switch using a Web browser or Device Manager. You can also establish a Telnet session to access the command line interface (CLI). Use the Ethernet management port to connect the switch to a network management station. The Ethernet management port has its own IP address but does not switch traffic to other ports in the chassis.

> **Note:** This port should be used only as a management port. This port provides out-of-band management for the 8190SM CPU Module.

DCE/DTE switch

The DCE/DTE switch changes the pin assignments on the Console port and allows you to designate the connector as either DTE or DCE. For information about pin assignments for the Console port, see "Console serial port" on page 201.

Serial ports

The 8190SM Module provides two serial ports for attaching modem and console devices. The Console port provides terminal access to the 8190SM Module to use the CLI. The Modem port allows you to connect a standard modem for out-of-band, dial-up management. For information about pin assignments for these ports, see "Console serial port" on page 201 and "Modem serial port" on page 202.

Reset button

The recessed Reset button on the module allows you to perform a hard reset or reboot of the system.

PCMCIA card slot

The 8190SM Module provides a PCMCIA card slot for use with an ATA-type SanDisk*-compatible flash memory card. This memory card provides a convenient way to store switch configurations and boot images. Using a memory card, you can quickly transfer configurations and images among multiple switches or store multiple configurations for a single switch.

Caution: You cannot use the Accelar 1200 PCMCIA card in 8000 Series equipment.

Chapter 3
8600 modules

The 8600 modules provide core routing and switching capabilities in a 8010 Chassis. The 8600 modules include a switch fabric module and input/output (I/O) modules. For CPU system redundancy, you can install two switch fabric modules. A 8010 Chassis with installed 8600 modules constitutes a 8600 Switch with distributed management and full redundancy that delivers wire-speed routing and layer 2 switching.

The 8600 I/O modules support different types of interfaces with different speeds and port counts including:

- 10/100 megabit per second (Mb/s) autonegotiating twisted pair Ethernet ports
- 100 Mb/s fiber Ethernet ports
- 1000 Mb/s fiber Ethernet ports
- 10,000 Mb/s fiber Ethernet ports
- ATM OC-3c/STM-1, OC-12c/STM-4, and DS-3 ports
- POS OC-3c/STM-1 and OC-12c/STM-4 ports

This chapter includes the following topics:

Table 7 lists the maximum port densities available with each type of I/O module.

Table 7   Maximum port densities for 8600 modules

Module type	Port type	Maximum number of ports
8608GBE or 8608GBM	1000BASE-SX	64
	1000BASE-LX	64
	1000BASE-ZX	64
	1000BASE-XD	64
	1000BASE-CWDM	64
8608GTE or 8608GBM	1000BASE-T	64
8608SXE	1000BASE-SX	64
8616GTE	1000BASE-T	128
8616SXE	1000BASE-SX	128
8624FXE	100BASE-FX	192
8632TXE or 8632TXM	10BASE-T/100BASE-TX	512
	1000BASE-SX	16
	1000BASE-LX	16
	1000BASE-ZX	16
	1000BASE-XD	16
	1000BASE-CWDM	16
8648TXE or 8648TXM	10/100 Mb/s	384
8672ATME[1] or 8672ATMM	OC-3c MDA	48
	OC-12c MDA	12

Table 7 Maximum port densities for 8600 modules

Module type	Port type	Maximum number of ports
	DS-3 MDA	24
8681XLR	10GBASE-LR	8
8681XLW	10GBASE-LW	8
8683POSM[2]	OC-3c MDA	24
	OC-12c MDA	12

1 For information about these MDAs, see "8672ATME and 8672ATMM Modules" on page 67.

2 For information about these MDAs, see "8683POSM Module" on page 73.

Local storage of forwarding data allows the forwarding engine to resolve addresses and to forward packets through the switch fabric without CPU intervention. The forwarding engine also filters packets against current prioritization policies and can set prioritization information in the internal packet header.

The backplane forwarding module is equipped with eight priority queues per port. You can use either of the following two prioritization schemes:

• Strict priority
• Weighted Round Robin (WRR)

Strict priority guarantees the highest priority. WRR gives priority based on a round robin algorithm. For more information on prioritization schemes see *Network Design Guidelines*.

Output buffer memory consists of 8 MB of memory allocated to each Gigabit Ethernet port or shared among eight 10/100 ports. For the 8681XLR and the 8681XLW Modules, output buffer memory consists of 64 MB of memory allocated to the port.

The front of the module contains the physical layer devices, including the optical transceivers and the MAC controllers.

8608GBE and 8608GBM Modules

The 8608GBE Module is a 32K records module.

> ➡ **Note:** If one, or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode (128K records mode). For instructions on enabling or disabling MMode, see *Platform and System Management*.

The 8608GBM Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. The 8608GBM module will only operate with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

•   The chassis must include at least one 8691SF CPU module.
•   All modules installed in the chassis must support 128K records (M modules) running 3.3 and later software.
•   MMode (128K records mode) must be enabled. If one or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode. For instructions on enabling MMode, see *Platform and System Management*.

Both the 8608GBE and 8608GBM Modules (Figure 12) provide eight bays for installing gigabit interface converters (GBICs). The fiber ports on the GBICs allow you to make riser connections, server attachments, or interswitch links.

Figure 12   8608GBE/8608GBM Module
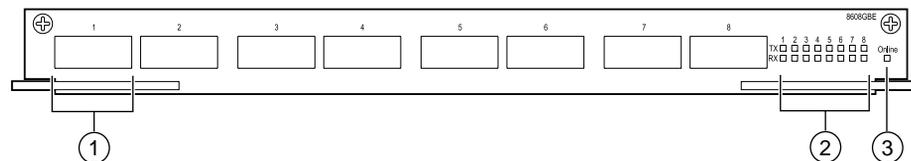
1 = GBIC bay
2 = Port link LEDs
3 = Module Online LED

9717EC

The following types of GBICs are supported:

- 1000BASE-CWDM
- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-ZX
- 1000BASE-XD

> → **Note:** Only GBICs qualified by Nortel Networks are supported for use in the 8608GBE and 8608GBM Modules. For specific model numbers, refer to the Nortel Networks price list.

For more information about the GBICs and instructions for installing them, see Chapter 7, "Installing gigabit interface converters," on page 131.

Figure 13 shows the location of the 8608GBE and 8608GBM Module LEDs.

Figure 13   8608GBE/8608GBM Module LEDs
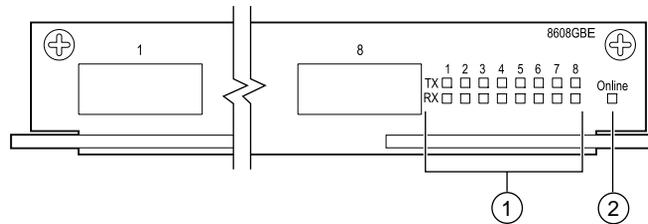
1 = Port TX and RX LEDs
2 = Module Online LED

9718EB

Table 8 describes the 8608GBE and 8608GBM Module LEDs.

Table 8   8608GBE/8608GBM Module LEDs

Type	Label	Color/State	Meaning
Port	TX	Green/Blinking	The port is transmitting data.
		Amber/Steady	A fault condition exists on the line or on the attached remote device.
		Off	The port has not detected a fault condition.
	RX	Green/Steady	The port has a link and is enabled.
		Green/Blinking	The port is receiving data.
		Amber/Steady	The port has either no optical signal or no link synchronization.
		Off	The port has signal but no link.
Module	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module failed its power-on self-test.
		Off	The switch power is off, or the power has been turned on and the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8608GTE and 8608GTM Modules

The 8608GTE Module is a 32K records module.

> → **Note:** If one, or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode (128K records mode). For instructions on enabling or disabling MMode, see *Platform and System Management*.

The 8608GTM Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. The 8608GTM module will only operate with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

- The chassis must include at least one 8691SF CPU module. If the chassis includes a 8690SF module, the mode defaults back to 32K mode.
- All modules installed in the chassis must support 128K records (M modules) running 3.3 and later software.
- MMode (128K records mode) must be enabled. If one or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode. For instructions on enabling MMode, see *Platform and System Management*.

Both the 8608GTE and 8608GTM Modules (Figure 14) provide eight 1000BASE-T, copper gigabit ports. The ports support the 802.3ab standard for autonegotiation. The ports can only operate full duplex at a rate of 1000 Mb/s. Links are established only with devices that support autonegotiated connections that meet these parameters.

Figure 14   8608GTE/8608GTM Module

1 = Air vents
2 = Port Link/Activity LEDs
3 = Module Online LED
4 = 1000BASE-T ports
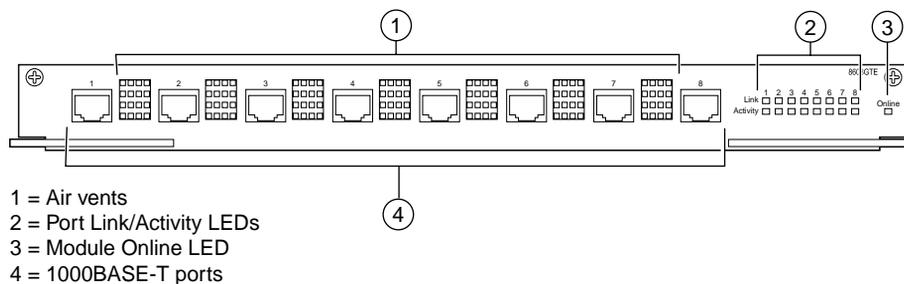
10351EB

Figure 15 shows the location of the 8608GTE or 8608GTM Module LEDs.

Figure 15   8608GTE/8608GTM Module LEDs
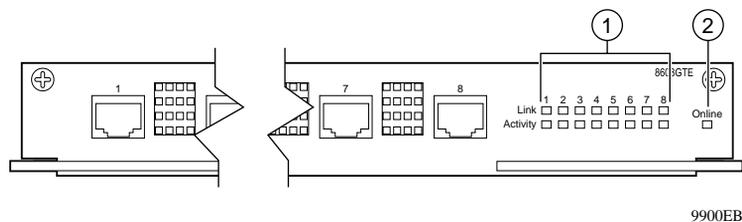
9900EB

1 = Port Link and Activity LEDs
2 = Module Online LED

Table 9 describes the 8608GTE and 8608GTM Module LEDs.

Table 9   8608GTE/8608GTM Module LEDs

Type	Label	Color/State	Meaning
Port	Link	Green/Steady	The port has established a link and is enabled.
		Amber/Steady	The port is connected, but an error condition is detected.
		Off	The port is disabled or has no link.
	Activity	Green/Blinking	The port is receiving data. NOTE: As port utilization increases this LED may blink so fast that it appears to be steady.
Module	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module failed its power-on self-test.
		Amber/Blinking	The module has been inserted into the chassis and diagnostics are running.
		Off	The module power is off, or the power has been turned on, and the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8608SXE Module

The 8608SXE Module (Figure 16) is a 32K records module.

> → **Note:** If one, or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode (128K records mode). For instructions on enabling or disabling MMode, see *Platform and System Management*.

The 8608SXE Module consists of a printed circuit board with eight 1000BASE-SX ports (850 nanometer [nm] shortwave, Gigabit Ethernet) for riser connections, server attachments, or interswitch links.

Figure 16   8608SXE Module

1 = 1000BASE-SX port
2 = Port TX and RX LEDs
3 = Module Online LED
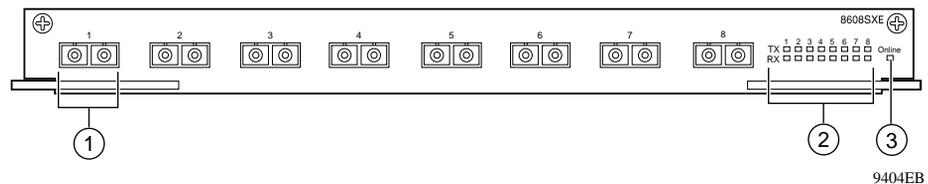
The shortwave optical transceivers provide transmission ranges as follows:

• Up to 260 meters (m) using 62.5 micrometers (μm) multimode fiber cable
• Up to 440 m using 50 μm multimode fiber cable

The 8608SXE Module supports standards-based full-duplex operation only.

Figure 17 shows the location of the 8608SXE Module LEDs.

Figure 17 8608SXE Module LEDs
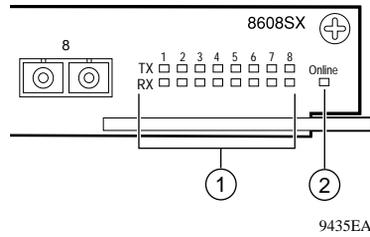
1 = Port TX and RX LEDs
2 = Module Online LED

Table 10 describes the 8608SXE Module LEDs.

Table 10 8608SXE Module LEDs

Type	Label	Color/State	Meaning
Port	TX	Green/Blinking	The port is transmitting data.
		Amber/Steady	A fault condition exists on the line or on the attached remote device.
		Off	The port has not detected a fault condition.
	RX	Green/Steady	The port has established a link and is enabled.
		Green/Blinking	The port is receiving data.
		Amber/Steady	The port has either no optical signal or no link synchronization.
		Off	The port has signal but no link.
Module	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module failed its power-on self-test.
		Off	The switch power is off, or the power has been turned on and the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8616GTE Module

The 8616GTE Module (Figure 18) is a 32K records module.

> **Note:** If one, or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode (128K records mode). For instructions on enabling or disabling MMode, see *Platform and System Management*.

The 8616GTE Module provides sixteen 1000BASE-T, copper gigabit ports. The ports support the 802.3ab standard for autonegotiation. The ports can only operate full duplex at a rate of 1000 Mb/s. Links are established only with devices that support autonegotiated connections that meet these parameters.

Figure 18   8616GTE Module

1 = 1000BASE-T ports
2 = Port Link/Activity LEDs
3 = Module Online LED

10528EB
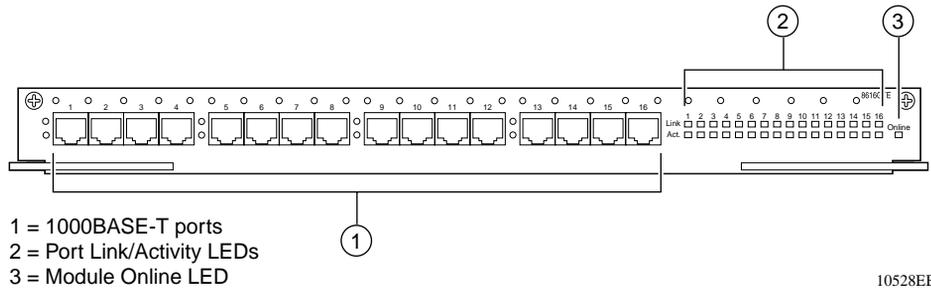
Figure 19 shows the location of the 8616GTE Module LEDs.

Figure 19   8616GTE Module LEDs

1 = Port Link/Activity LEDs
2 = Module Online LED

10529EB
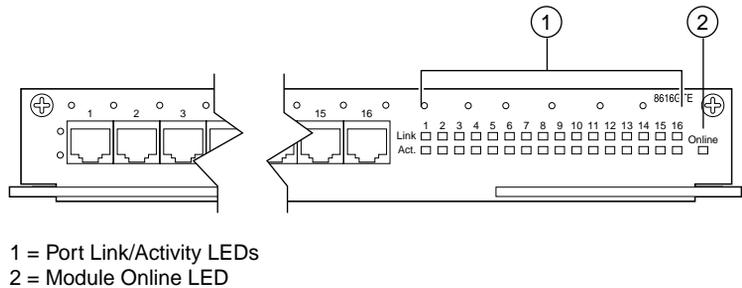
describes the 8616GTE Module LEDs.

Table 11   8616GTE Module LEDs

Type	Label	Color/State	Meaning
Port	Link	Green/Steady	The port has established a link and is enabled.
		Amber/Steady	The port is connected, but an error condition is detected.
		Off	The port is disabled or has no link.
	Activity	Green/Blinking	The port is receiving data. NOTE: As port utilization increases this LED may blink so fast that it appears to be steady.
Module	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module failed its power-on self-test.
		Amber/Blinking	The module has been inserted into the chassis and diagnostics are running.
		Off	The module power is off, or the power has been turned on, and the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8616SXE Module

The 8616SXE Module (Figure 20) is a 32K records module.

→ **Note:** If one, or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode (128K records mode). For instructions on enabling or disabling MMode, see *Platform and System Management*.

The 8616SXE Module provides 16 1000BASE-SX ports (850 nm, shortwave, Gigabit Ethernet) for riser connections, server attachments, or interswitch links.

Figure 20 8616SXE Module
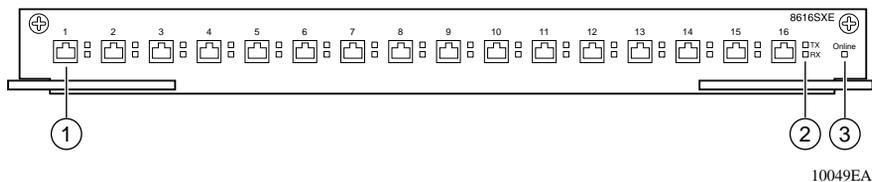
1 = 1000BASE-SX port
2 = Port TX and RX LEDs
3 = Module Online LED

The shortwave optical transceivers provide transmission ranges as follows:

- Up to 275 m using 62.5 μm multimode fiber cable
- Up to 550 m using 50 μm multimode fiber cable

The 8616SXE Module supports standards-based 1000 Mb/s full-duplex operation only.

Figure 21 shows the location of the 8616SXE Module LEDs.

Figure 21 8616SXE Module LEDs
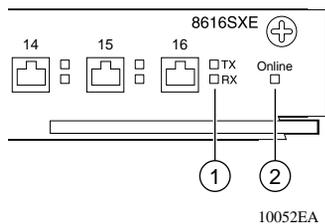
1 = Port TX and RX LEDs
2 = Module Online LED

Table 12 describes the 8616SXE Module LEDs.

Table 12   8616SXE Module LEDs

| Type	Label	Color/State	Meaning
Port	TX	Green/Blinking	The port is transferring data.
		Off	There is no port activity.
	RX	Green/Steady	The port has established a link and is enabled.
		Green/Blinking	The port is receiving data.
		Amber/Steady	The port has either no optical signal or no link synchronization.
		Off	The port has a signal but no link.
Module	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module failed its power-on self-test.
		Off	The switch power is off, or the power has been turned on and the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8624FXE Module

The 8624FXE Module (Figure 22) is a 32K records module.

> ➡ **Note:** If one, or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode (128K records mode). For instructions on enabling or disabling MMode, see *Platform and System Management*.

It uses fiber optic technology to allow long-distance connections for backbone and riser applications. The module consists of a printed circuit board with status LEDs and 24 100BASE-FX ports.

Figure 22   8624FXE Module
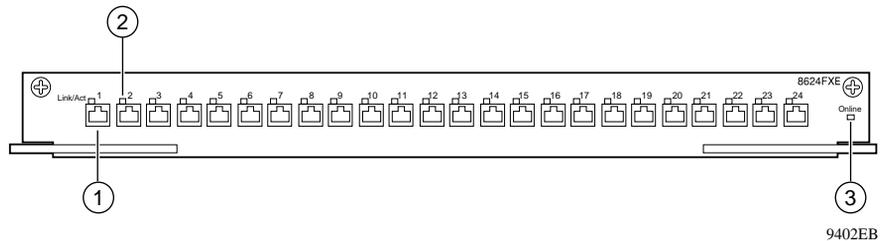
1 = 100BASE-FX port
2 = Port LED
3 = Module Online LED

The 24 100BASE-FX ports on the 8624FXE Module can operate in full-duplex. The optical transceivers provide transmission ranges of up to 6562 ft (2 km) using 62.5 μm multimode fiber cable.

Figure 23 shows the location of the LEDs.

Figure 23   8624FXE Module LEDs
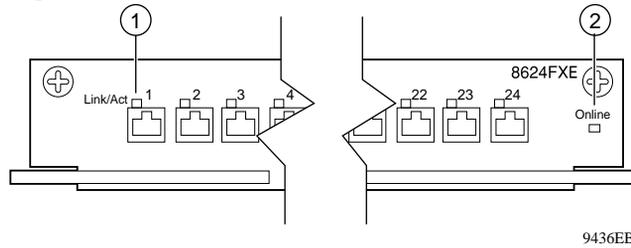
1 = Port Link/Activity LEDs
2 = Module Online LED

Table 13 describes the 8624FXE Module LEDs.

Table 13   8624FXE Module LEDs

Type	Label	Color/State	Meaning
Port	Link/Act	Green/Steady	The port is connected, and the link is good.
		Green/Blinking	Data is passing through this port.
		Amber/Steady	A fault condition exists at the far end of the connection.
		Amber/Blinking	A fault condition exists at the far end of the connection, and the port is sending or receiving.
		Off	The port is not connected, or it is connected but has no link.
Module	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module failed its power-on self-test.
		Off	The switch power is off, or the power has been turned on and the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8632TXE and 8632TXM Modules

The 8632TXE Module is a 32K records module.

> → **Note:** If one, or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode (128K records mode). For instructions on enabling or disabling MMode, see *Platform and System Management*.

The 8632TXM Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. The 8632TXM module will only operate with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

- The chassis must include at least one 8691SF CPU module. If the chassis includes a 8690SF module, the mode defaults back to 32K mode.
- All modules installed in the chassis must support 128K records (M modules) running 3.3 and later software.
- MMode (128K records mode) must be enabled. If one or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode. For instructions on enabling MMode, see *Platform and System Management*.

Both the 8632TXE and 8632TXM Modules (Figure 24) consist of a printed circuit board with status LEDs, 32 autonegotiating 10/100 Mb/s ports, and two bays for 1000BASE-X gigabit interface connectors (GBICs).

Figure 24   8632TXE/8632TXM Module
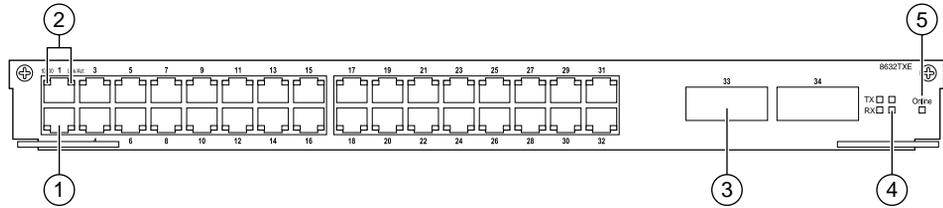
1 = 10/100 Mb/s port
2 = Port LEDs: 10/100 (speed), link/activity
3 = GBIC bay
4 = GBIC TX and RX LEDs
5 = Module online LED

10458EA

The ports for both the 8632TXE and 8632TXM Modules support the IEEE 802.3 1998 Clause 28 autonegotiation standard. Each port can operate in full- or half-duplex mode. When a port is connected to another device that also supports the IEEE 802.3 1998 Clause 28 autonegotiation standard, the two devices negotiate the highest possible data rate and the duplex mode of operation.

Figure 25 shows the location of the 8632TXE and 8632TXM Module LEDs.

Figure 25   8632TXE/8632TXM Module LEDs
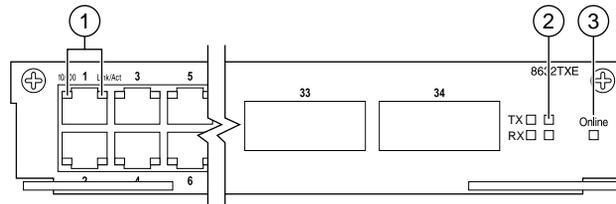
1 = Port LEDs: 10/100 (speed), link/activity
2 = GBIC TX and RX LEDs
3 = Module online LED

10459EA

Table 14 describes the 8632TXE and 8632TXM Module LEDs.

Table 14   8632TXE/8632TXM Module LEDs

| Type	Label	Color/State	Meaning
Module	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module failed its power-on self-test.
		Off	The switch power is off, or the power has been turned on and the module is performing its power-on self-test and software initialization. A module in this state is not yet functional.
Port	10/100	Green/Steady	The port is operating at 100 Mb/s.
		Off	The port is operating at 10 Mb/s.
	Link/Act	Green/Steady	The port is connected, and the link is good.
		Green/Blinking	Data is passing through this port.
		Off	The port is disabled or has no link.
GBIC	TX	Green/Blinking	The port is transmitting data.
		Amber/Steady	A fault condition exists on the line or on the attached remote device.
		Off	The port has not detected a fault condition.
	RX	Green/Steady	The port has a link and is enabled.
		Green/Blinking	The port is receiving data.
		Amber/Steady	The port has either no optical signal or no link synchronization.
		Off	The port has a signal but no link.

8648TXE and 8648TXM Modules

The 8648TXE Module is a 32K records module.

→ **Note:** If one, or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode (128K records mode). For instructions on enabling or disabling MMode, see *Platform and System Management*.

The 8648TXM Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. The 8648TXM module will only operate with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

- The chassis must include at least one 8691SF CPU module.If the chassis includes a 8690SF module, the mode defaults back to 32K mode.
- All modules installed in the chassis must support 128K records (M modules) running 3.3 and later software.
- MMode (128K records mode) must be enabled. If one or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode. For instructions on enabling MMode, see *Platform and System Management*.

Both the 8648TXE and 8648TXM Modules (Figure 26) consist of a printed circuit board with status LEDs and 48 autonegotiating 10/100 Mb/s ports.

Figure 26   8648TXE/8648TXM Module

9401EB
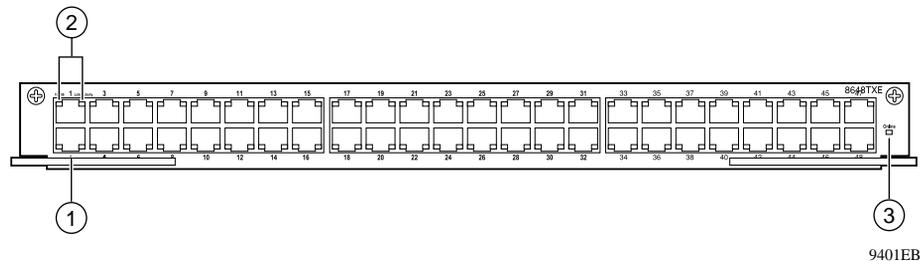
1 = 10/100BASE-T port
2 = Port LEDs: 10/100 (speed)
                    Link/Activity
3 = Module Online LED

The ports for both the 8648TXE and 8648TXM Modules support the IEEE 802.3 1998 Clause 28 autonegotiation standard. Each port can operate in full- or half-duplex mode. When a port is connected to another device that also supports the IEEE 802.3 1998 Clause 28 autonegotiation standard, the two devices negotiate the highest possible data rate and the duplex mode of operation.

Figure 27 shows the location of the 8648TXE and 8648TXM Module LEDs.

Figure 27   8648TXE/8648TXM Module LEDs
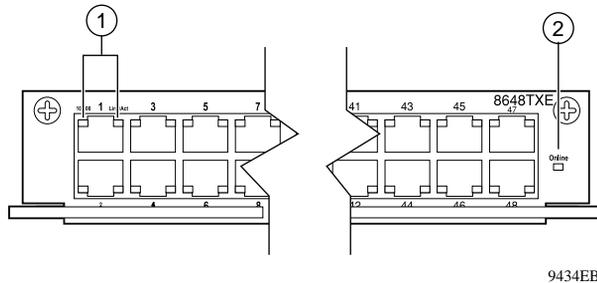
1 = Port LEDs: 10/100 (speed) and Link/Activity
2 = Module Online LED

Table 15 describes the 8648TXE and 8648TXM Module LEDs.

Table 15   8648TXE/8648TXM Module LEDs

Type	Label	Color/State	Meaning
Port	10/100	Green/Steady	The port is operating at 100 Mb/s.
		Off	The port is operating at 10 Mb/s.
	Link/Activity	Green/Steady	The port is connected, and the link is good.
		Green/Blinking	Data is passing through the port.
		Off	The port is disabled or has no link.
Module	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module failed its power-on self-test.
		Off	The switch power is off, or the power has been turned on and the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8672ATME and 8672ATMM Modules

The 8672ATME Module is a 32K records module.

> **Note:** If one, or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode (128K records mode). For instructions on enabling or disabling MMode, see *Platform and System Management*.

The 8672ATMM Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. The 8672ATMM module will only operate with 8000 Series software release 3.3 and later

For 128K record support the following configurations are required:

- The chassis must include at least one 8691SF CPU module. If the chassis includes a 8690SF module, the mode defaults back to 32K mode.
- All modules installed in the chassis must support 128K records (M modules) running 3.3 and later software.
- MMode (128K records mode) must be enabled. If one or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode. For instructions on enabling MMode, see *Platform and System Management*.

Both the 8672ATME and 8672ATMM Modules (Figure 28) have two bays for installing ATM MDAs. These MDAs provide network transmission that supports RFC 1483 routed and bridged PVCs. The 8672ATME and 8672ATMM Modules support SONET and SDH frame structures for data.

Figure 28   8672ATME/8672ATMM Module with an OC-12c/STM-4 MDA
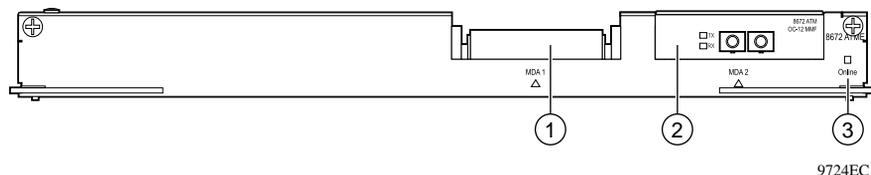
1 = MDA bay
2 = Installed MDA
3 = Online LED

The module requires at least one of the following MDAs:

- 1-port OC-12c/STM-4: single-mode fiber (SMF) or multimode fiber (MMF) using the Synchronous Optical Network (SONET) or Synchronous Digital Hierarchy (SDH) media
- 4-port OC-3c/STM-1: SMF or MMF using SONET or SDH media
- 2-port DS-3

For more information about the MDAs for the 8672ATME and 8672ATMM Modules, see Chapter 9, "Installing media dependent adapters on 8600 modules," on page 143.

The PCMCIA card contains the image file for the 8672ATME and 8672ATMM Modules. To initialize these modules, see "Initializing the 8672ATME, 8672ATMM, and 8683POSM Modules" on page 169.

In the data center, the 8672ATME and 8672ATMM Modules act as an edge device for WAN connectivity to connect a 8600 Switch to public or private ATM networks. In the wiring closet, this module provides inter-building connections for campus networks where each building is supported by frame-switched networks. You can install six 8672ATME or 8672ATMM Modules in one 8010 chassis.

Both the 8672ATME and 8672ATMM Module have an Online LED that indicates overall status for the module. Table 16 describes the Online LED.

Table 16   8672ATME/8672ATMM Module LED

Color/State	Meaning
Green	The module is receiving power and is ready to receive and transmit traffic.
Amber	The module is initializing and performing diagnostic self-tests.
Off	The module is offline and not receiving power.

See *Using the 8672ATME and 8672ATMM Modules* for a description of how to configure the 8672ATME and 8672ATMM Modules using the Command Line Interface (CLI) or Device Manager.

8681XLR Module

The 8681XLR Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. This module only operates with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

- The chassis must include the 8691SF CPU module.
- All modules installed in the chassis must support 128K records running 3.3 and later software.
- MMode (128K records mode) must be enabled. For instructions on enabling MMode, see *Platform and System Management*.

The 8681XLR Module (Figure 29) consists of a printed circuit board with status LEDs and, one 10GBASE-LR 1310nm 10 gigabit Ethernet serial LAN port. The 10GBASE-LR port (10.3 Gb/s LAN PHY) operates in full-duplex mode and provides transmission ranges of up to 10 km using 9/125 μm single-mode fiber cable.

You can use up to eight 8681XLR Modules in one 8010 Chassis.

Figure 29   8681XLR Module
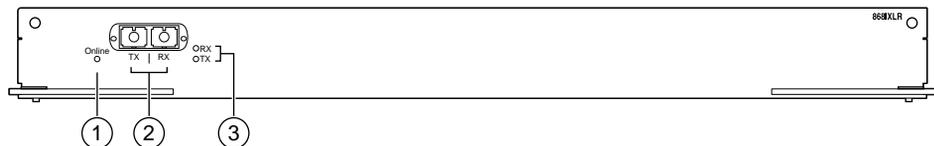
1 = Online LED
2 = 10GBASE LR port
3 = Port RX and TX LEDs

10548EA

Figure 30 shows the location of the 8681XLR Module LEDs.

> **Note:** Unlike other 8600 Modules, the TX LED for the 8681XLR and
> 8681XLW Modules is located below the RX LED.

Figure 30   8681XLR Module LEDs
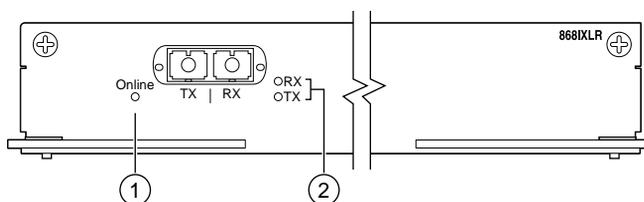
1 = Online LED
2 = Port RX and TX LEDs

10550EA

Table 17 describes the 8681XLR Module LEDs.

Table 17   8681XLR Module LEDs

Type	Label	Color/State	Meaning
Port	TX	Green/Steady	The port is enabled but not transmitting data.
		Green/Blinking	The port is transmitting data.
		Off	The port transmit is disabled.
	RX	Green/Steady	The port has a link and is enabled.
		Green/Blinking	The port is receiving data.
		Amber/Steady	The cable is disconnected, the port is disabled, or the link is down.
Module	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module slot is disabled.
		Off	The switch power is off, or the power has been turned on and the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8681XLW Module

The 8691XLW Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. This module only operates with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

- The chassis must include the 8691SF CPU module.
- All modules installed in the chassis must support 128K records running 3.3 and later software.
- MMode (128K records mode) must be enabled. For instructions on enabling MMode, see *Platform and System Management*.

The 8681XLW Module (Figure 31) consists of a printed circuit board with status LEDs and one 10GBASE-LW 1310nm 10 gigabit Ethernet serial WAN port. The 10GBASE-LW port (9.95 Gb/s WAN PHY) operates in full-duplex mode and provides transmission ranges of up to 10 km using 9/125 μm single-mode fiber cable.

You can use up to eight 8681XLW Modules in one 8010 chassis.

Figure 31   8681XLW Module
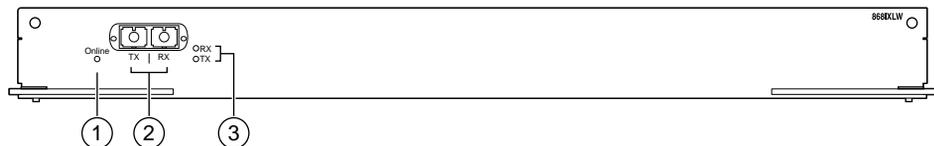
1 = Online LED
2 = 10GBASE LW port
3 = Port RX and TX LEDs

10547EA

Figure 32 shows the location of the 8681XLW Module LEDs.

> **Note:** Unlike other 8600 Modules, the TX LED for the 8681XLR and 8681XLW Modules is located below the RX LED.

Figure 32   8681XLW Module LEDs
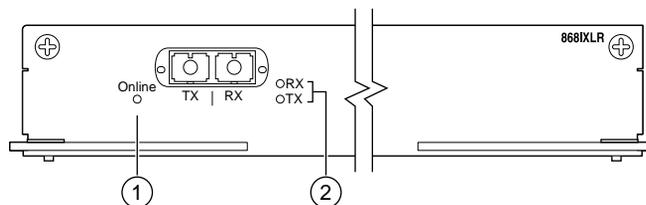
1 = Online LED
2 = Port RX and TX LEDs

10550EA

Table 18 describes the 8681XLW Module LEDs.

Table 18   8681XLW Module LEDs

Type	Label	Color/State	Meaning
Port	TX	Green/Steady	The port is enabled but not transmitting data.
		Green/Blinking	The port is transmitting data.
		Off	The port has not detected a fault condition.
	RX	Green/Steady	The port has a link and is enabled.
		Green/Blinking	The port is receiving data.
		Amber/Steady	The cable is disconnected, the port is disabled, the link is down, or SONET errors are detected.
Module	Online	Green/Steady	The module has completed its power-on self-test and software initialization and is operating normally.
		Amber/Steady	The module slot is disabled.
		Off	The switch power is off, or the power has been turned on and the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8683POSM Module

The 8683POSM Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. This module only operates with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

- The chassis must include at least one 8691SF CPU module.
- All modules installed in the chassis must support 128K records (M modules) running 3.3 and later software.
- MMode (128K records mode) must be enabled. If one or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode. For instructions on enabling MMode, see *Platform and System Management*.

The 8683POSM Module (Figure 33) has three bays for installing POS MDAs. These MDAs provide WAN support by allowing access to SONET services in the metropolitan area. You can connect multiple campuses in a single metropolitan area without compromising performance or increasing complexity.

Figure 33   8683POSM Module with an OC-12c/STM-4 MDA
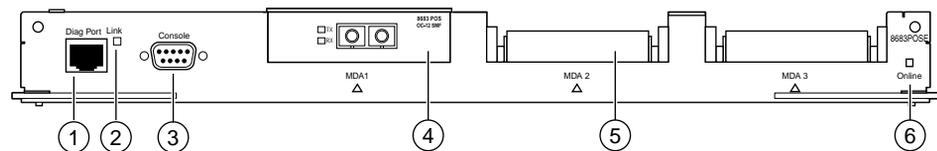
1 = Diag port   3 = Console port   5 = MDA bay
2 = Link LED   4 = Installed MDA   6 = Online LED

10352EB

To operate, each module requires at least one of the following MDAs:

- 1-port OC-12c/STM-4: SMF or MMF using SONET media
- 2-port OC-3c/STM-1: SMF or MMF using SONET media

For more information about the MDAs for the 8683POSM Module, see Chapter 9, "Installing media dependent adapters on 8600 modules," on page 143.

The PCMCIA card contains the image file for the 8683POSM Module. To initialize this module, see "Initializing the 8672ATME, 8672ATMM, and 8683POSM Modules" on page 169.

The 8683POSM Module supports a mixture of OC-3c/STM-1 and OC-12c/STM-4 lines. For example, you can install an OC-12c/STM-4 MDA in the first bay and OC-3c/STM-1 MDAs in the two remaining bays. This module supports up to six I/O OC-3c/STM-1 lines and up to three I/O OC-12c/STM-4 lines. You can install up to four 8683POSM Modules in one 8010 Chassis.

The 8683POSM Module has an Online LED that indicates overall status for the module. Table 19 describes the Online LED.

Table 19   8683POSM Module LED

Color/State	Meaning
Green	The module is receiving power and is ready to receive and transmit traffic.
Amber	The module is initializing and performing diagnostic self-tests.
Off	The module is offline and is not receiving power.

See *Using the 8683POSM Module* for a description of how to configure the 8683POSM Module using the Command Line Interface (CLI) or Device Manager.

8691SF Module

The 8691SF Module (Figure 34) provides the core switching fabric for the 8600 Switch, as well as a a CPU subsystem and a real-time clock. The core switching fabric switches all traffic through the routing switch modules. The CPU subsystem manages the routing switch fabric and the other I/O modules.

Figure 34   8691SF Module

9403EA
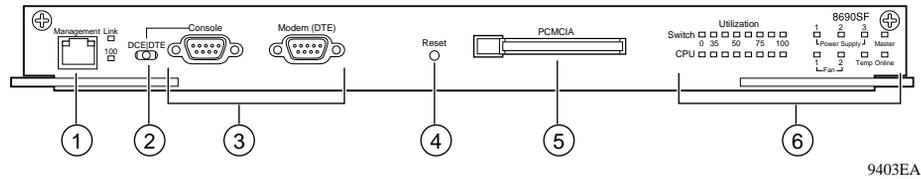
1 = Ethernet Management port
2 = DTE/DCE switch
3 = Console and Modem ports
4 = Reset button
5 = PCMCIA card slot
6 = LEDs

The 8691SF Module consists of a printed circuit board with status LEDs, a management port, a DCE/DTE switch for the console port, a console port, a modem port, a reset button, and a PCMCIA card slot.

The CPU subsystem uses a PowerPC CPU and has 64 megabytes (MB) of synchronous dynamic random access memory (SDRAM). The 8691SF Module contains 16 MB of onboard flash memory, used to store the image file, and 2 MB of boot memory (ROM).

The routing switch fabric uses 10 MB of shared, high-speed memory. This memory buffers traffic destined for I/O modules. The switch logic allocates memory to the various switch priority queues according to traffic usage and current switch configuration.

To enable redundant operation, install a 8691SF Module in both slots 5 and 6 of the chassis. The redundant module in slot 6 can then assume the processing duties of a failing primary 8691SF Module in slot 5. When the 8691SF Module in slot 6 completes initialization, it relearns the routing and VLAN bridging information for the switch unless the HA-CPU flag has been enabled. In that case the static routes and ARP entries for routing are synchronized to the redundant CPU which will result in no interruption of network services.

The two 8691SF Modules share switch fabric functions for the switch. If one 8691SF Module fails, the system reverts to operation with a single 8691SF Module.

Figure 35 shows the location of the 8691SF Module LEDs.

Figure 35 8691SF Module LEDs

1 = Link LED   4 = Power supply status LEDs   7 = Temp LED
2 = Port speed LED   5 = Master LED   8 = Fan LEDs
3 = Switch Utilization LEDs   6 = Online LED   9 = CPU Utilization LEDs
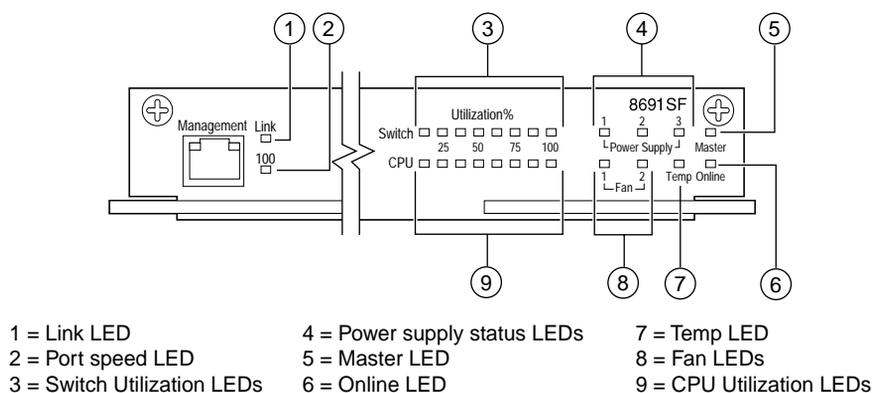
10350EA

The Switch LEDs and the CPU LEDs serve as a bar graph to indicate card activity. The Switch bar graph increases as the switch fabric utilization increases. The CPU bar graph increases when the CPU is actively performing tasks, such as learning media access control (MAC) addresses, updating routing tables, or interacting with the device management station.

Table 20 describes the 8691SF Module LEDs.

Table 20 8691SF Module LEDs

Label	Color/State	Meaning
Link	Green/Steady	The management port is connected, and the link is good.
	Off	There is no link to the management port.
100	Green/Steady	The management port is operating at 100 Mb/s.
	Off	The management port is operating at 10 Mb/s.
Switch Utilization (8 LEDs)	Green	The number of lit LEDs indicates the utilization level of the switch fabric as follows: 1 LED = 10 Mb/s 5 LEDs = 10 Gb/s 2 LEDs = 100 Mb/s 6 LEDs = 20 Gb/s 3 LEDs = 1 Gb/s 7 LEDs = 40 Gb/s 4 LEDs = 5 Gb/s 8 LEDs = 64 Gb/s

Table 20   8691SF Module LEDs (continued)

Label	Color/State	Meaning
CPU Utilization (8 LEDs)	Green	The number of lit LEDs indicates the level of CPU activity as follows: 1 LED = 12% 5 LEDs = 60% 2 LEDs = 24% 6 LEDs = 72% 3 LEDs = 36% 7 LEDs = 84% 4 LEDs = 48% 8 LEDs = 100%
Power Supply 1, 2, 3	Green/Steady	The specified power supply is operating normally.
	Amber/Steady	The specified power supply has a fault.
	Off	A power supply is not present in the specified bay, or the power supply in the specified bay is not turned on.
Fan 1, 2	Green/Steady	The specified fan is operating normally.
	Amber/Steady	The specified fan has failed.
Temp	Green/Steady	The temperature is normal for switch operation.
	Amber/Steady	The maximum operating temperature has been exceeded.
Master	Green/Steady	The CPU subsystem on this module is performing diagnostics.
	Green/Blinking	This module is providing active CPU functions for the switch and is the master CPU module.
	Amber/Steady	The CPU subsystem is in a fault state.
	Off	The CPU subsystem on this module is active and is in standby mode.
Online	Green/Steady	The switch fabric portion of the module is online and is load-sharing.
	Amber/Steady	The switch fabric portion of the module has failed diagnostics.
	Off	The switch fabric portion of the module is off-line.

Ethernet management port

The Ethernet management port on the 8691SF Module is an MDI 10/100BASE-T port that allows out-of-band management of the switch using a Web browser or Device Manager. You can also establish a Telnet or SSH (Secure Shell) session to access the CLI. Use this port to connect the switch to a network management station. The Ethernet management port has its own IP address but does not switch traffic to other ports in the chassis.

→ **Note:** This port should be used only as a management port. This port provides out-of-band management for the 8691SF CPU Module.

DCE/DTE switch

The DCE/DTE switch changes the pin assignments on the Console port and allows you to designate the connector as either DTE or DCE. For information about pin assignments for the Console port, see "Console serial port" on page 226.

Serial ports

The 8691SF Module provides two serial ports for attaching modem and console devices. The Console port provides terminal access to the 8691SF Module to use the CLI. The Modem port allows you to connect a standard modem for out-of-band, dial-up management. For information about pin assignments for these ports, see "Console serial port" on page 226 and "Modem serial port" on page 227.

Reset button

The recessed Reset button on the module allows you to perform a hard reset or reboot of the system.

PCMCIA card slot

The PCMCIA card slot in the 8691SF Module accepts an ATA-type, SanDisk-compatible flash memory card. This memory card provides a convenient way to store switch configurations and boot images. Using a memory card, you can quickly transfer configurations and images between switches or store multiple configurations for a single switch.

Supported memory cards for the 8691SF Module include the following:

- Modem cards that are compatible with Intel* 8250 or National 16552 serial ports
- LAN cards from 3Com* 589, 562, or 556 equipment

Caution: You cannot use the Accelar 1200 PCMCIA card in 8000 Series equipment.

Chapter 4
Installing the 8010 Chassis

This chapter describes how to install the 8010 Chassis. It includes the following topics:

Topic	Page
Preparing to install the 8010 Chassis	81
Installing the chassis	86

Preparing to install the 8010 Chassis

Before beginning the installation, verify that:

- Your shipment is complete and undamaged.
- You have the cables, tools, and other equipment that you need.
- Your installation site meets the physical, electrical, and environmental requirements.

The sections that follow provide information to help you prepare for installation.

Caution: The 8010 Chassis is intended for use in a restricted access location.

Shipment contents

Inspect all items for shipping damage. If you detect any damage, do not install the 8010 Chassis. Call the Nortel Networks Technical Solutions Center in your area (see "How to get help" on page 22.)

In addition to the 8010 Chassis, your shipping container contains several hardware accessories. Verify that the items in the shipping container match those on the shipment packing list.

Use Table 21 as a checklist when verifying the contents of the shipping container.

Table 21   8010 Chassis shipping accessories

Check	Accessory	Use to
	Bracket kit containing • Two rack mounting brackets • Flat head screws	Prepare the chassis for installation in an equipment rack.
	Screw package	Mount the chassis in an equipment rack.
	2 side cable management brackets	Manage network interface cables.
	Cable adapter	Connect an optional management console.

Figure 36 illustrates the items in the 8010 Chassis shipping container.

Figure 36   Items in the 8010 Chassis shipping container
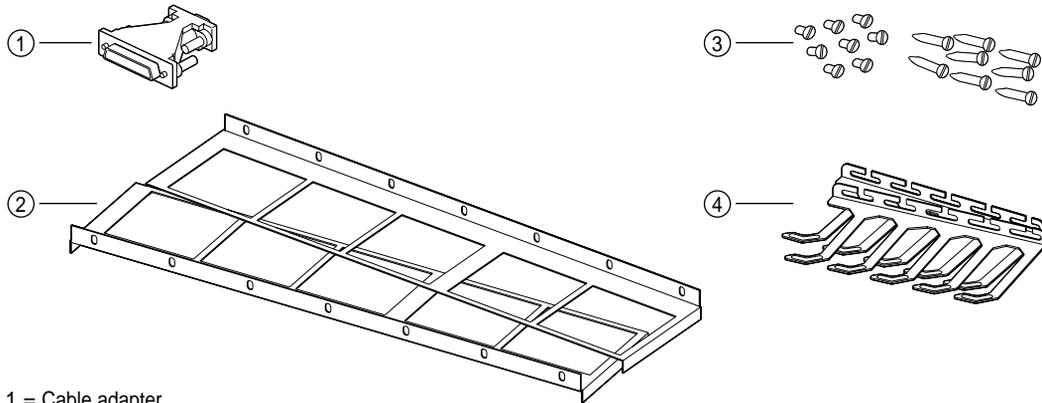
1 = Cable adapter
2 = Rack mounting brackets
3 = Screws for brackets and equipment rack
4 = Cable guides

9073FB

Supplying equipment

You will need items that are not included in the 8010 Chassis accessory package. Before installing the 8010 hardware, make sure that you have all the cables, tools, and other equipment that you will need.

Management console

To configure startup options and to monitor the results of startup diagnostics, you can attach an optional PC, laptop, VT-100 console or equivalent, such as a PC terminal emulator. Or, you can attach an AT-compatible modem to allow dial-in access to startup configuration and diagnostics.

Cables

Unless you specifically ordered them, the cables required for your network configuration are not included in the 8010 accessory package. If you do not have the proper cables, contact your network administrator.

Hardware for mounting the 8010 in an equipment rack

To install the 8010 Chassis in an equipment rack, you need a Phillips screwdriver and an equipment rack that meets the following specifications:

- Heavy-duty steel construction
- Electronic Industries Association (EIA) standard hole-spacing
- Width of 19 in. (48.26 cm) and depth of 24 in. (60.96 cm)

Site requirements

Ensure that the installation site meets the space, electrical, and environmental requirements listed in this section. See Appendix A, "Technical specifications for the 8010 Chassis," on page 185 for more information.

Space requirements

The installation site must provide sufficient free space around the 8010 Chassis to ensure proper ventilation and access for servicing.

Use the following guidelines to plan front and rear access:

- The maintenance aisle in front of the frame requires a clearance of 76.2 cm (30 inches).
- The wiring aisle at the back of the frame requires a clearance of 61 cm (24 inches).

AC input electrical requirements

The installation site must meet the following electrical requirements for AC power (Table 22). For additional electrical requirements, see Appendix A, "Technical specifications for the 8010 Chassis," on page 185.

Table 22   Wall receptacle requirements for AC power

Country	Receptacle	Voltage
United States and Canada	National Electrical Manufacturers Association (NEMA) 5-15P standard receptacle 10405EA	100-120 V
Any other country	For installation outside of North America, make sure that you have the proper power cord for your country.	100-240 V
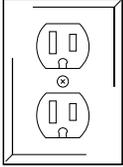
DC input electrical requirements

The installation site must meet the following electrical requirements for DC power (Table 23). For additional electrical requirements, see Appendix A, "Technical specifications for the 8010 Chassis," on page 185.

Table 23   Electrical requirements for the DC model

Nominal Input voltage	Input current	Input power
–48/ –60 VDC	29 -23 A	1308 W

Environmental requirements

The installation site must meet the following environmental requirements (Table 24).

Table 24   Environmental requirements

Altitude	Humidity	Temperature
0-10,000 ft (0-3048 m)	5%-85%, noncondensing	41°F-104°F (5°C-40°C), stable

Installing the chassis

When you are ready to install the 8010 Chassis, you can do one of the following:

- Position the 8010 Chassis on a flat, sturdy, horizontal surface.
- Mount the 8010 Chassis in a standard 19-inch equipment rack.

To make the chassis lighter to install, you can do the following:

- Remove the power supply filler panels (see "Removing and installing a power filler panel" on page 94).
- Remove the module filler panels (see "Removing a filler panel" on page 117).
- Remove the fan trays (see Chapter 10, "Installing and replacing the fan tray," on page 161).

Positioning the 8010 Chassis on a flat surface

When positioning the 8010 Chassis on a flat surface, make sure that the surface is large enough for the 8010 Chassis to operate properly and sturdy enough to support the combined weight of the 8010 Chassis, its components, and any cables that you attach to it (225 pounds or 101 kilograms).

Mounting the 8010 Chassis in an equipment rack

To mount the 8010 Chassis in an equipment rack, you need the following items:

• Standard 19 in. (48.2 cm) equipment rack

→ **Note:** If you are mounting the 8010 Chassis in a 23-inch equipment rack, refer to the rack manufacturer's 19-inch-to-23-inch rack adapter installation instructions.

• 10 screws (extra screws are shipped with the 8010 Chassis)
• Phillips screwdriver

In a 7-foot rack, you can install two 8010 Chassis platforms.

To install the 8010 Chassis in a 19-inch equipment rack:

1 Hold each rack-mounting bracket against one side of the chassis. Make sure that the attachment holes in the bracket match the holes in the chassis (Figure 37).

→ **Note:** Each bracket fits only one side of the chassis. If the mounting holes do not line up between a bracket and the chassis, try that bracket on the other side of the chassis.

Figure 37   Positioning the rack-mounting brackets
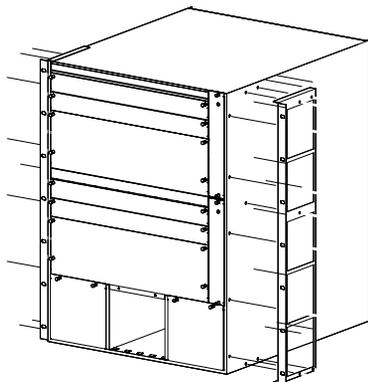
9103FA

2 Insert and tighten the supplied flat-head screws to fasten each bracket to the chassis (Figure 38).

Figure 38 Attaching the rack-mounting brackets to the chassis

9104FA
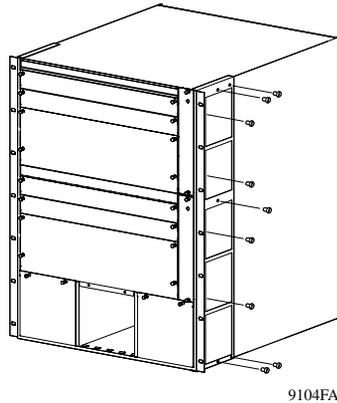
3 Measure 13.1 rack units (22.925 inches) of free vertical space inside the rack and mark the spot.

4 Holding the 8010 Chassis in position, align the flanged end of each mounting rail with two holes on each side of the vertical rack support.

It is easiest to complete this step with two people. Make sure that the hole pairs on either side of the vertical support match horizontally (Figure 39).

Figure 39 Aligning the rack-mounting brackets with the equipment rack

9074FA
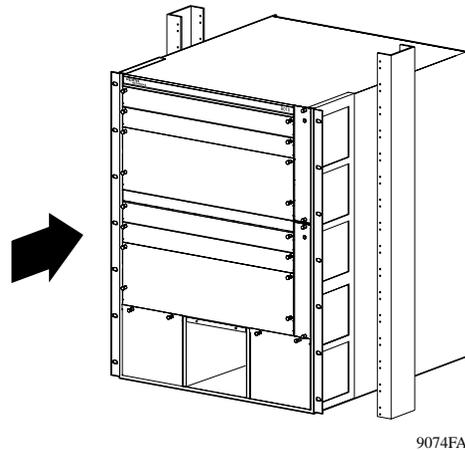
5 Insert and tighten the rack-mounting screws with a Phillips screwdriver (Figure 40).

Figure 40   Installing the 8010 Chassis in an equipment rack
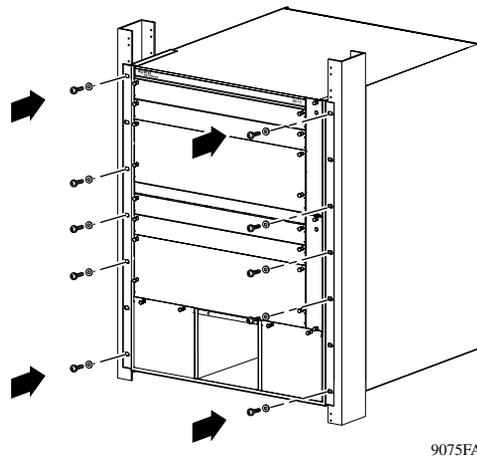
9075FA

Installing the cable guides

The cable guides keep cable clusters fastened and out of the way, but still accessible for maintenance.

To install the cable guides:

1   Loosen, but do not remove, the rack-mounting screws needed to install one cable guide (Figure 41).

Figure 41   Loosening the rack-mounting screws
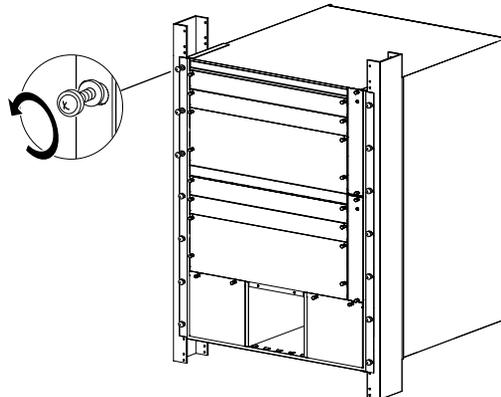
9105FA

2   Slide the guide onto the loosened screws (Figure 42).

Figure 42 Sliding the cable guide onto the screws

9106FA
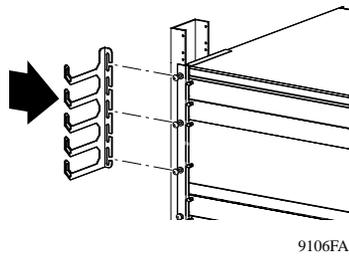
3 Tighten the screws to secure the guide to the chassis (Figure 43).

Figure 43 Securing the cable guide to the chassis

9107FA
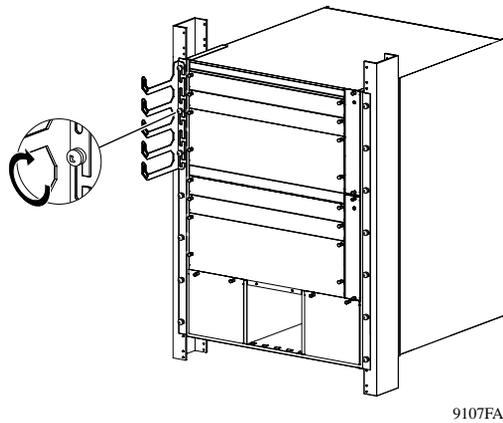
Chapter 5
Installing power supplies

This chapter contains information about installing power supplies. This chapter includes the following topics:

Power supplies for the 8010 Chassis

The 8010 Chassis operates with AC or DC input source power. The 8010 Chassis has three bays for AC or DC power supplies. Use the AC power supply with AC input power source. Use the DC power supply with DC input power source. Figure 44 shows a DC power supply. Figure 45 shows an AC power supply.

Table 25 describes the power supply LED on the AC and DC power supply.

Table 25   Power supply LED

State	Meaning
Off	No output is present.
On (green)	Power supply output is normal.

Figure 44   8010 Chassis DC power supply
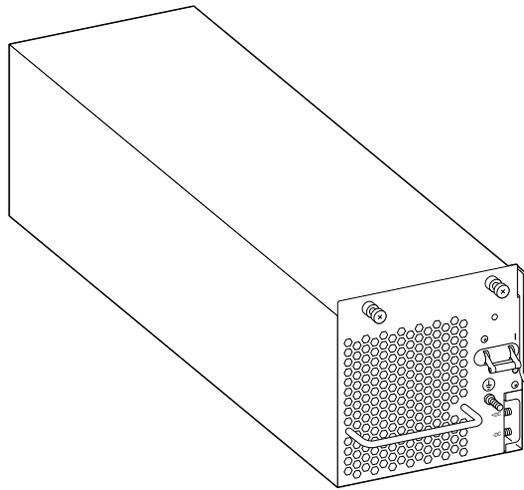
10220FA

Figure 45   8010 Chassis AC power supply
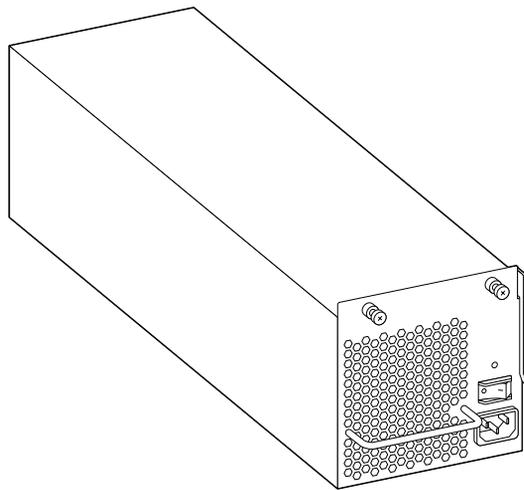
10221FA

The 8010 Chassis ships with no installed power supplies. Install the first power supply in the leftmost bay. (Power supply bays are numbered 1, 2, and 3 left to right as viewed from the front of the chassis.)

The number of power supplies that you need to install—1, 2, or 3—depends on the number of modules installed in the chassis and whether you want an optional redundant power supply (Table 26).

Table 26   Number of power supplies to install

Number of modules[1]	Number of power supplies	
	Required	Redundant configuration
1—5	1	2
6—10	2	3

1   Includes one or two 8190SM Modules or one or two 8691SF Modules.

If a chassis has a redundant power configuration and one power supply fails, the chassis continues to operate with no interruption of service.

> **Note:** When you plug the power cord for each power supply into separate AC circuits or separate DC power sources, the redundant power supply also provides protection against the disconnection or power loss of an individual circuit or power source.

If a chassis has the minimum power supply configuration and one power supply fails, the system loses power and network connectivity.

Removing and installing a power filler panel

A power filler panel maintains the proper cooling airflow in the 8010 Chassis. When you install a power supply for the first time in a bay, you must first remove the power filler panel from the power bay. If you remove a power supply from the 8010 Chassis without replacing it, you must install a power filler panel.

To remove a power filler panel:

1 Using a Phillips screwdriver, loosen the 2 captive screws that fasten the power filler panel to the chassis until the power filler panel disengages (Figure 46).

Figure 46 Removing a power filler panel
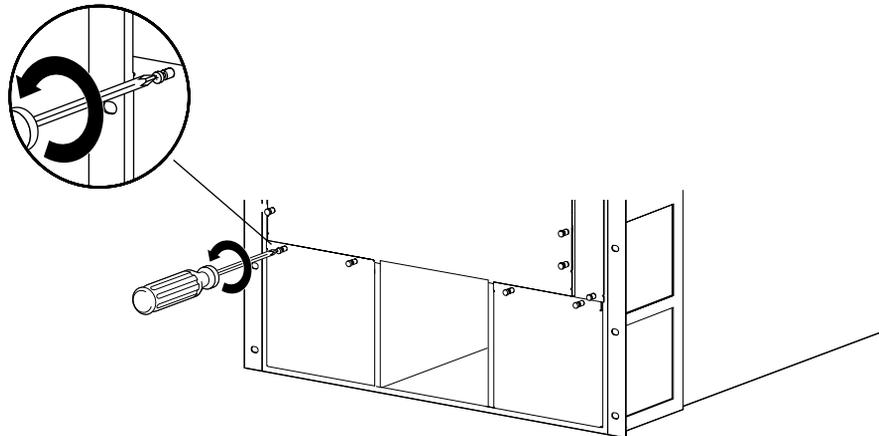
10454FA

2 Pull the power filler panel out of the 8010 Chassis.

To install a power filler panel:

1 Place the power filler panel in the empty power supply bay (Figure 47).

2 Tighten the 2 captive screws until the power filler panel is seated firmly.

Figure 47 Installing a power filler panel
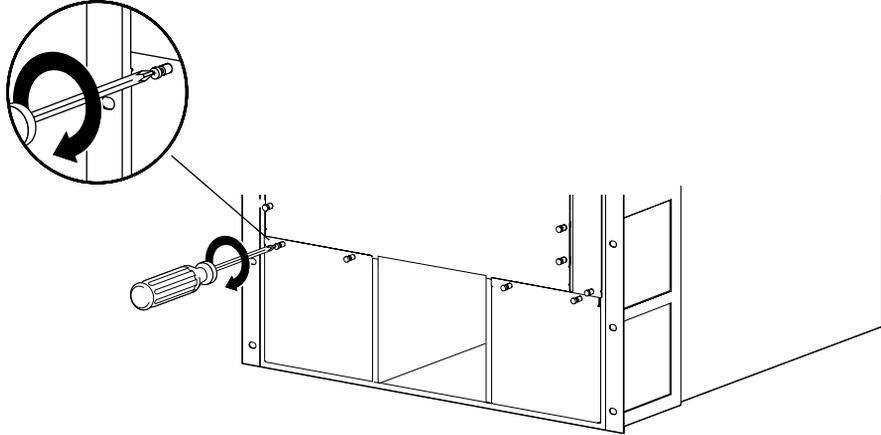
10453FA

Installing the DC power supply

⚠ **Danger:** Due to high-energy hazards, only qualified service personnel are permitted to connect the 8010 Chassis to the DC power source. Make sure the DC input power source is off and disconnected at the remote end before you perform any of the steps in this section.

In addition to the DC power supply and a guide for installing it, your DC power supply shipping container contains several hardware accessories. Verify that the items in the shipping container match those on the shipment packing list.

Use Table 27 as a checklist to verify the contents of the shipping container.

Table 27 DC power supply shipping accessories

Check	Accessory		Use to
	2 two-hole crimp lug terminals with attached tubing		Connect the positive and negative power inputs.
	1 one-hole crimp lug terminal with attached tubing		Connect the ground stud.
	5 nuts		Connect all leads.
	5 lock washers		Connect all leads.
	1 washer		Connect the ground stud.

Before you begin the installation, verify that you have the following tools and materials:

- Cable
- Crimping tool for crimping the lugs onto the cable
- Heat gun to shrink the tubing around the cable (optional)
- 7/16-inch hex wrench
- Phillips screwdriver

Preparing cables

Nortel Networks does not supply the cables for connecting the 8004DC Power Supply to the DC input power source. Select cables that comply with the electrical code of the country where you will use the DC power supply.

> **Caution:** You have the sole responsibility of ensuring that the connection cable used with the 8004DC Power Supply is appropriate for use with the DC power source to which the power supply is connected. Consider gauge, flammability, and mechanical serviceability when determining which cables to use.

To prepare cables for connecting the power supply:

1 Strip 0.81 in. (2.1 cm) of insulation from the ends of the cables (Figure 48).

Figure 48   Cable stripping requirements

≥0.81 in. (2.1 cm) 3 places
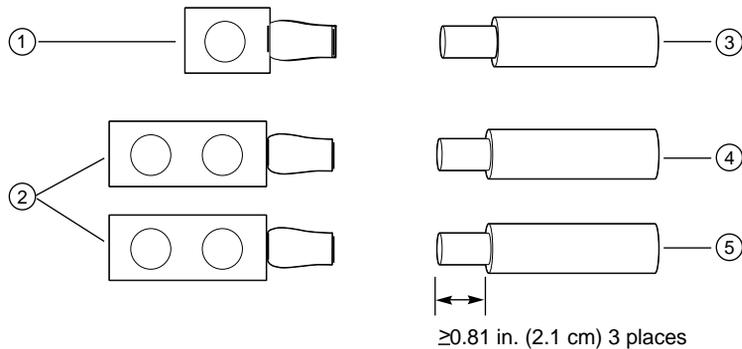
1 = Single-hole crimp lug   3 = Ground lead wire
2 = Two-hole crimp lug   4 = Positive lead wire
                            5 = Negative lead wire

10296EA

2 Crimp the lugs onto the cables using a standard crimping tool.

Failure to properly crimp the lugs onto the cables constitutes a safety hazard.

3 If necessary, use a heat gun to shrink the tubing around the cable.

Installing the power supply

To install a DC power supply:

1   Make sure that the power switch is turned off (Figure 49).

Figure 49   DC power supply power switch
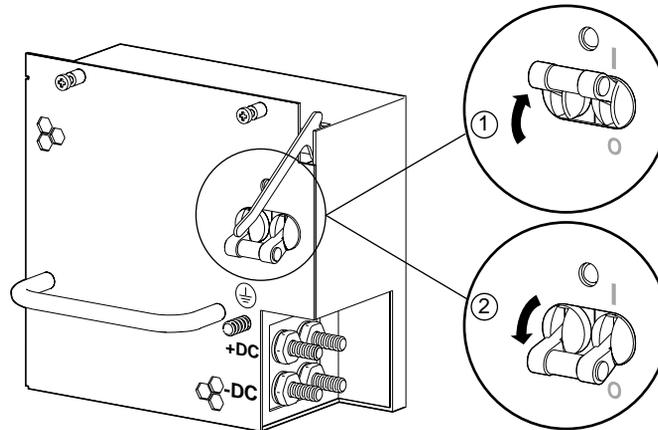
1 = On
2 = Off

10298FA

2   Remove the filler panel from the power bay if necessary.

For instructions, see "Removing and installing a power filler panel" on page 94.

3   If you are replacing a failed power supply, remove the failed supply.

For instructions, see "Removing the DC power supply" on page 105.

4   Grasp the handle of the new power supply.

5 Using a Phillips screwdriver, remove the plastic safety shield from the power supply (Figure 50).

Figure 50 Removing the plastic safety cover
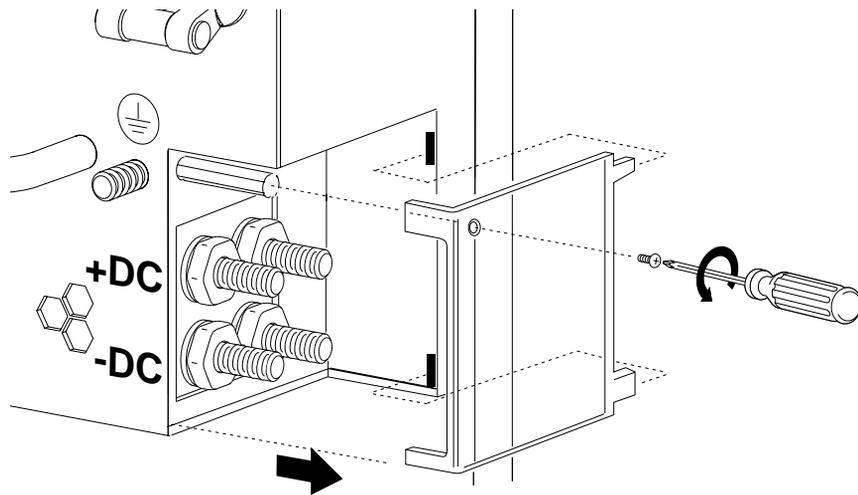
10412FA

6 Push the new power supply partway into the bay, leaving the terminal block at the side of the power supply exposed (Figure 51).

Figure 51 Inserting the DC-DC power supply
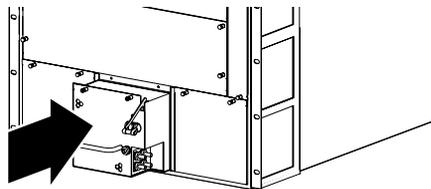
9412FAnew

7 Note the positions of the ground stud and of the positive and negative power inputs (Figure 52).

The +VDC and -VDC inputs to the power supply are isolated from frame ground. Either +VDC or -VDC may be referenced to frame ground.

Figure 52 DC-DC power supply input and ground stud location

10299FA
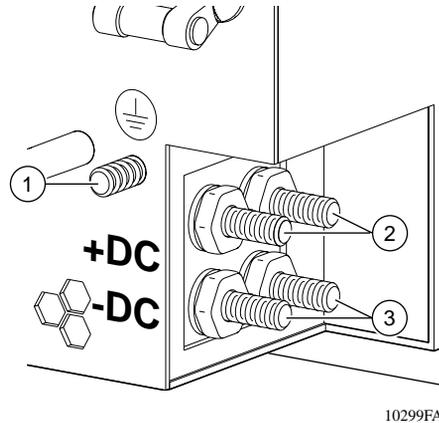
1 = Ground stud
2 = Positive power inputs
3 = Negative power inputs

8 Refer to Table 28 to verify the proper connection of the positive and negative power leads.

Table 28 Correct cable connection to the DC-DC power supply

Type of DC voltage	Voltage lead	Power supply terminal
Positive	Ground	Ground
	Positive voltage	+ terminal
	Return	– terminal
Negative	Ground	Ground
	Negative voltage	– terminal
	Return	+ terminal

> ⚠ **Danger:** Make sure that the DC power source is off or disconnected on the remote end before you connect the terminal leads to the power supply. You may need to switch a circuit breaker or turn off the DC input power source.

9 Attach the earth ground lead to the ground stud on the power supply (Figure 53). Use the washers in this order:

a Flat washer

b Crimp lug

c Lock washer

d Hex nut

Figure 53 Attaching the earth ground lead to the ground stud
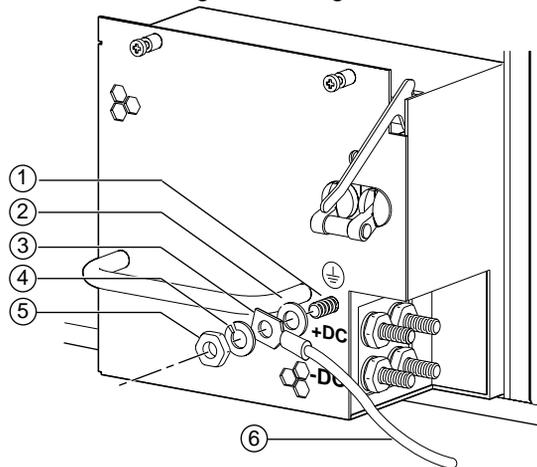
1 = Grounding stud   4 = Lock washer
2 = Flat washer   5 = Hex nut
3 = Crimp lug   6 = Earth ground lead

10297FA

10 Attach the positive voltage lead to the positive terminal on the power supply, inserting a lock washer between the crimp lug and each hex nut (Figure 54).

Figure 54 Attaching the voltage leads to the power supply terminals

1 = Two-hole crimp lug   4 = Positive lead wire
2 = Lock washer   5 = Negative lead wire
3 = Hex nut
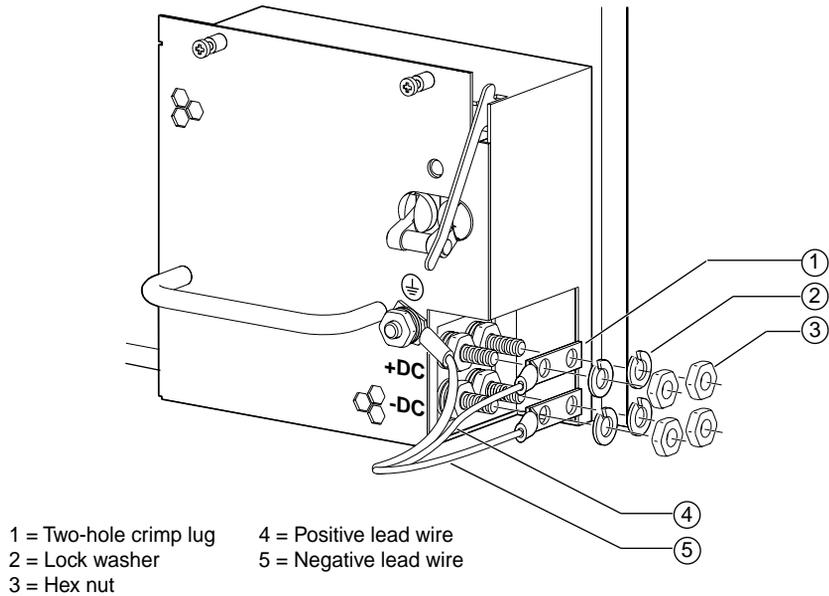
10300FA

11 Attach the negative voltage lead to the negative terminal on the power supply, inserting a lock washer between the crimp lug and each hex nut (Figure 54).

12 Using a 7/16 in. hex wrench, tighten the hex nut on each terminal.

13 Attach the earth ground cable to the system or rack ground for your DC input power source.

14 Firmly slide the power supply all the way into the bay.

15 Tighten the retaining screws until the power supply is seated firmly (Figure 55).

Figure 55   Tightening the retaining screws on the DC-DC power supply
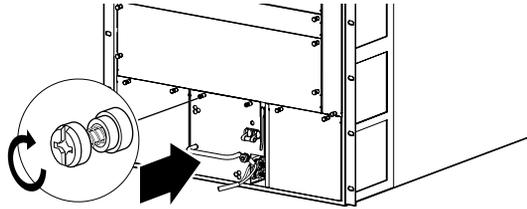
9428FA

16 Attach the positive and negative terminal leads and ground to the DC input power source according to the proper safety and technical specifications for your 48 V power distribution system.

17 Turn the DC input power source on, or reset the power source circuit breaker, to provide power to the power supply.

18 Turn the power supply switch to the on position (Figure 56).

Figure 56   DC-DC power supply power switch
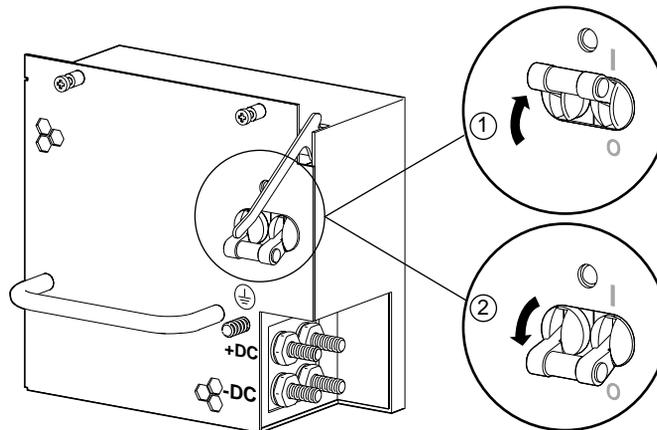
1 = On
2 = Off

10298FA

➡ **Note:** When you first install a 8010 Chassis that requires two power supplies, you must turn on both power supply units within 2 seconds of each other. If you wait longer to turn on the second power supply, both power supplies shut down. To correct this condition, turn off both power supplies, wait at least 30 seconds, and then turn on both power supplies again within 2 seconds.

If the LED on the power supply does not turn on, contact the Nortel Networks Technical Solutions Center.

Removing the DC power supply

You can remove a redundant power supply without affecting the operation of the 8000 Series switch. When you remove a power supply, the LED on the power supply turns off, and the 8010 Chassis automatically redistributes the load to the remaining power supplies.

To remove a DC power supply:

1   Turn the power supply switch to the off position .

Figure 57   DC power supply power switch
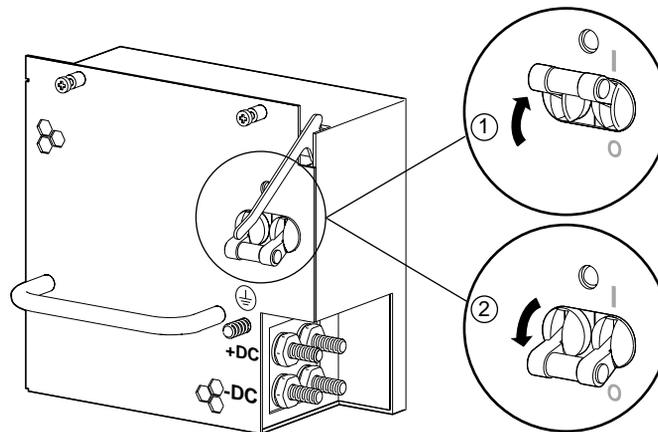
1 = On
2 = Off

10298FA

2   Disable the incoming input power from the DC input power source by switching a circuit breaker or turning off the DC input power source.

⚡ **Danger:** Make sure that the DC power source is off or disconnected at the remote end before you connect or disconnect cables from the power supply.

3 Loosen the retaining screws on the power supply (Figure 58).

Figure 58   Loosening the retaining screws on the DC power supply
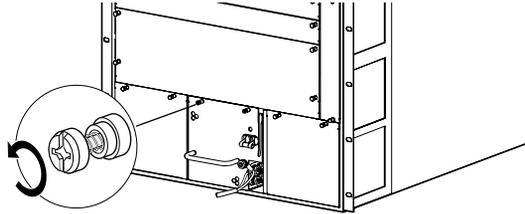
9431FA

4 Lift the extractor lever to disconnect the power supply from the backplane connector (Figure 59).

Figure 59   Disconnecting the DC power supply from the backplane
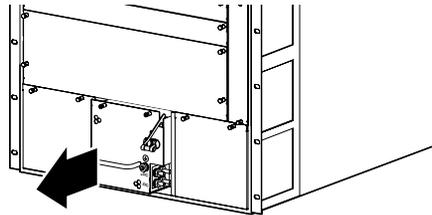
9432FA

5 Slide the power supply partway out of the chassis.

6 Using a Phillips screwdriver, remove the screw securing the plastic safety cover to the power supply, and then remove the cover (Figure 60).

Figure 60 Removing the plastic safety cover
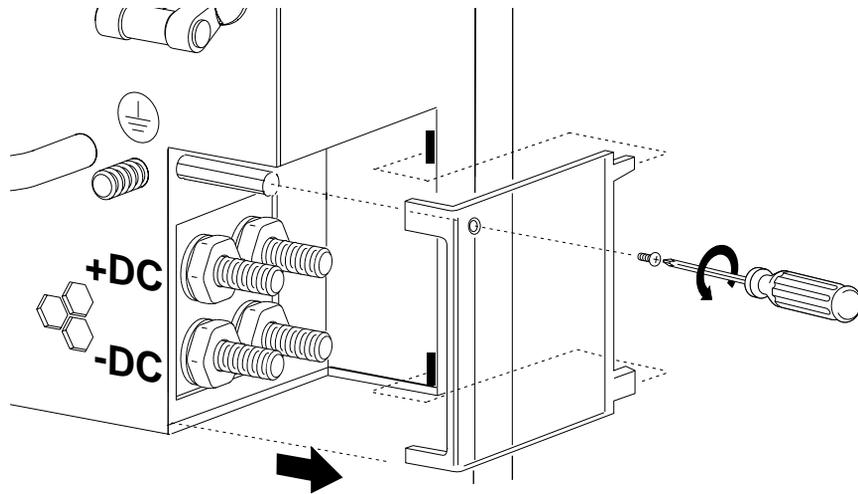
10412FA

7 Disconnect the positive and negative voltage leads from the power supply
terminals (Figure 61).

Figure 61 Disconnecting the positive and negative voltage lead

1 = Two-hole crimp lug   4 = Positive lead wire
2 = Lock washer   5 = Negative lead wire
3 = Hex nut

10300FA

8 Disconnect the earth ground lead from the ground stud on the power supply (Figure 62).

Figure 62 Disconnecting the earth ground lead from the DC power supply
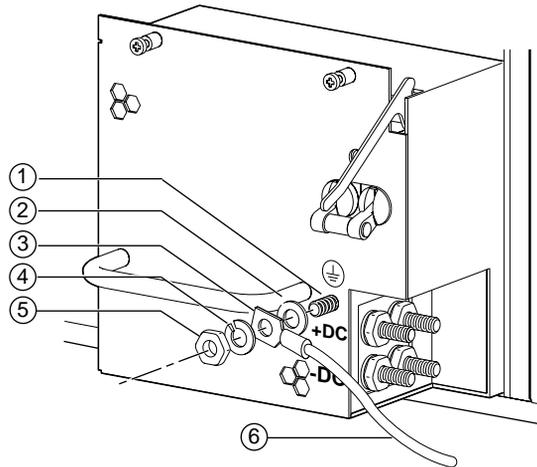
1 = Grounding stud   4 = Lock washer
2 = Flat washer   5 = Hex nut
3 = Crimp lug   6 = Earth ground lead

10297FA

9 Slide the power supply all the way out of the chassis and set it aside.

10 Install a new power supply (see "Installing the DC power supply" on page 96) or install a power filler panel (see "Removing and installing a power filler panel" on page 94).

Installing the AC power supply

To install an AC power supply:

1 Remove the filler panel from the power bay if necessary.

For instructions, see "Removing and installing a power filler panel" on page 94.

2 If you are replacing a failed power supply, remove the failed supply.

For instructions, see "Removing the AC power supply" on page 111.

3 Grasp the handle of the new power supply.

4 Push the new power supply firmly into the bay (Figure 63).

Figure 63   Installing the AC power supply
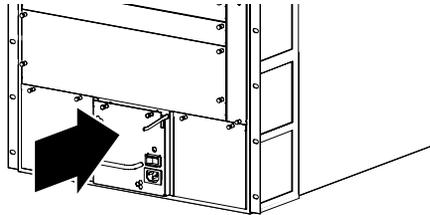
8958FA

5 Tighten the retaining screws until the power supply is seated firmly (Figure 64).

Figure 64 Tightening the retaining screws on the AC power supply
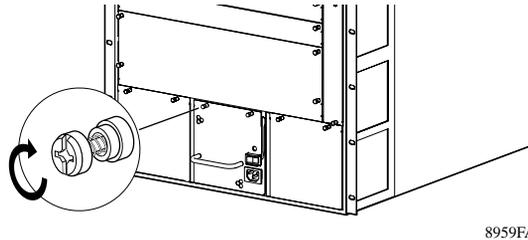
8959FA

6 With the AC power switch off, connect the power cord to the power supply and to an AC power outlet that is on a circuit with no other equipment connected to it (Figure 65).

Connect each power supply in the chassis to a separate AC circuit.

Figure 65 Connecting the power cord to the AC power supply
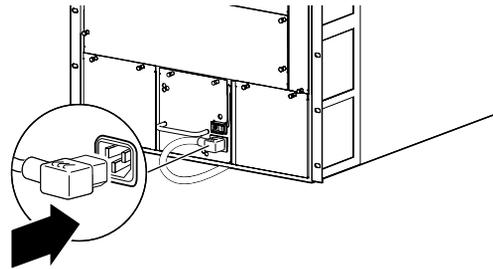
8960FA

7 Turn on the power switch (Figure 66).

Figure 66 AC power supply power switch on
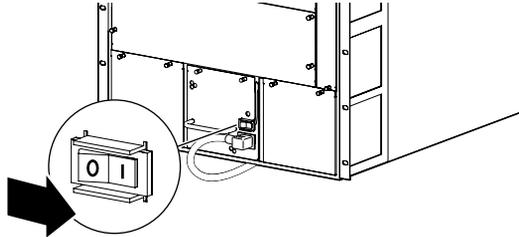
8964FA

> → **Note:** When you first install a 8010 Chassis that requires two power supplies, you must turn on both power supply units within 2 seconds of each other. If you wait longer to turn on the second power supply, both power supplies shut down. To correct this condition, turn off both power supplies, wait at least 30 seconds, and then turn on both power supplies again within 2 seconds.

Removing the AC power supply

You can remove a redundant power supply without affecting the operation of the 8000 Series switch. When you remove a power supply, the LED on the power supply turns off, and the 8010 Chassis automatically redistributes the load to the remaining power supplies.

To remove an AC power supply:

1 Turn off the power switch on the power supply that you are replacing (Figure 67).

Figure 67 AC power supply power switch off
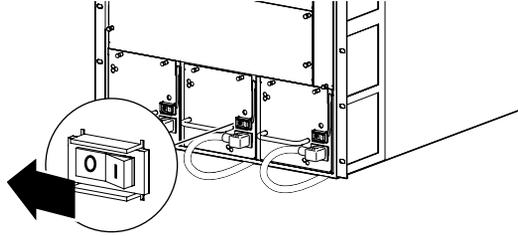
8972FA

2 Disconnect the power cord from the power outlet and from the power supply (Figure 68).

Figure 68 Disconnecting the power cord from the AC power supply
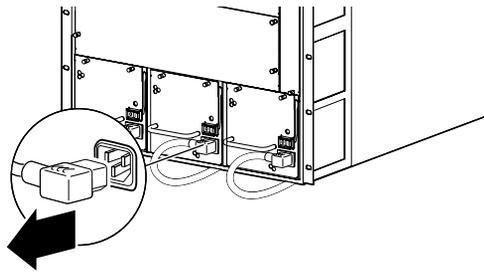
8962FA

3   Loosen the retaining screws on the power supply (Figure 69).

Figure 69   Loosening the retaining screws on the AC power supply
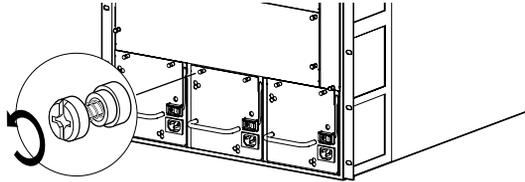

8963FA

4   Lift the extractor lever to disconnect the power supply from the backplane connector (Figure 70).

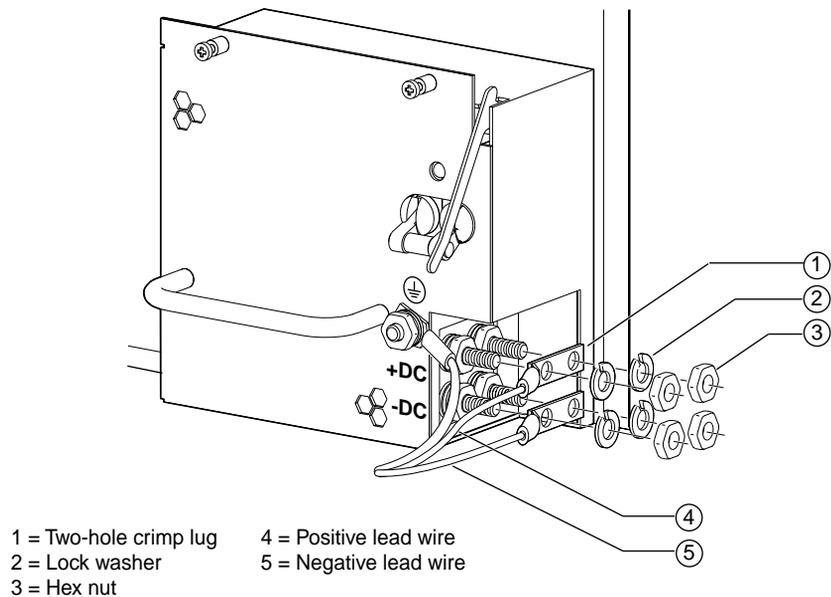**Figure 70**   Disconnecting the AC power supply from the backplane
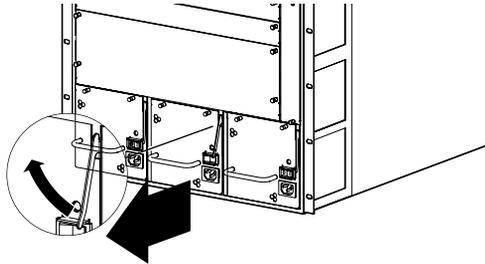
9072FA

5   Pull the power supply out of the chassis.

6   Install a new power supply (see "Installing the AC power supply" on page 109) or install a power filler panel (see "Removing and installing a power filler panel" on page 94).

Chapter 6
Installing 8000 Series modules and connecting equipment

This chapter provides instructions for installing and connecting 8000 Series modules in a 8010 Chassis to create a 8000 Series switch. It includes the following topics:

Location of the 8000 Series modules

Figure 71 shows the location of the 8000 Series modules in a 8010 Chassis. For descriptions of these modules see Chapter 2, "8100 modules" and Chapter 3, "8600 modules."

8100 modules installed in slots 1 or 2 serve as a clock source for the entire chassis. Therefore, you must install a 8100 module in either slot 1 or 2 to avoid traffic loss.

→ **Note:** 8000 Series software Release 3.2 and later does not support configurations of 8100 modules and 8600 modules installed within the same chassis.

Figure 71   Location of the 8000 Series modules
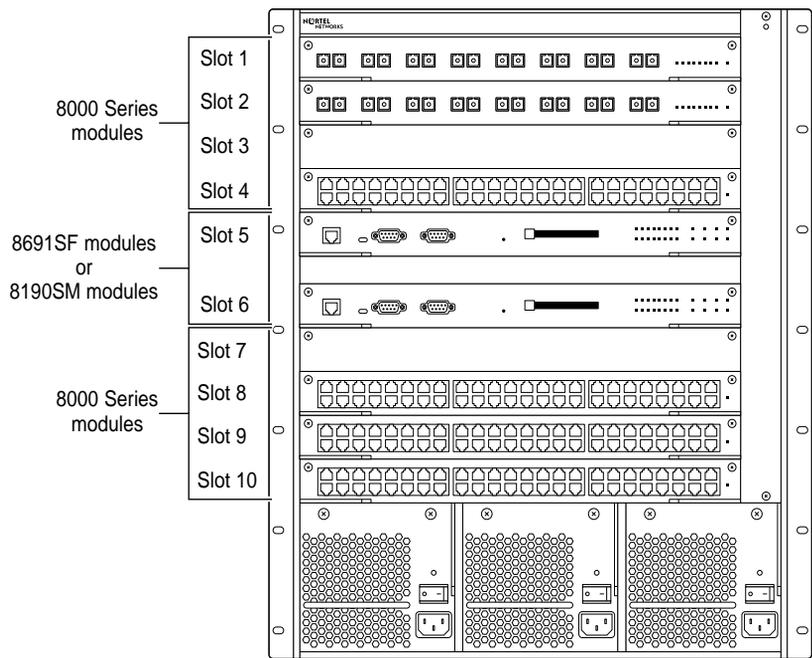
10462EB

Removing and installing a filler panel

Nortel Networks ships the 8010 with a filler panel in each empty module slot.

Before you can install a new module, you must remove the appropriate filler panel. For instructions, see the next section, "Removing a filler panel."

If you need to install a filler panel, see "Installing a filler panel" on page 117.

Removing a filler panel

To remove a filler panel:

1 Using a Phillips screwdriver, loosen the 2 captive screws that fasten the filler panel to the slot (Figure 72).

Figure 72   Removing a filler panel
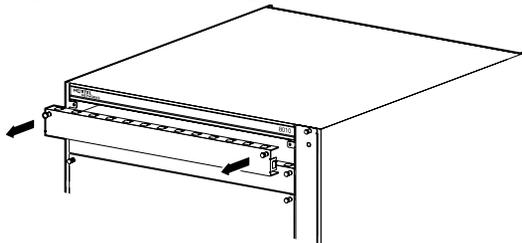
9058FA

2 Pull the filler panel away from the chassis.

Installing a filler panel

If you plan to remove a module from the 8010 Chassis without immediately replacing it, you must install a filler panel in the slot.

To install a filler panel:

1 Locate the slot where you want to install the filler panel.

2 Place the filler panel over the slot.

3 Tighten the 2 screws with a Phillips screwdriver.

Installing and replacing a module

You can add or replace a module with the power on or off. To replace a module, see the next section, "Removing a module." To install a module, see "Installing a module" on page 121.

⚠️ **Warning:** Fiber optic equipment can emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables are connected to a light source.

⚠️

CLASS 1 INVISIBLE LASER PRODUCT
LASERSCHUTZKLASSE 1 PRODUKT
TO EN 60825

8769EB

Removing a module

You can remove a module from an operating switch chassis without turning off the chassis power.

🛑 **Caution:** Do not operate the 8010 Chassis with an empty module slot. If you need to replace a failed module and you do not yet have a replacement module, leave the failed module installed or install a filler panel.

After you remove or replace a module in your chassis, you can expect the following results:

• If you remove an I/O module from an operating switch without turning off the chassis power and replace it with the same type module, the system restores the configuration.

• If you remove a 8672ATME, 8672ATMM, or 8683POSM module from an operating switch without turning off the chassis power and the module you insert has the same type MDAs installed as the module which was removed, the system saves the configuration.

- If you remove a 8672ATME, 8672ATMM, or 8683POSM module from an operating switch without turning off the chassis power and the module you insert has different MDAs installed than the module which was removed, you must reconfigure the module. Nortel Networks recommends that you save the original configuration in a file for future use.

- If you replace a module with a different type module, the system discards the configuration of the old ports, and the new ports are added to either the default VLAN or a null VLAN, depending on the operating mode of the switch.

- If you save the configuration in nonvolatile random access memory (NVRAM), turn off the switch, replace a module with a different module type, and turn the system on again, the system discards the configuration of the old ports, add adds new ports to either the default VLAN or an unassigned VLAN, depending on the operating mode of the switch.

- If you replace a 8691SF Module, all the other modules in the chassis reset and revert to their saved configuration settings. If configuration settings for a module were not saved, the module reverts to its factory default settings.

- If you remove a 8190SM Module (for example, to replace it), the switch continues switching for up to 2 minutes. Then it reboots using the configuration settings on the backup switch management module, if one is present. If, after 2 minutes, no backup switch management module is present, all ports go to blocking mode.

To remove a module:

1 Disconnect any cables attached to the ports on the module.

2 Using a Phillips screwdriver, loosen the 2 captive screws that secure the module to the chassis (Figure 73).

Figure 73   Removing a 8000 Series module

PPCO0020A
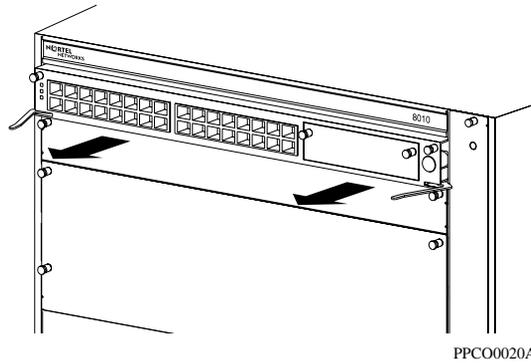
3   Rotate the insert/extract levers to eject the module from the chassis.

4   Slide the module out of the chassis.

5   If you are installing a replacement module, go to the next section. Otherwise, install a filler panel (see "Installing a filler panel" on page 117).

Installing a module

You can install a 8000 Series module with the power on or off. If you install a module in the same chassis slot where the same type of module was previously installed, the previous configuration is maintained for the new module in that slot. In all other cases, a module installed in a 8010 Chassis is reset to factory defaults.

If you are installing modules for an initial installation, follow the steps in this section to install all modules except the 8672ATME, 8672ATMM, and 8683POSM Modules. Then follow the steps in the section, "Verifying a successful installation" on page 168. Return to this section and install the 8672ATME, 8672ATMM, and 8683POSM Modules, then refer to "Initializing the 8672ATME, 8672ATMM, and 8683POSM Modules" on page 169.

If you are adding the 8672ATME, 8672ATMM, and 8683POSM Modules to an existing system, follow the steps in this section then refer to "Initializing the 8672ATME, 8672ATMM, and 8683POSM Modules" on page 169.

To install a 8000 Series module:

1 Locate the slot where you want to install the module.

2 Remove the filler panel.

   For instructions see "Removing a filler panel" on page 117.

3 Make sure that the insert/extract levers are extended away from the front of the module (Figure 74).

Figure 74 Insert/extract levers in extended position
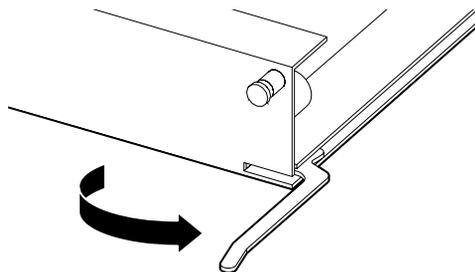
9397FA

4 Slide the module into the slot using the slot module guides (Figure 75).

Figure 75 Installing a 8000 Series module
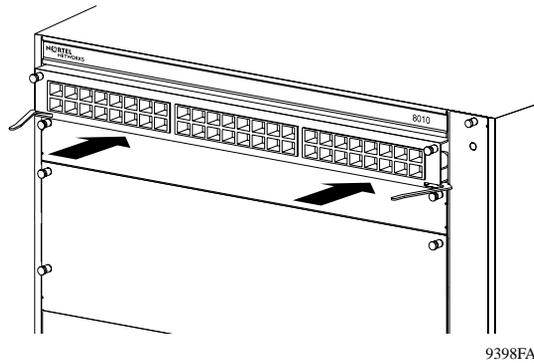
9398FA

5 Slide the module into the chassis until its connector panel touches the 8010 Chassis back panel.

6 Rotate the insert/extract levers to seat the module backplane connectors (Figure 76).

Figure 76 Seating the backplane connectors
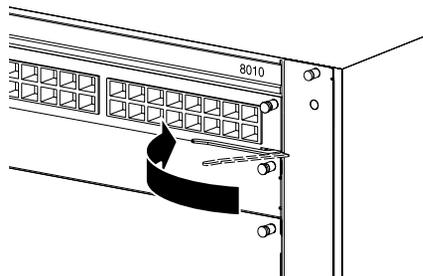
9399FA

7   Using a Phillips screwdriver, tighten the 2 captive screws to secure the 8000 Series module to the chassis (Figure 77).

Figure 77   Securing the 8000 Series module in the chassis

9400FA
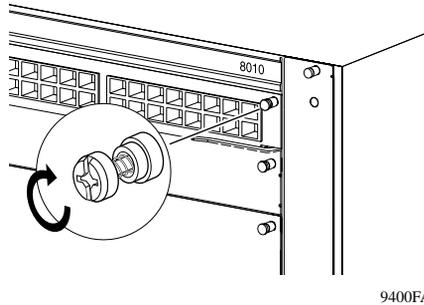
→   **Note:** Make sure that both screws are tight for proper module operation.

After you install the modules, connect console equipment and network cables. For instructions, see these sections:

Connecting a PC or terminal to the console port

You use Device Manager or the command line interface (CLI) to customize your 8000 Series switch configuration (for example, by editing IP parameters). To establish a local CLI or Device Manager session, you must connect a PC, laptop, or a VT-100 terminal to the console port on the 8190SM Module or the 8691SF Module.

To connect a PC, laptop, or terminal to the console port, you need a serial console cable with the 9-pin receptacle connector. See "Console serial port" on page 226 for a list of pin assignments.

To connect a PC, laptop, or terminal to the console port:

1 Turn on and configure the terminal or a communications port on the PC, using the parameters in Table 29.

See the PC or terminal user manual for instructions.

Table 29 PC and terminal parameters

Parameter	Value
Baud rate	9600
Data bits	8
Stop bits	1
Parity	None

2 Insert the 9-pin receptacle end of the console cable into the console connector on the 8190SM Module or the 8691SF Module.

3 Attach the 9-pin plug end of the cable to the serial communications port on the back of the PC or terminal.

Connecting a network management station to the switch

The management port on the 8190SM Module and the 8691SF Module is a 10/100 Mb/s Ethernet port implemented on an RJ-45 connector wired as an MDI connection. You can use this port to connect the switch to a network management station for out-of-band management of the switch using a Web browser or Device Manager.

The port has its own IP address but does not switch traffic to other ports in the chassis.

> → **Note:** For 10 Mb/s connections, you can use Category 3, 4, or 5 copper unshielded twisted pair (UTP) cable. Use only Category 5 UTP cable to connect ports that will operate at 100 Mb/s.

To connect a UTP cable to the management port, insert the cable into the RJ-45 receptacle connector on the 8190SM Module or the 8691SF Module.

Connecting a modem

If you need remote dial-in access to the CLI, you can connect a modem (AT or Hayes compatible) to the 8190SM Module or the 8691SF Module using a serial cable.

To connect a modem to the 8000 Series switch:

1 Turn on and configure the modem, using the parameters in .

See the modem documentation for instructions.

Table 30   Modem settings

Setting	Value
Clear to send (CTS) signal	On
Data terminal ready (DTR) signal	Modem will only connect if the DTR signal is present. If the DTR signal is not present, the modem will disconnect.
Data carrier detect (DCD) or received line signal detection (RLSD)	On while the carrier is present. The switch uses DCD to detect modem connect and disconnect.
Data set ready (DSR) signal	On
Ready to send (RTS) signal	Ignored
Synchronous/asynchronous mode	Asynchronous
Auto answer	Answer on two rings when DTR is active.
Local character echo	Off
Supervisory functions	Off
Baud rate	9600
Data bits	8
Stop bits	1
Parity	None

2 Insert the 9-pin receptacle end of the serial cable into the modem connector on the 8190SM Module or the 8691SF Module.

3 Insert the 25-pin plug connector at the other end of the serial cable into the modem's RS-232 data communications port.

Connecting communications cables to 8100 modules

Gather the communications equipment and cables that you will attach to the 8100 modules. If you do not have the proper cables, contact your network administrator. Table 31 lists the cable requirements for the 8100 modules.

Table 31 Connectors and cables for 8100 modules

Module	Port	Connector	Recommended cable type	Maximum cable length
8108GBIC	1000 Mb/s Ethernet port	Duplex SC	Depends on installed GBIC model; for specifications, see "GBICs" on page 193.	
8116FX	100 Mb/s Ethernet port	MT-RJ	62.5 μm or 50 μm multimode fiber optic	1352 ft (412 m) for half-duplex links 6562 ft (2 km) for full-duplex links
8132TX	10/100 Mb/s Ethernet ports	RJ-45 wired as MDI-X	EIA Category 3, 4, or 5 UTP for 10 Mb/s operation; EIA Category 5 UTP required for 100 Mb/s operation	328 ft (100 m)
8148TX	10/100 Mb/s Ethernet ports	RJ-45 wired as MDI-X	EIA Category 3, 4, or 5 UTP for 10 Mb/s operation; EIA Category 5 UTP required for 100 Mb/s operation	328 ft (100 m)
8190SM	Ethernet Management port	RJ-45	EIA Category 3, 4, or 5 UTP for 10 Mb/s operation; EIA Category 5 UTP required for 100 Mb/s operation	328 ft (100 m)
	Serial ports	DB-9	RS-232	

→ **Note:** Ports on the 8132TX and 8148TX Modules are wired as MDI-X. Use straight-through cables to connect these ports to MDI connections such as workstations or servers. Use crossover cables to connect these ports to other MDI-X connections such as hubs or other switches.

Connecting communications cables to 8600 modules

Gather the communications equipment and cables that you will attach to the 8600 modules. If you do not have the proper cables, contact your network administrator. Table 32 lists the cable requirements for the 8600 modules.

Table 32   Connectors and cables for 8600 modules

Module	Port	Connector	Recommended cable type	Minimum cable length	Maximum cable length
8608GBE or 8608GBM	1000 Mb/s Ethernet port	Duplex SC fiber optic connector	Depends on installed GBIC model; for specifications, see "GBICs" on page 209.	None	Depends on installed GBIC model; for specifications, see "GBICs" on page 209.
8608GTE or 8608GTM	1000BASE-T Ethernet ports	RJ-45	EIA Category 5 or better UTP/STP straight-through cable. Cables must use all four pairs.	7 ft (2.1 m)	328 ft (100 m)
8608SXE	1000BASE-SX Ethernet ports	Duplex SC	62.5 µm multimode fiber optic cable	None	722 ft (220 m) @ 160 MHz/km bandwidth 902 ft (275 m) @ 200 MHz/km bandwidth
			50 µm multimode fiber optic cable	None	1640 ft (500 m) @ 400 MHz/km bandwidth 1804 ft (550 m) @ 400 MHz/km bandwidth
8616GTE	1000BASE-T Ethernet ports	RJ-45	EIA Category 5 or better UTP/STP straight-through cable. Cables must use all four pairs.	7 ft (2.1 m)	328 ft (100 m)

Table 32 Connectors and cables for 8600 modules (continued)

Module	Port	Connector	Recommended cable type	Minimum cable length	Maximum cable length
8616SXE	1000BASE-SX Ethernet ports	MT-RJ	62.5 µm multimode fiber optic cable	None	722 ft (220 m) @ 160 MHz/km bandwidth 902 ft (275 m) @ 200 MHz/km bandwidth
			50 µm multimode fiber optic cable	None	1640 ft (500 m) @ 400 MHz/km bandwidth 1804 ft (550 m) @ 400 MHz/km bandwidth
8624FXE	100BASE-FX Ethernet ports	MT-RJ	62.5 µm multimode fiber optic cable	None	6562 ft (2 km)
8632TXE or 8632TXM	1000 Mb/s Ethernet port	Duplex SC	Depends on installed GBIC model; for specifications, see "GBICs" on page 209.	None	Depends on installed GBIC model; for specifications, see "GBICs" on page 209.
	10/100 Mb/s Ethernet ports	RJ-45 wired as MDI-X	EIA Category 3, 4, or 5 UTP for 10 Mb/s operation; EIA Category 5 required for 100 Mb/s operation	None	328 ft (100 m)
8648TXE or 8632TXM	10/100 Mb/s Ethernet ports	RJ-45 wired as MDI-X	EIA Category 3, 4, or 5 UTP for 10 Mb/s operation; EIA Category 5 required for 100 Mb/s operation	None	328 ft (100 m)
8672ATME OC-3	OC-3	MT-RJ	9/125 µm single-mode fiber optic cable	None	9.3 mi (15 km)
	OC-3	MT-RJ	62.5/125 µm multimode fiber optic cable	None	1.24 mi (2 km)
8672ATME OC-12	OC-12	Duplex SC	9/125-µm single-mode fiber optic cable	None	9.3 mi (15 km)
	OC-12	Duplex SC	62.5/125 µm multimode fiber optic cable	None	1640 ft (500 m)

Table 32   Connectors and cables for 8600 modules (continued)

Module	Port	Connector	Recommended cable type	Minimum cable length	Maximum cable length
8672ATME DS-3	DS-3	BNC	75 ohm coaxial cable	None	450 ft (137 m)
8681XLR	10GBASE-LR port	Duplex SC	9/125 µm single-mode fiber optic cable	None	6.2 mi (10 km)
8681XLW	10GBASE-LW port	Duplex SC	9/125 µm single-mode fiber optic cable	None	6.2 mi (10 km)
8683POSM OC-3	OC-3	MT-RJ	9/125 µm single-mode fiber optic cable	None	9.3 mi (15 km)
	OC-3	MT-RJ	62.5/125 µm multimode fiber optic cable	None	1.24 mi (2 km)
8683POSM OC-12	OC-12	Duplex SC	9/125-µm single-mode fiber optic cable	None	9.3 mi (15 km)
	OC-12	Duplex SC	62.5/125 µm multimode fiber optic cable	None	1640 ft (500 m)
8691SF	Ethernet Management port	RJ-45	EIA Category 3, 4, or 5 UTP for 10 Mb/s operation; EIA Category 5 required for 100 Mb/s operation	None	328 ft (100 m)
	Serial ports	DB-9	RS-232		

> → **Note:** Ports on the 8632TXE and 8648TXE Modules are wired as MDI-X. Use straight-through cables to connect these ports to MDI connections such as workstations or servers. Use crossover cables to connect these ports to other MDI-X connections such as hubs or other switches.

Chapter 7
Installing gigabit interface converters

Gigabit interface converters (GBICs) are hot-swappable I/O enhancement components that link Gigabit Ethernet ports to fiber optic networks.

This chapter describes how to install GBICs in the following 8000 Series modules that support GBICs:

- 8108GBIC Module
- 8608GBE Module
- 8608GBM Module
- 8632TXE Module
- 8632TXM Module

This chapter does not describe how to install coarse wavelength division multiplexing (CWDM) GBICs in 8000 Series modules. To install the CWDM GBICs and the optical routing system, see the following documents:

- *Installing CWDM Gigabit Interface Converters*

  Describes how to install CWDM GBICs in 8000 Series modules.

- *Installation and Networking Guidelines for Optical Routing*

  Describes how to install the optical routing system, including connections between the GBICs, multiplexers, and the switch.

This chapter includes the following topics:

Topic	Page
Installing a GBIC	133
Removing a GBIC	134

The 8108GBIC, 8608GBE, 8608GBM Modules have eight bays for installing GBICs. The 8632TXE and 8632TXM Modules have two bays for installing GBICs. The GBIC bays are covered by spring-loaded filler panels that rotate out of the way when you push the GBIC into place.

The following types of GBIC are supported:

- 1000BASE-SX—uses multimode fiber over distances up to 550 meters (m)
- 1000BASE-LX—uses multimode fiber over distances up to 550 m or single-mode fiber over distances up to 5 kilometers (km)
- 1000BASE-XD—uses single-mode fiber over distances up to 50 km
- 1000BASE-ZX—uses single-mode fiber over distances up to 70 km
- 1000BASE-CWDM—uses single-mode fiber over distances up to 120 km

> → **Note:** CWDM GBICs are not supported on the 8108GBIC Module.

GBICs are available in different case styles (Figure 78). One type has two spring tabs at the front of the GBIC; the other type has an extractor handle on the front.

Figure 78   Types of GBICs

GBIC model with
extractor tabs

GBIC model with
extractor handle

9702FA
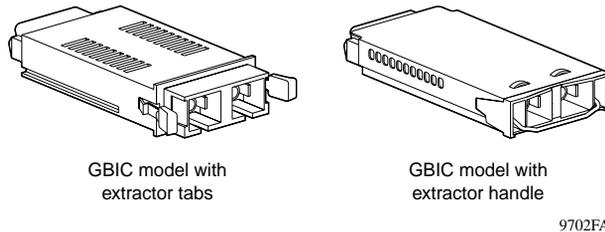
GBICs are shipped with a protective rubber plug in the connectors. Leave the plug in place when no cables are connected to the GBIC.

Installing a GBIC

You can install or replace a GBIC in an operating 8000 Series module without turning off the power to the switch.

> ⚠ **Danger:** Fiber optic equipment can emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables are connected to a light source.

To install a GBIC:

1 Remove the GBIC from its protective packaging.

2 Insert the GBIC into the bay on the module (Figure 79).

GBICs are keyed to prevent improper insertion. If the GBIC resists pressure, do not force it. Remove it, turn it over, and reinsert it.

Figure 79 Installing a GBIC
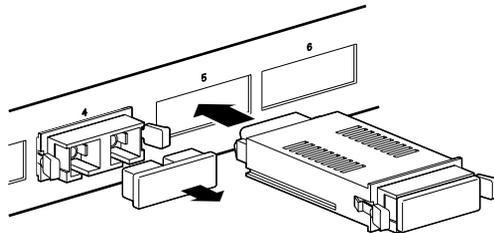
9708FA

3 Press on the front of the GBIC until it snaps into place.

4 Remove the rubber plug from the connectors to connect the cables.

When shorter lengths of single-mode fiber cable are used with the 1000BASE-ZX and 1000BASE-XD GBICs, there is a risk of overloading the receiver. You may need to insert an in-line optical attenuator at each end of the link between the fiber optic cable plant and the receiving port on the 1000BASE-ZX or 1000BASE-XD GBIC (Table 33).

Table 33   In-line optical attenuators for 1000BASE-ZX and 1000BASE-XD GBICs

Fiber optic cable span	In-line optical attenuator
Less than 25 km	10 dB
Less than 50 km	5 dB

Removing a GBIC

To remove an installed GBIC:

- If the GBIC has an extractor handle, grasp the handle and pull firmly to remove the GBIC from the bay.
- If the GBIC has spring tabs, press in on the tabs on each side of the GBIC and pull the GBIC out of the bay (Figure 80).

Figure 80   Removing a GBIC

9704FA
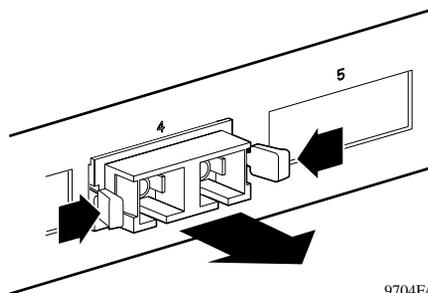
Chapter 8
Installing media dependent adapters on 8100 modules

This chapter describes the 400 Series and 8100 Series media dependent adapters (MDAs) and how to install them on the 8116FX Module and the 8132TX Module. The MDAs support high-speed connections to servers, shared Fast Ethernet hubs, or backbone devices.

This chapter includes the following topics:

The 8116FX and 8132TX Modules support the following MDAs:

- 450-1SX MDA—1000BASE-SX MDA (1-port shortwave gigabit fiber)
- 450-1SR MDA—1000BASE-SX MDA (1-port shortwave gigabit fiber with 1 redundant port)
- 450-1LX MDA—1000BASE-LX MDA (1-port longwave gigabit fiber)
- 450-1LR MDA—1000BASE-LX MDA (1-port longwave gigabit fiber with 1 redundant port)
- 8100-4TX MDA—10BASE-T/100BASE-TX MDA (4-port copper)
- 8100-2FX MDA—100BASE-FX MDA (2-port multimode fiber with SC connectors)
- 8100-4FX MDA—100BASE-FX MDA (4-port multimode fiber with MT-RJ connectors)

450 Series MDAs

Four Gigabit Ethernet MDAs are available for the 8116FX Module and the 8132TX Module:

- Two shortwave gigabit MDAs (Figure 81):
  - The 450-1SX MDA is a single-Phy MDA.
  - The 450-1SR MDA is a single-MAC MDA with a redundant Phy port.

  These MDAs use shortwave 850 nm fiber optic connectors to connect devices over multimode (550 meter) fiber optic cable.

- Two longwave gigabit MDAs (Figure 82):
  - The 450-1LX MDA is a single-Phy MDA.
  - The 450-1LR MDA is a single-MAC MDA with a redundant Phy port.

  These MDAs use longwave 1300 nm fiber optic connectors to connect devices over single-mode (3 kilometer) or multimode (550 meter) fiber optic cable.

Figure 81   1000BASE-SX (shortwave gigabit) MDA front panels
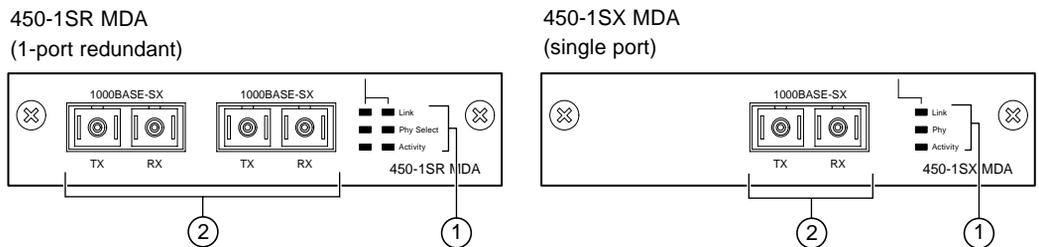
1 = LEDs
2 = 1000BASE-FX SC port connectors

Figure 82   1000BASE-LX (longwave gigabit) MDA front panels

450-1LR MDA
(1-port redundant)

450-1LX MDA
(single port)

9216EA

1 = LEDs
2 = 1000BASE-FX SC port connectors
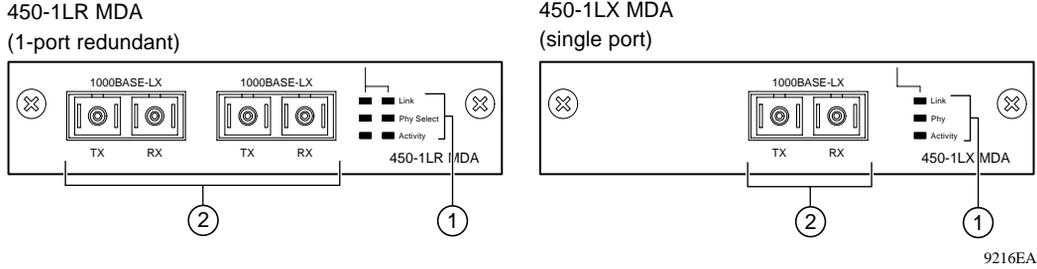
Table 34 describes the 1000BASE-SX and 1000BASE-LX MDA LEDs.

Table 34   1000BASE-SX and 1000BASE-LX MDA LEDs

Label	Color/State	Meaning
Link	Green/Steady	A valid communication link is established.
	Green/Blinking	The corresponding port is management disabled.
	Off	The communication link connection is bad, or there is no connection to this port.
Phy Select	Green/Steady	The corresponding Phy port is selected.
	Off	The corresponding Phy port is in backup mode.
Activity	Green/Blinking	Indicates the network activity level for the corresponding port. A high level of network activity can cause LEDs to appear to be on continuously.

8100-4TX MDA

The 8100-4TX MDA (Figure 83) has four standard RJ-45 connectors to attach to Ethernet devices. This MDA can operate at either 10 Mb/s or 100 Mb/s speed. The speed is determined through autonegotiation with the connected device.

Figure 83   8100-4TX MDA front panel
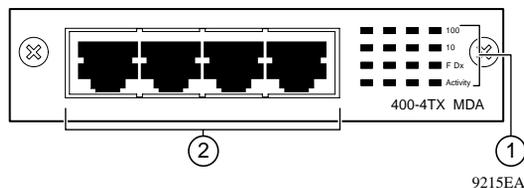
1 = LEDs
2 = 10BASE-T/100BASE-TX port connectors

Table 35 describes the 8100-4TX MDA LEDs.

Table 35   8100-4TX MDA LEDs

Label	Description	Color/State	Meaning
100	100BASE-TX port status LEDs	Green/Steady	The corresponding port is set to operate at 100 Mb/s.
		Green/Blinking	The corresponding port is management disabled.
		Off	The link connection is bad, or there is no connection to this port.
10	10BASE-T port status LEDs	Green/Steady	The corresponding port is set to operate at 10 Mb/s.
		Green/Blinking	The corresponding port is management disabled.
		Off	The link connection is bad, or there is no connection to this port.
F Dx	Full-duplex port status LEDs	Green/Steady	The corresponding port is in full-duplex mode.
		Off	The corresponding port is in half-duplex mode.
Activity	Port activity LEDs	Green/Blinking	Indicates the network activity level for the corresponding port. A high level of network activity can cause LEDs to appear to be on continuously.

8100 Series fiber MDAs

The 8100 Series fiber MDAs are used to make fiber-based 100 Mb/s connections to the switch. Two versions of this MDA are available (Figure 84):

- The 8100-2FX MDA uses two longwave 1300 nm SC connectors to connect devices over 62.5/125 μm multimode fiber optic cable.
- The 8100-4FX MDA uses four longwave 1300 nm MT-RJ connectors to connect devices over 62.5/125 μm multimode fiber optic cable.

The 8100 Series fiber MDAs do not support single-mode fiber cable.

Figure 84 8100 Series fiber MDA front panels

8100-2FX MDA
(2-port SC connectors)

8100-4FX MDA
(4-port MT-RJ connectors)

1 = LEDs
2 = 100BASE-FX port connectors
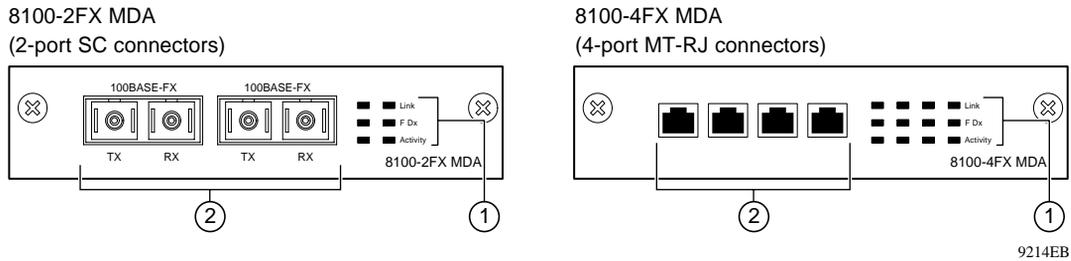
Table 36 describes the 8100 Series fiber MDA LEDs.

Table 36 8100 Series fiber MDA LEDs

Label	Description	Color/State	Meaning
Link	Communication link LEDs	Green/Steady	A valid communication link is established.
		Green/Blinking	The corresponding port is management disabled.
		Off	The communication link connection is bad, or there is no connection to this port.
F Dx	Full-duplex port status LEDs	Green/Steady	The corresponding port is in full-duplex mode.
		Off	The corresponding port is in half-duplex mode.
Activity	Port activity LEDs	Green/Blinking	Indicates the network activity level for the corresponding port. A high level of network activity can cause LEDs to appear to be on continuously.

Installing an MDA on a 8100 module

The 8116FX Module and the 8132TX Module have one slot for a single MDA.

> → **Note:** You can install or replace an MDA without turning off the chassis; however, the module resets when an MDA is inserted or removed.

To install or replace an MDA:

1 Loosen the retaining screw at each end of the module.

2 Use the insert/extract levers to disconnect the module from the chassis backplane connector.

3 Loosen the thumbscrews and remove the filler panel (or the installed MDA) from the MDA slot.

4 Insert the MDA into the slot (Figure 85), taking care to slide the MDA onto the guides provided on the module backing.

> ⬡ **Caution:** Make sure that the MDA slides in on the guides provided. Failure to align the MDA with the guides can result in bent and broken pins.

Figure 85 Installing an MDA on the 8132TX Module
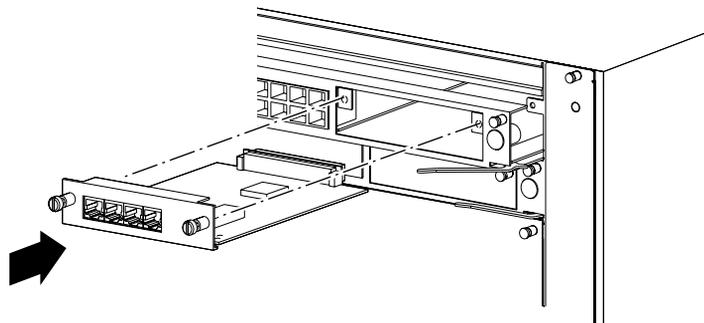
9169FA

5 Press the MDA firmly into the slot. Make sure that the MDA is fully seated in the connector.

6 Secure the MDA in the module by tightening the thumbscrews on the MDA front panel.

7 Use the insert/extract levers to reseat the module backplane connector.

8 Tighten the module retaining screws.

9 Attach devices to the MDA ports.

> → **Note:** The IEEE 802.3 1998 Clause 28 autonegotiation specification requires that all ports operating at 100 Mb/s use only Category 5 unshielded twisted pair (UTP) cabling.

Chapter 9
Installing media dependent adapters on 8600 modules

This chapter provides instructions for adding and replacing media dependent adapters (MDAs) on the 8672ATME, 8672ATMM and 8683POSM Modules. It also discusses connecting communications cables. This chapter includes the following topics:

8672ATME and 8672ATMM Module MDAs

The media dependent adapters (MDAs) for the 8672ATME and 8672ATMM Modules are modular port adapters that you install on the module. The module has two slots for MDAs. You can install one or two of the following MDAs:

- 1-port OC-12c/STM-4 (Figure 86)
- 4-port OC-3c/STM-1 (Figure 87)
- 2-port DS-3 (Figure 88)

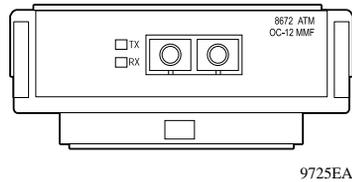**Figure 86**   8672ATME and 8672ATMM Module MDA: OC-12c/STM-4

9725EA

Figure 87   8672ATME and 8672ATMM Module MDA: OC-3c/STM-1
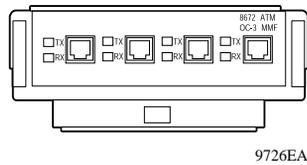

9726EA

Figure 88   8672ATME and 8672ATMM Module MDA: DS-3

10530EB
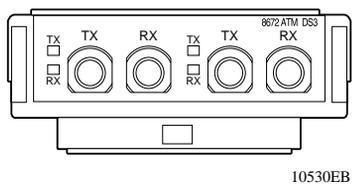
Each MDA has ports for connection to an ATM network. You can install both types of MDA to achieve flexibility in connectivity types. Table 37 lists the MDAs available for the 8672ATME and 8672ATMM Module.

Table 37   MDAs for the 8672ATME/8672ATMM Module

Port type	Model	Cable type	Connector type
OC-12c/STM-4	DS1304004	Multimode fiber	Duplex SC
	DS1304005	Single-mode fiber	Duplex SC
OC-3c/STM-1	DS1304006	Multimode fiber	MT-RJ
	DS1304007	Single-mode fiber	MT-RJ
DS-3	DS1304002	75 ohm coaxial	BNC

The OC-3c/STM-1 and OC-12c/STM-4 MDAs for the 8672ATME and 8672ATMM Module are Class 1 laser products, as identified by the label on the MDA (Figure 89).

Figure 89   Product label for the 8672ATME and 8672ATMM Module MDA

CLASS 1 INVISIBLE LASER PRODUCT
LASERSCHUTZKLASSE 1 PRODUKT
TO EN 60825

8769EB

The MDAs have two bicolor LEDs for each port: one marked TX (transmit) and one marked RX (receive). Table 38 describes the LEDs.

Table 38   LEDs on the 8672ATME/8672ATMM Module MDA

Label	Color	State	Meaning
Tx	Green	Steady/Blinking	The port is transmitting data.
	Amber	Steady	An alarm (RDI) condition has been detected; the administrative state is down.
	Amber	Blinking	The port is out of order; the administrative state is down.
	—	Off	The port is not transmitting data.

Table 38 LEDs on the 8672ATME/8672ATMM Module MDA (continued)

Label	Color	State	Meaning
Rx	Green	Steady/Blinking	The port is receiving data.
	Amber	Steady	An alarm (OOF/LOF/LOS) condition has been detected; the administrative state is down.
	Amber	Blinking	The port is out of order; the administrative state is down.
	—	Off	The port is not receiving data.

Specifications for the 8672ATME and 8672ATMM Module MDAs

Table 39 lists the specifications for the 8672ATME and 8672ATMM Module MDA- OC-3c and OC-12c.

Table 39 8672ATME and 8672ATMM Module MDA specifications- OC-3c/STM-1 and OC-12c/STM-4

Port type	Operating wavelength	Operating power	Pulse repetition rate
OC-12c/STM-4	1274-1356 nm	-14 to -20 dBm	622.08 Mb/s
	1260-1360 nm	-8 to -15 dBm	622.08 Mb/s
OC-3c/STM-1	1274-1356 nm	-14 to -20 dBm	155.52 Mb/s
	1260-1360 nm	-8 to -15 dBm	155.52 Mb/s

→ **Note:** See Table 42 for DS-3 specifications.

The OC-3c/STM-1 MDA uses SONET STS-3c/SDH STM-1 1300 nm optical transceivers with MT-RJ fiber optic connectors and either single-mode fiber (SMF) or multimode fiber (MMF) cabling. Table 40 describes the connector specifications.

Table 40   OC-3c/STM-1 specifications: 8672ATME and 8672ATMM Module MDA

Parameter	SMF description	MMF description
Physical media	9/125 µm	62.5/125 µm
Line code	NRZ	NRZ
Wavelength	1274 to 1356 nm	1274 to 1356 nm
Average transmit output power	-8 to -15 dBm	-14 to -20 dBm
Average receiver sensitivity	-8 to -28 dBm	-14 to -30 dBm
Distance	15 km	2 km
Input power	40 W	40 W
Thermal rating	138 Btu/hour maximum	138 Btu/hour maximum

The OC-12c/STM-4 MDA uses SONET STS-3c/SDH STM-1 1300 nm optical transceivers with duplex SC-type fiber optic connectors and either single-mode fiber (SMF) or multimode fiber (MMF) cabling. Table 41 describes the connector specifications.

Table 41   OC-12c/STM-4 specifications: 8672ATME and 8672ATMM Module MDA

Parameter	SMF description	MMF description
Physical media	9/125 µm	62.5/125 µm
Line code	NRZ	NRZ
Wavelength	1274 to 1356 nm	1274 to 1356 nm
Average transmit output power	-8 to -15 dBm	-14 to -20 dBm
Average receiver sensitivity	-8 to -28 dBm	-14 to -26 dBm
Distance	15 km	500 m
Input power	40 W	40 W
Thermal rating	138 Btu/hour maximum	138 Btu/hour maximum

The DS-3 MDA uses a 75 ohm coaxial cable. Table 42 describes the connector specifications.

Table 42   DS-3 specifications: 8672ATME and 8672ATMM Module MDA

Parameter	Specification
Line rate	44.736 Mb/s (20 ppm)
Impedance	75 ohms
Maximum length	450 feet (135 m)

8683POSM Module MDAs

The MDAs for the 8683POSM Module are modular port adapters that you install on the module. The module has three slots for MDAs. You can install one, two, or three of the following SMF and MMF MDAs:

- 1-port OC-12c/STM-4 (Figure 90)
- 2-port OC-3c/STM-1 (Figure 91)
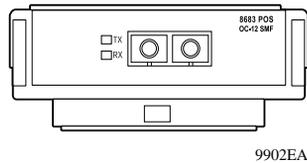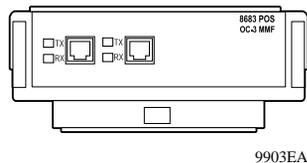
Figure 90   8683POSM Module MDA: OC-12c/STM-4

9902EA

Figure 91   8683POSM Module MDA: OC-3c/STM-1

9903EA

Each MDA has ports for connection to a packet over SONET (POS) network. You can install both types of MDA to achieve flexibility in connectivity types. Table 43 lists the MDAs available for the 8683POSM Module.

Table 43   MDAs for the 8683POSM Module

Port type	Model	Cable type	Connector type
OC-12c/STM-4	DS1333001	Multimode fiber	Duplex SC
	DS1333002	Single-mode fiber	Duplex SC
OC-3c/STM-1	DS1333003	Multimode fiber	MT-RJ
	DS1333004	Single-mode fiber	MT-RJ

The MDAs for the 8683POSM Module are Class 1 laser products, as identified by the label on the MDA (Figure 92).

Figure 92   Product label for the 8683POSM Module MDA

CLASS 1 INVISIBLE LASER PRODUCT
LASERSCHUTZKLASSE 1 PRODUKT
TO EN 60825

8769EB

The MDAs have two bicolor LEDs for each port: one marked TX (transmit) and one marked RX (receive). Table 44 describes the LEDs.

Table 44   LEDs on the 8683POSM Module MDA

Label	Color	State	Meaning
Tx	Green	Steady	The port is transmitting data.
	Amber	Blinking	The port is out of order; the administrative state is down.
	—	Off	The port is not transmitting data.

Table 44   LEDs on the 8683POSM Module MDA (continued)

Label	Color	State	Meaning
Rx	Green	Steady/ Blinking	The port is operational.
	Amber	Steady	An alarm (RDI) condition has been detected; the administrative state is down.
	Amber	Blinking	The port is out of order; the administrative state is down.
	—	Off	The port is not receiving data.

Specifications for the 8683POSM Module MDAs

Table 45 lists the specifications for the 8683POSM Module MDA.

Table 45   8683POSM Module MDA specifications

Port type	Operating wavelength	Operating power	Pulse repetition rate
OC-12c/STM-4	1274-1356 nm	-14 to -20 dBm	622.08 Mbs
	1260-1360 nm	-8 to -15 dBm	622.08 Mbs
OC-3c/STM-1	1274-1356 nm	-14 to -20 dBm	155.52 Mbs
	1260-1356 nm	-8 to -15 dBm	155.52 Mbs

The OC-3c/STM-1 MDA uses SONET STS-3c/STM-1 1300 nm optical transceivers with MT-RJ fiber optic connectors and either single-mode fiber (SMF) or multimode fiber (MMF) cabling. Table 46 describes the connector specifications for OC-3c/STM-1.

Table 46   OC-3c/STM-1 specifications: 8683POSM Module MDA

Parameter	SMF description	MMF description
Physical media	9/125 µm	62.5/125 µm
Line code	NRZ	NRZ
Wavelength	1274 to 1356 nm	1274 to 1356 nm
Average transmit output power	-8 to -15 dBm	-14 to -20 dBm

Table 46   OC-3c/STM-1 specifications: 8683POSM Module MDA

Parameter	SMF description	MMF description
Average receiver sensitivity	-14 to -28 dBm	-4 to -29 dBm
Distance	15 km	2 km
Input power	70 W	70 W
Thermal rating	241 Btu/hour maximum	241 Btu/hour maximum

The OC-12c/STM-4 MDA uses SONET STS-3c/STM-1 1300 nm optical transceivers with duplex SC-type fiber optic connectors and either single-mode fiber (SMF) or multimode fiber (MMF) cabling. Table 47 describes the connector specifications for OC-12c/STM-4.

Table 47   OC-12c/STM-4 specifications: 8683POSM Module MDA

Parameter	SMF description	MMF description
Physical media	9/125 µm	62.5/125 µm
Line code	NRZ	NRZ
Wavelength	1274 to 1356 nm	1260 to 1360 nm
Average transmit output power	-8 to -15 dBm	-14 to -20 dBm
Average receiver sensitivity	-7 to -18 dBm	-14 to -28 dBm
Distance	15 km	500 m
Input power	90 W	90 W
Thermal rating	310 Btu/hour maximum	310 Btu/hour maximum

Installing an MDA on a 8600 module

To install an MDA on a 8672ATME, 8672ATMM, or 8683POSM Module:

**1**   Remove the module from the chassis and place it on a flat, static-free surface.

For instructions on removing a 8000 Series module, see "Removing a module" on page 118.

⚠️ **Warning:** You cannot hot-swap an MDA. You must remove the 8672ATME, 8672ATMM, or 8683POSM Module, install the MDA, and then reinstall the module.


2   Using a Phillips screwdriver, remove the 2 screws securing the MDA slot cover to the module (Figure 93).

3   Lift the cover straight up. (Save the cover for possible future use.)

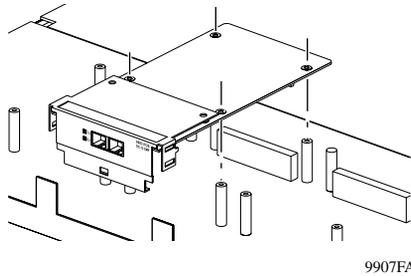**Figure 93**   Removing the MDA slot cover

9905FA
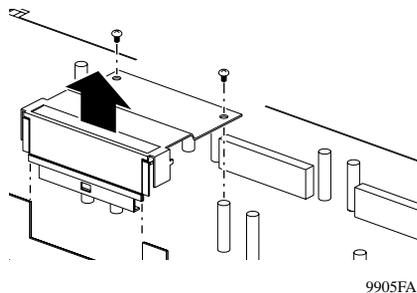
4   Align the front of the MDA with the front of the 8672ATME, 8672ATMM, or 8683POSM Module (Figure 94).

**Figure 94**   Aligning the MDA with the front of the module

9906FA
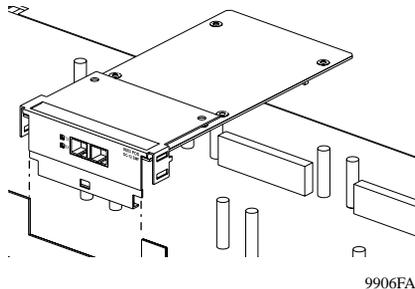
5   Align the four holes on the MDA with the mounting posts on the module (Figure 95).

Figure 95   Aligning the MDA with the mounting posts of the module

9907FA

6   Press firmly on the MDA in the middle of the back to seat the MDA in the mounting posts on the module (Figure 96). Apply about 20 pounds of pressure.

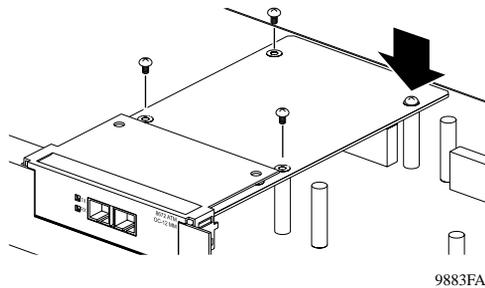**Figure 96**   Seating the MDA on the module

9908FA
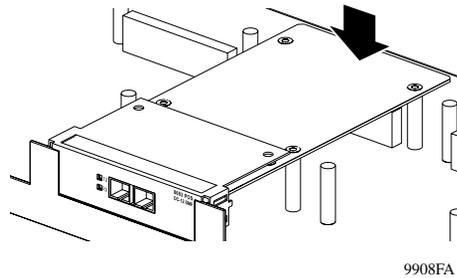
When the MDA is seated properly, the posts of the module are visible in the holes of the MDA.

7   Insert the Phillips screws through the holes. Use the Phillips screwdriver to tighten the screws (Figure 97).

➡   **Note:** Tighten the rear screws before you tighten the front screws.

Figure 97   Tightening the screws on the MDA

9883FA

8   Attach the supplied laser product label to the front panel of the host module, directly below the MDA. Use the label that is printed in the appropriate language for the country where you are installing the equipment.

9   Reinstall the 8672ATME, 8672ATMM or the 8683POSM Module in the chassis.

For instructions on installing a module, see "Installing a module" on page 121.

Replacing an MDA on a 8600 module

To replace an MDA on a 8672ATME, 8672ATMM, or 8683POSM Module:

1   Remove the module from the chassis and place it on a flat, static-free surface.

For instructions on removing a module, see "Removing a module" on page 118.

> ⚠ **Warning:** You cannot hot-swap an MDA. You must power down the switch and remove the 8672ATME, 8672ATMM, or 8683POSM Module, replace the MDA, and then reinstall and power up the module.
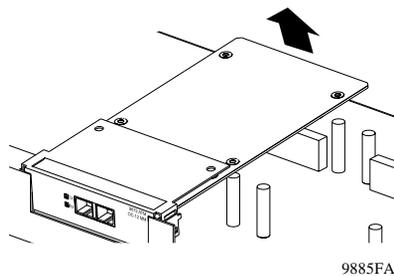
2 Using a Phillips screwdriver, unscrew the 4 screws from the MDA that you want to replace (Figure 98).

Figure 98   Preparing an MDA for removal

9884FA
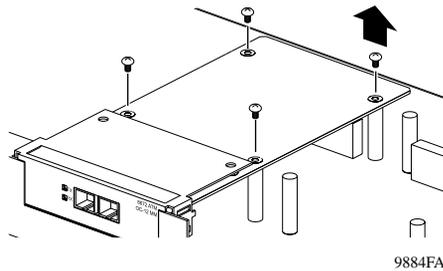
3 Place the palm of your hand on top of the MDA and cup your fingers around the back of the MDA. Lift the MDA enough to loosen it from the mounting posts (Figure 99).

Figure 99   Loosening the MDA from the mounting posts

9885FA

4 When the MDA is loosened from the mounting posts, hold the sheet metal by each side and lift the MDA straight up (Figure 100). Be careful not to catch the lip of the MDA on the module. Store the MDA in a static-free container.

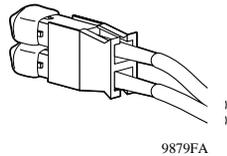**Figure 100**   Removing the MDA from the module

9912FA
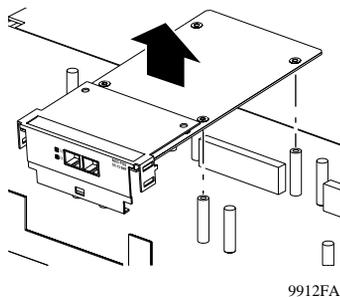
5   See "Installing an MDA on a 8600 module" on page 151 for instructions on installing the replacement MDA.

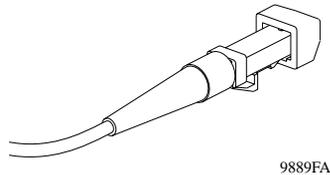# Connecting fiber cables to a 8600 module MDA

The OC-12c/STM-4 MDA uses duplex SC connectors (Figure 101).

Figure 101   OC-12c/STM-4 MDA duplex SC connector with dust cap

9879FA

The OC-3c/STM-1 MDA uses MT-RJ connectors (Figure 102).

Figure 102   OC-3c/STM-1 MDA MT-RJ connector with dust cap

9889FA

To connect a fiber cable to an MDA:

1   Remove the protective dust plug from the connector on the MDA (Figure 103 and Figure 104). Save the dust plug for future use.

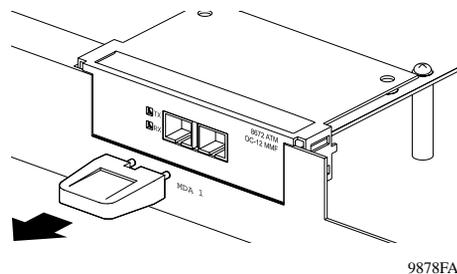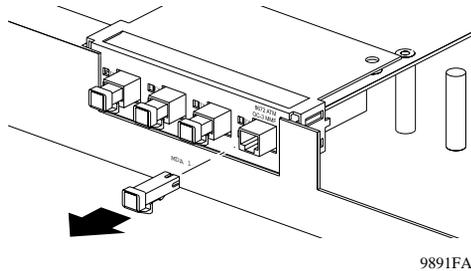**Figure 103**   Removing the dust plug from an OC-12c/STM-4 MDA (SC) connector

9878FA

Figure 104   Removing the dust plug from an OC-3c/STM-1 MDA (MT-RJ) connector

9891FA

2   Remove the protective dust caps from the connector on the fiber cable. Save the dust caps for future use (Figure 105 and Figure 106).

Figure 105   Removing the dust cap from an SC fiber cable connector

6105FB
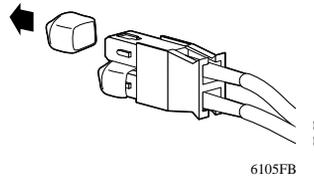
Figure 106   Removing the dust cap from an MT-RJ fiber cable connector

9890FA
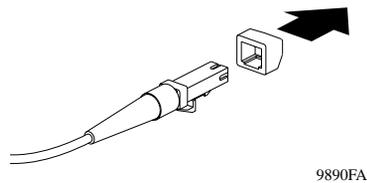
3   Hold the cable connector so that the keyed surface will insert easily into the MDA connector.

4   Carefully insert the cable connector into the MDA connector and push gently until you hear the cable connector snap into place (Figure 107 and Figure 108).

Figure 107 Inserting the SC cable connector into an OC-12c/STM-4 MDA

9888FA
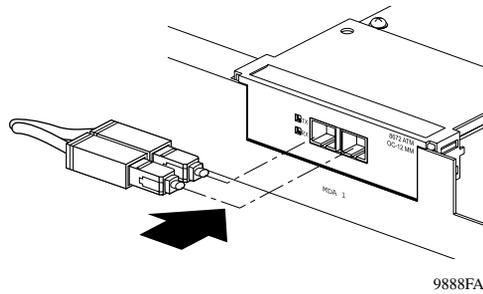
Figure 108 Inserting the MT-RJ cable connector into an OC-3c/STM-1 MDA

9892FA
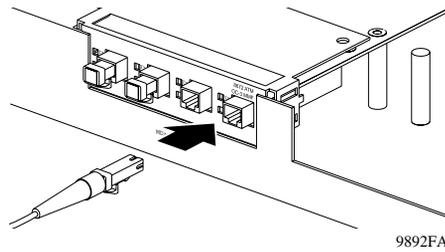
Connecting coaxial cables to a 8600 module MDA

The DS-3 MDA uses BNC connectors.

To connect a coaxial cable to a DS-3 MDA:

1 Push the coaxial cable onto the DS-3 connector (Figure 109).

Figure 109   Pushing the coaxial cable onto the DS-3 connector
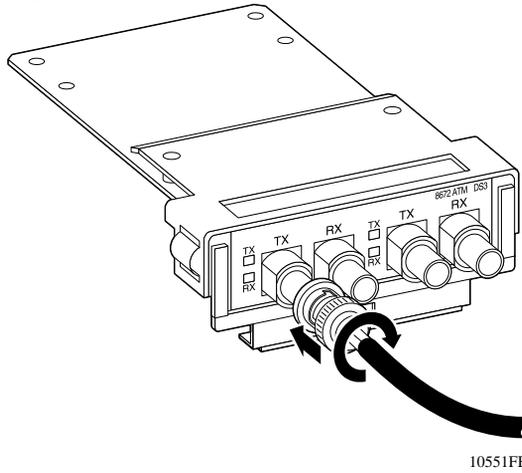
10551FB

2   Turn the coaxial cable to the right until the key on the DS-3 connector clicks
into the notch on the coaxial cable.

Chapter 10
Installing and replacing the fan tray

This chapter describes how to replace a fan tray in the 8010 Chassis.

The 8010 Chassis has two fan trays that are installed on the right side of the chassis (Figure 110). Each fan tray contains eight high-capacity, multiple-speed fans and a control/monitor circuit board.

Figure 110   Fan tray

10395FA
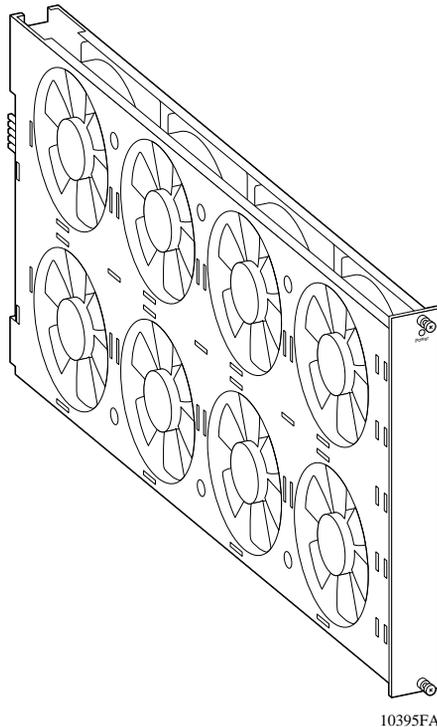
If one of the fans in a tray fails, replace the fan tray as quickly as possible to maintain high-availability operation. Failure to replace the fan tray could cause the chassis to overheat.

Replacing the fan tray

You can replace a fan tray in the 8010 Chassis with the power on or off.

To replace a fan tray:

1 Loosen the 2 captive screws that fasten the fan tray to the chassis (Figure 111).

2 Wait 10 seconds for the fans to stop turning, then pull the fan tray out of the chassis.

> ⚠ **Warning:** Grasp the fan tray at the middle of the front panel, and be careful to keep your fingers out of the fan blades.

Figure 111   Removing the fan tray
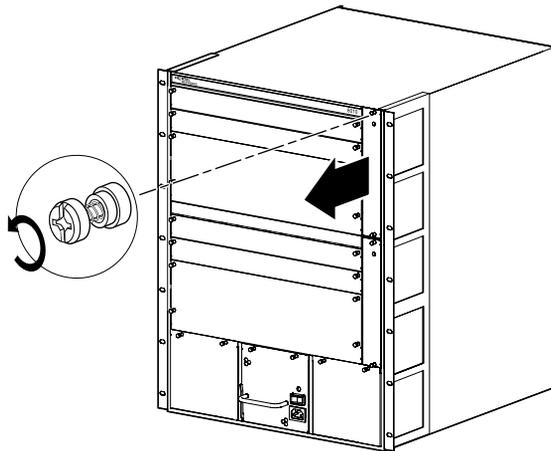
8977FA

3   Slide the new fan tray into the chassis until the connectors at the rear of the fan tray engage (Figure 112).

If the chassis is on, the fans start turning when the fan tray connectors fully engage.

Figure 112   Installing the fan tray
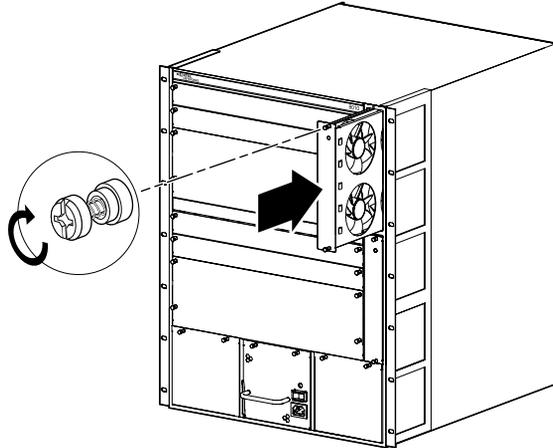
8976FA

4   Tighten the 2 captive screws to fasten the fan tray to the chassis.

5   Check that the green status LED on the fan tray is lit.

Chapter 11
Operating the 8000 Series switch

This chapter describes some of the routine tasks of operating the 8000 Series switch and provides troubleshooting information. It includes the following topics:

Turning the 8000 Series switch on and off

If the 8010 Chassis has DC power supplies, go to the next section, "Turning DC power supplies on and off." If the 8010 Chassis has AC power supplies, go to "Turning AC power supplies on and off" on page 167.

Turning DC power supplies on and off

To turn on a 8000 Series switch with a DC power source:

1 Make sure that the power cables are connected to the switch and that the DC power source is turned on.

2 Move the power switch on each DC power supply to the on position (Figure 113).

Figure 113   DC power supply power switch
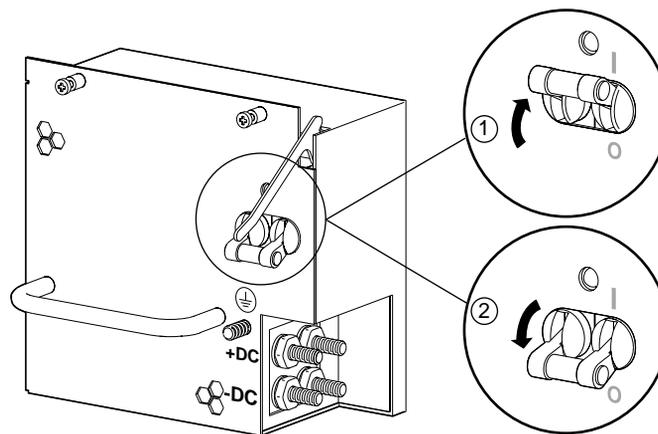
1 = On
2 = Off

10298FA

3 Verify that the power output LED for each power supply lights green.

4 Verify that air is flowing from the cooling fans out through the vents of the chassis.

If you cannot feel air flow from the chassis vents, or if the power output LED remains off, do the following:

1   Turn the power switch on each power supply to the off position.

2   Wait 1 minute.

3   Turn the power switch on each power supply to the on position.

If the problem persists, contact the Nortel Networks Technical Solutions Center.

After you turn on the 8000 Series switch, each module automatically initiates a diagnostic test to verify proper module function (see "Verifying a successful installation" on page 168).

To turn off a 8000 Series switch with a DC power source:

➡   Move each power switch to the off position (see Figure 113 on page 166).

Turning AC power supplies on and off

To turn on a 8000 Series switch with an AC power supply:

1   Verify that the AC power cords are connected to AC power outlets.

2   Move the power switch on each AC power supply to the on position (Figure 114).

Figure 114   AC power switch in on position
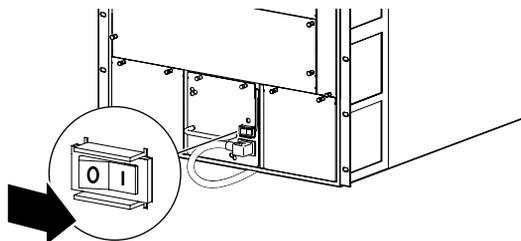
8964FA

3   Verify that the power output LED for each power supply lights green.

4   Verify that air is flowing from the cooling fans out through the vents of the chassis.

If you cannot feel air flow from the chassis vents, or if the power output LED remains off, do the following:

1   Turn the power switch on each power supply to the off position.

2   Wait 1 minute and then turn each power switch to the on position.

If the problem persists, contact the Nortel Networks Technical Solutions Center.

After you turn on the 8000 Series switch, each module automatically initiates a diagnostic test to verify proper module function (see "Verifying a successful installation" on page 168).

To turn off a 8000 Series switch with an AC power source:

➡   Move each power switch to the off position (Figure 115).

Figure 115   AC power switch in off position
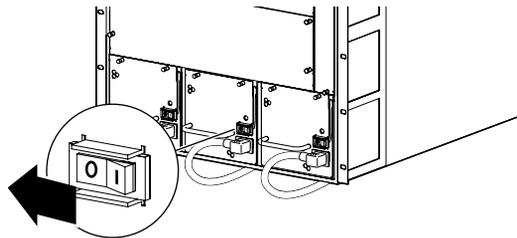
8972FA

Verifying a successful installation

In a normal power-up sequence, the LEDs light as follows:

1   When power is applied to the 8000 Series switch, the green LED on each power supply and fan tray turns on within 5 seconds.

2 Each module initiates a self-test, during which the port and module LEDs display various patterns to indicate the progress of the self-test.

3 Upon successful completion of the self-test (within 10 seconds after power is applied), the Online LED lights on each module.

If the LEDs on the modules light in this sequence, your installation is successful. Contact your network administrator to verify that the 8000 Series switch is now connected to the network.

If the LEDs do not light in this sequence, contact your local Nortel Networks Technical Solutions Center.

Initializing the 8672ATME, 8672ATMM, and 8683POSM Modules

If you have installed a 8672ATME, 8672ATMM, or 8683POSM Module with at least one MDA into a 8010 chassis, the 8691SF Module retrieves the image file to download to these modules. Ensure that the installed 8691SF Module has a PCMCIA card inserted and that the PCMCIA card contains the correct image for the installed module. See Table 48 for a list of image filenames.

Table 48   Image filenames for 8672ATME/8672ATMM/8683POSM

Module	Image filename
8672ATME	p80t3300.dld
8672ATMM	p80t3300.dld
8683POSM	p80p3300.dld

For more information about the PCMCIA slot and the 8691SF Module, refer to "8691SF Module" on page 74.

The following sections describe the initialization process for the 8672ATME, 8672ATMM, and 8683POSM Modules.

Initializing the 8672ATME and 8672ATMM Modules

The 8691SF Module retrieves the image file to download to the 8672ATME or 8672ATMM Module. First, the 8691SF Module searches the host flash memory for the file, then the PCMCIA card. The 8691SF Module downloads the image file to the 8672ATME, or 8672ATMM and identifies which MDAs are installed. The screen displays a message similar to the following:

```
Using image = /slot/p80t3200.dld for ATM card download.
ATM card: Slot 4 MDA [OC-12c MM] [Quad OC-3c MM] Ver=2.2
```

If the image file is not found in either the flash memory or the PCMCIA, the system stops and the screen displays an error message such as:

```
ERROR Task=rcStart Couldn't find an ATM download image!
Aborting card initialization in Slot=4
```

or:

```
ERROR Task=rcStart portPresent:port=X/X, invalid port Type
```

The 8672ATME or 8672ATMM Module requests a redownload from the switch fabric module, and the screen displays the following message:

```
Redownload requested by ATM card in slot <number>.
```

If the image download is unsuccessful, the screen displays the following message:

```
ATM card in slot <number> not ready.
```

If there are three unsuccessful attempts to download, the screen displays the message shown in Figure 116.

Figure 116   Unsuccessful download screen output

```
Copyright (c) 2002 Nortel Networks, Inc.
CPU Slot 5:    PPC 740 Map B
Version:       3.3.0.0/097
Creation Time: Aug 27 2002, 17:51:07
Hardware Time: SEP 05 2002, 13:58:01 UTC
Memory Size:   0x04000000
Start Type:    warm
CENTENNIAL    ATA
/flash/  - Volume is OK
Loaded boot configuration from file /flash/boot.cfg
Press <Return> to stop auto-boot...
/pcmcia/  - Volume is OK
4739529 to 15708054 (15708054)
Starting at 0x10000...
CENTENNIAL    ATA
/flash/  - Volume is OK
Passport 8600 System Software Release REL3.3.0.0_B097
Copyright (c) 1996-2002 Nortel Networks, Inc.
[09/05/02 14:58:20] System boot
/pcmcia/  - Volume is OK
[09/05/02 14:58:20] Passport System Software Release
REL3.3.0.0_B097
[09/05/02 14:58:21] Card inserted: Slot=1 Type=8672ATME
[09/05/02 14:58:21] Card inserted: Slot=2 Type=8683POS
[09/05/02 14:58:21] Card inserted: Slot=3 Type=8608SX
[09/05/02 14:58:21] Card inserted: Slot=4 Type=8608GT
[09/05/02 14:58:21] Card inserted: Slot=5 Type=8690SF
[09/05/02 14:58:21] Initializing 8690SF in slot #5 ...
[09/05/02 14:58:24] Initializing 8672ATME in slot #1 ...
[09/05/02 14:58:41] ERROR Task=rcStart Couldn't find an ATM download
image!
(File name: /flash/p80t3300.dld or /pcmcia/p80t3300.dld)
Slot 1 ATM card is put offline!
[09/05/02 14:58:41] Initialization of card failed for Slot 1 !
[09/05/02 14:58:41] Initializing 8683POS in slot #2 ...
[09/05/02 14:58:43] Initializing 8608SX in slot #3 ...
[09/05/02 14:58:46] Initializing 8608GT in slot #4 ...
[09/05/02 14:58:50] Loading configuration from /flash/config.cfg
[09/05/02 14:58:50] The system is ready
[09/05/02 14:58:50] Booted with PRIMARY boot image source - /pcmcia/
p80a3300b097
```

After the image loads onto the 8672ATME or 8672ATMM Module, it performs a series of self-diagnostic tests. If the module fails the diagnostics, the screen displays the following message:

```
Fatal bring up error on ATM card in slot <number>.
```

If you see this message, contact a service representative. For information on contacting service representatives, refer to "How to get help" on page 22.

When the image successfully loads onto the 8672ATME or 8672ATMM Module, the screen displays the following message:

```
ATM card in slot <number> is online.
```

➔ **Note:** If you accidentally delete the image file, reset the 8691SF Module and redownload the file. For information on how to reset the 8691SF Module, see "Resetting the 8000 Series switch" on page 175.

If you have one MDA installed, you can proceed to configure the 8672ATME or 8672ATMM Module as described in *Using the 8672ATME and 8672ATMM Modules*.

➔ **Note:** You must save your configuration (using either the CLI or Device Manager) to preserve the configuration changes you made to the 8672ATME or 8672ATMM Module across reboots.

Initializing the 8683POSM Module

The 8691SF Module retrieves the image file to download to the 8683POSM Module. First, the 8691SF Module searches the host flash memory for the file, then the PCMCIA card. The 8691SF Module downloads the image file to the 8683POSM Module and identifies which MDAs are installed. The screen displays a message similar to the following:

```
Downloading POS image to slot <number> .........Done (file
name and image size.)
```

If the image file is not found in either the flash memory or the PCMCIA, the screen displays this message:

```
POS image file name not found either in FLASH or PCMCIA.
```

If the image download is unsuccessful, the screen displays the following message:

```
Card is off line.
```

The 8683POSM Module requests a redownload from the 8691SF module, and the screen displays this message:

```
Redownload requested by POS card in slot <number>.
```

The 8683POSM Module attempts a redownload three times. If the download is still unsuccessful, the 8683POSM Module goes offline and the screen displays this message:

```
Redownload of POS card in slot <number> failed maximum 3
times; POS card is offline.
```

When the 8683POSM Module boots, the redownload count is reset to 0. After the image loads onto the 8683POSM Module, it performs a series of self-diagnostic tests. If the module fails the diagnostics, the screen displays the following message:

```
Port <number> for POS card in slot <number> failed
diagnostics.
```

If you see this message, contact a service representative. For information on contacting service representatives, refer to "How to get help" on page 22.

When the image successfully loads onto the 8683POSM Module, the screen displays the following message:

```
POS card in slot <number> is online.
```

> → **Note:** If you accidentally delete the image file, reset the 8691SF Module and redownload the file. For information on how to reset the 8691SF Module, see "Resetting the 8000 Series switch" on page 175.

If you have one MDA installed, you can proceed to configure the 8683POSM Module as described in *Using the 8683POSM Module.*

→ **Note:** You must save your configuration (using either the CLI or Device Manager) to preserve the configuration changes you made to the 8683POSM Module across reboots.

If you have one MDA installed, you can proceed to configure the 8683POSM Module as described in *Using the 8683POSM Module.*

→ **Note:** You must save your configuration (using either the CLI or Device Manager) to preserve the configuration changes you made to the 8683POSM Module across reboots.

Configuring the chassis to operate in 32K or 128K Mode

You can configure the chassis to operate either in 32K or 128K extended memory mode (MMode) if you installed a 8691SF CPU Module.

When you configure a chassis you need to ensure that a system having both 128K and 32K modules will reboot in the desired mode. The boot mode is determined by the type of modules installed in the chassis and whether 128K mode is enabled (Table 49).

Table 49 Boot mode at startup

if configuration is:	And 128K mode status at startup is:	Then:
All 128K modules	Enabled	System starts in 128K mode
Mixed modules	Enabled	System starts in 128K mode. Non-128K modules are disabled.
All non-128K modules	Enabled	Non-128K modules are disabled.
All 128K modules	Disabled	System starts in 32K mode
Mixed modules	Disabled	System starts in 32K mode
All non-128K modules	Disabled	System starts in 32K mode

For information on using Device Manager or the CLI to configure 128K records, see *Platform and System Management*.

Resetting the 8000 Series switch

You can use the Reset button to reboot the 8000 Series switch hardware without cycling power. To *warm-start* the 8000 Series switch (no diagnostic tests are run), press the Reset button for less than 5 seconds.

Figure 117 shows the location of the Reset button on the 8190SM Module.

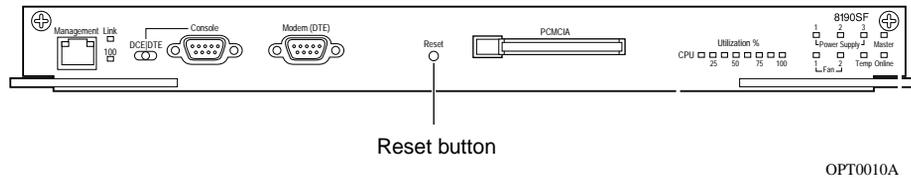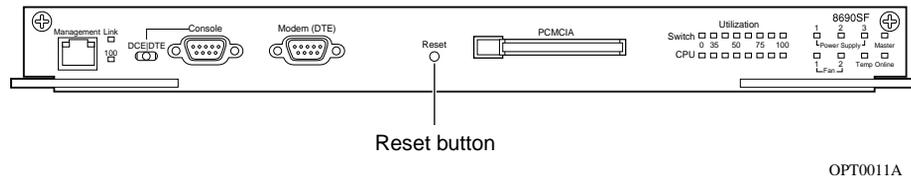**Figure 117**   Reset button on the 8190SM Module

Reset button

OPT0010A

Figure 118 shows the location of the Reset button on the 8691SF Module.

Figure 118   Reset button on the 8691SF Module
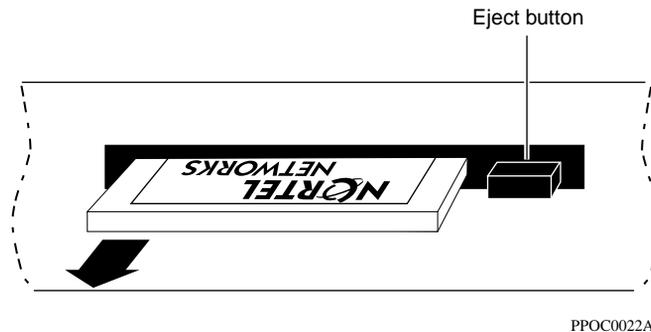

Reset button

OPT0011A

Removing flash memory cards

To remove flash memory cards from the 8190SM Module or the 8691SF Module:

1 Press the eject button to the right of the memory card receptacle on the 8190SM Module or the 8691SF Module (Figure 119).

The card pops out slightly.

Figure 119   Removing a flash memory card

Eject button

NORTEL NETWORKS

PPOC0022A

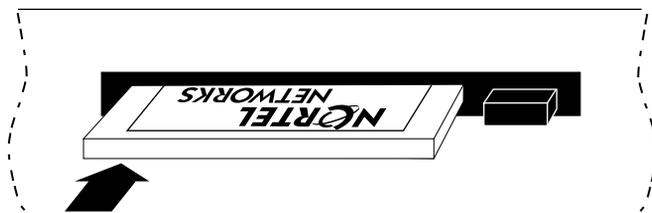**2** Pull the flash memory card out of the card receptacle.

Installing flash memory cards

> **Caution:** You cannot use the Accelar 1200 PCMCIA card in 8000 Series equipment.

8190SM Module or a 8691SF Module:

1 Position the card with the label facing up and the insert arrow pointing toward the card receptacle (Figure 120).

Figure 120   Inserting a flash memory card

PPOC0021A

2   Insert the card into the card receptacle.

3   Gently push the card in until it fits snugly in place.

Protecting memory card files

Nortel Networks ships each memory card with its read-write protect switch in the unprotected position. After you successfully load the configuration file and save your configuration, you may want to write-protect the memory card for backup purposes.

> **Note:** You typically do not operate a 8000 Series switch with a write-protected memory card. You should make a copy of your configuration on another memory card, write-protect that card, and store it in a safe place.

To change memory card protection:

**1**   Remove the memory card from the 8010 Chassis.

a   Press the eject button to the right of the memory card receptacle (see Figure 119 on page 176).

b   Pull the card out of the card receptacle.

> **Caution:** You must remove the card from the 8010 Chassis before changing the read-write protection. Failure to remove the card may result in improper write protection.

2 Locate the read-write protect switch on the edge opposite the arrow on the memory card (Figure 121).

Figure 121 Memory card read-write protect switch
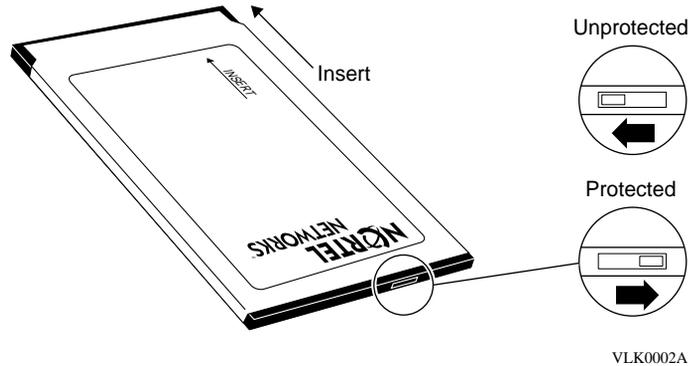
3 Adjust the read-write protect switch.

4 Reinsert the memory card into the card receptacle (see Figure 120 on page 177).

   a Position the card with the label facing up and the insert arrow pointing toward the card receptacle.

   b Insert the card into the card receptacle.

   c Gently push the card in until it fits snugly in place.

Troubleshooting

The following sections provide troubleshooting information for some of the more common problems that you may encounter with the 8000 Series switch.

Topic	Page
LED indications of problems	179
Apparent module failure	180
Failure to get a login prompt from the Console port	180
Cable connection problems	181
Autonegotiation mode problems for 8100 modules	182

LED indications of problems

Table 50 lists possible problems indicated by the LEDs on the switch modules and suggests corrective action.

Table 50 LED problem indicators

Symptom	Probable cause	Corrective action
Green AC power supply LEDs are off.	The switch is not receiving AC power.	Verify that each AC power cord is fastened securely at both ends and that power is available at each AC power outlet. Verify that each power supply is turned on.
The Link/Activity LED for a connected port is off or does not blink (and you believe that traffic is present).	The switch is experiencing a port connection problem, or the switch's link partner is not autonegotiating properly.	Verify that the cable connections to the link partner are correct. Verify port configuration parameters for both ends of the connection. Move the cable to another port to see whether the problem occurs on the new port.
The Link/Activity LED blinks continuously.	There may be a port configuration error.	Verify port configuration parameters for both ends of the connection.
The Online LED on an I/O module is amber.	Software incompatibility exists, or the module cannot communicate with the master module over the backplane.	Use the show log command to check the system log for indications of communication problems. Use the boot command to download a new software image.
The Master LED on a module in slot 1 or slot 2 is amber.	The module has detected a system clock generation failure on its own circuitry.	Replace the module; make sure that it is in the correct slot. **Note:** This LED has significance only for the module in slot 1 or slot 2 that provides the clock function for the switch.
The Fault LED is blinking amber.	A chassis failure has been detected.	From the console management station, use the show log command to check the system log for information about hardware failures. Check the fan tray in the 8010 Chassis to make sure both fans are running. Check the switch power supplies; one may have stopped functioning. The module may have failed to read the MAC address from the chassis backplane. If this is the case, arrange to replace the chassis.
The Fault LED is steady amber.	The module failed its power-on self-test. A diagnostic or hardware failure has been detected.	Replace the module.
No LEDs are lit.	A hardware failure has been detected.	Turn the switch power off and then turn it on again.

Apparent module failure

If a module failure occurs, check for possible backplane connection problems. Make sure that the module is correctly seated in the backplane connector and that the retaining screws are securely tightened.

If a module fails during module initialization and the replacement module is the same module type, in rare cases the new module may not initialize.

To workaround this issue, follow the steps in either workaround 1 or 2.

Module failure workaround 1

1 Remove the faulty module.

2 Insert a module type that is different from the module type removed in Step 1and wait for this replacement module to initialize.

3 Remove the module inserted in Step 2.

4 Insert a new module model in the same slot as the faulty module resided. This new module model must be identical to the module model removed in Step 1.

Module failure workaround 2

1 Remove the faulty module.

2 Insert a new module.

3 Reboot the chassis.

If the module still fails to operate, contact the Nortel Networks Technical Solutions Center for assistance.

Failure to get a login prompt from the Console port

If you connect a terminal to the Console port of the 8190SM Module or the 8691SF Module and you fail to get a login prompt, the port may have an incorrect DCE/DTE setting. Try moving the DCE/DTE switch from its current setting to the other position (Figure 122).

Figure 122 DCE/DTE switch
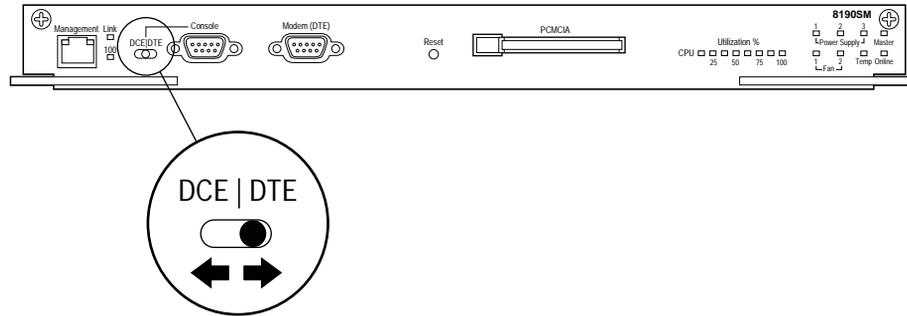
10456EA

Cable connection problems

Port connection problems can usually be traced to a poor cable connection or to an improper connection of the port cables at either end of the link. To remedy such problems, make sure that the cable connections are secure and that the cables are connected to the correct ports at both ends of the link.

> **Note:** Port connection problems can also be traced to the autonegotiation mode (see "Autonegotiation mode problems for 8100 modules" on page 182).

10BASE-T cables

Cabling for 10BASE-T networks can consist of two-pair Category 3, 4, or 5 unshielded twisted pair (UTP) wiring. However, to prepare for future upgrades to Fast Ethernet, Nortel Networks strongly recommends that you use all Category 5 cable in your network.

Ethernet 10BASE-T network installations use cables consisting of two pairs of twisted pair wires—one pair to send data and one to receive data. These wires must connect to another 10BASE-T station that has the sending pair attached to its receiving pair and vice versa. If the two nodes are wired alike, they both attempt to send data out on the same RJ-45 pins. In such a case, a straight-through cable would not work. However, a crossover cable would operate normally.

The 8100 modules are designed to have Ethernet network interface cards (NICs) connect directly to their RJ-45 ports using straight-through (MDI) cables. However, if a 8100 module must connect to a hub or another switch that follows usual conventions, a crossover cable (MDI-X) is required.

100BASE-T cables

The 100 Mb/s ports are designed to operate using Category 5 UTP cabling only. Category 5 UTP cable is a two-pair cable certified to handle up to 100 Mb/s bandwidth. 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. (1.27 cm).

For best performance with respect to noise immunity and emissions, the unused pairs in the two-pair cable should be terminated at their characteristic impedance (that is, 100 ohms) in the equipment at each end of the cable. All Nortel Networks 100BASE-TX equipment includes such a Common Mode Termination (CMT).

8100 Series fiber MDA cables

The 8100 Series fiber MDAs use only multimode 62.5/125 µm fiber cable. The Nortel Networks 100BASE-FX MDA is not supported on single-mode fiber. SC connectors are used on 2-port 100BASE-FX MDAs, and MT-RJ connectors are used on 4-port 100BASE-FX MDAs.

GBIC cables

Cables for the GBICs vary depending on the specific GBIC type. For information about the cable requirements for GBICs, see "GBICs" on page 193 (8100 modules) and "GBICs" on page 209 (8600 modules).

Autonegotiation mode problems for 8100 modules

Port connection problems can occur when a port (or station) is connected to another port (or station) that is not operating in a compatible mode (for example, connecting a full-duplex port on one station to a half-duplex port on another station).

The 8100 modules negotiate port speeds according to the IEEE 802.3 1998 Clause 28 autonegotiating standard. The switch adjusts (autonegotiates) its port speed and duplex mode to match the best service provided by the connected station, up to 100 Mb/s in full-duplex mode.

The following autonegotiation problems can occur:

• If the connected station uses a form of autonegotiation that is not compatible with the IEEE 802.3 1998 Clause 28 autonegotiating standard, the 8100 module cannot negotiate a compatible mode for correct operation.

• If the autonegotiation feature is not present or is not enabled at the connected station, the 8100 module may not be able to determine the correct duplex mode.

In both situations, the 8100 module autosenses the speed of the connected station and, by default, reverts to half-duplex mode. If the connected station is operating in full-duplex mode, it cannot communicate with the switch.

To correct this mode mismatch problem:

1 Use the CLI to disable autonegotiation for the suspect port.

See *Configuring Network Management and Diagnostics* for the appropriate CLI commands.

2 Use the CLI to set the speed and duplex mode of the port to match the speed and duplex mode of the connected station.

You may need to try several settings before you find the correct speed/duplex mode for the connected station.

If the problem persists, follow these additional steps:

1 Using the CLI, disable the autonegotiation feature at the connected station.

2 Manually set the speed/duplex mode of the connected station to the same speed/duplex mode that you manually set for the 8100 module port.

→ **Note:** Nortel Networks recommends that you manually set the 8100 module port to the desired speed/duplex mode when connecting to any of the following Nortel Networks products:

- Nortel Networks 28000 product family
- Nortel Networks 58000 product family
- BayStack* 302T switch (100 Mb/s port)

Appendix A
Technical specifications for the 8010 Chassis

This appendix provides physical, environmental, and electrical specifications for the 8010 Chassis.

Physical specifications

Height:	22.9 in. (58.2 cm)
Width:	17.5 in. (44.5 cm)
Depth:	19.9 in. (50.5 cm)
Weight (empty):	85 lb (39 kg)
Weight (fully loaded):	225 lb (102 kg)
Cooling system:	
Fan trays:	2 per chassis
Fans:	8 per fan tray
Thermal sensors:	1 per fan tray

Environmental specifications

Operating temperature:	0°C to 40°C (32°F to 104°F)
Storage temperature:	–25°C to 70°C (–13°F to 158°F)
Operating humidity:	85% maximum relative humidity, noncondensing
Storage humidity:	95% maximum relative humidity, noncondensing
Operating altitude:	3048 m (10,000 ft) maximum
Storage altitude:	3048 m (10,000 ft) maximum
Free fall/drop:	ISO 4180-s, NSTA 1A
Vibration:	IEC 68-2-6/34
Shock/bump:	IEC 68-2-27-29

8004 AC-DC Power Supply specifications

Input voltage:	100 to 240 VAC
Input frequency:	47 to 63 Hz
Input current:	12 - 6 A
Input power:	1308 W
Input volt amperes:	1.3 kilovolt amperes (kVA)
Output power:	850 W maximum (110 - 240 VAC) derated to 780 W maximum (100 - 109 VAC)
Thermal output:	4464 Btu/hr maximum

8004 DC-DC Power Supply specifications

Nominal Input voltage:	-48/ -60 VDC
Input current:	29 - 23 A
Input power:	1308 W
Input volt amperes:	1.3 kVA
Output power:	850 W
Thermal output:	4464 Btu/hr maximum
Crimp lugs:	
Two-hole lug terminal:	Panduit LCD6-14A-L or equivalent
One-hole terminal:	Panduit LCA6-14H-L or equivalent

System power specifications

	8004AC-DC	8004DC-DC
Input voltage:	100-240 VAC	-48/-60 VDC
Input current:	3 x 12 - 6 A	3 x 29 -23 A
Output power	1700 W maximum	1700 W maximum
	Derated 1560 W maximum @ < 110 VAC	
Thermal output	8928 Btu/hr maximum	8928 Btu/hr maximum

International regulatory requirements

Electromagnetic emissions
regulatory requirements:

Global basis for certification:	CISPR 22-1997 Class A
US:	FCC CFR47 Part 15, Subpart B, Class A
Canada:	ICES-003, Issue-2, Class A
Europe:	EN 55022-1998 Class A; EN 61000-3-2/A14, EN 61000-3-3 (CE Marking)
Australia/New Zealand:	AS/NZS 3548:1995, Class A

International regulatory requirements (continued)

Japan:	VCCI-V3/97.04, Class A
Taiwan:	CNS 13438, Class A

Electromagnetic immunity regulatory requirements:

Global basis for certification:	CISPR 24:1997
Europe:	EN 55024:1998

Safety regulatory requirements:

Global basis for certification:	IEC 60950 current edition with all CB member deviations
US:	UL60950
Canada:	CSA 22.2 No. 60950
Europe:	EN60950 (CE Marking)
Australia/New Zealand:	AS/NZS 3260
Mexico:	NOM-019-SCFI-1998

Appendix B
Technical specifications for 8100 modules

This appendix lists technical specifications for the 8100 modules. The appendix includes the following information:

General specifications

Standards supported

IEEE Std 802.3, 1998 Clause 4 Media Access Control CSMA/CD

IEEE Std 802.3, 1998 Clause 14 10Base T New

IEEE Std 802.3, 1998 Clause 21 100Base T

ANSI/IEEE Std 802.1D, 1998 Media Access Control (MAC) Bridges

IEEE 802.1Q Virtual Bridged Local Area Networks

IEEE Std 802.3, 1998 Clause 34-42

IEEE Std 802.3, 1998 Clause 31 (MAC Control)

Data rate and encoding

10 Mb/s Manchester encoding

100 Mb/s 4B/5B encoding

1000 Mb/s 8B/10B encoding

Environmental specifications

Operating temperature:	5° to 40° C (41° to 104° F)
Storage temperature:	–25° to 70° C (–13° to 158° F)
Operating humidity:	85% maximum relative humidity, noncondensing
Storage humidity:	95% maximum relative humidity, noncondensing
Operating altitude:	3000 m (10,000 ft) maximum
Free fall/drop:	ISO 4180-s, NSTA 1A
Vibration:	IEC 68-2-6/34
Shock/bump:	IEC 68-2-27/29

Performance specifications (64-byte packets)

Aggregate throughput:	3,000,000 pps maximum
Switched forwarding rates:	For 10 Mb/s: 14,880 pps maximum
	For 100 Mb/s: 148,810 pps maximum
	For 1000 Mb/s: 1,488,100 pps maximum
Latency:	9 ms

Address database size

Addressing:	48-bit MAC address
Frame Length:	64 to 1518 bytes (IEEE 802.1Q Untagged)
	64 to 1522 bytes (IEEE 802.1Q Tagged)

International regulatory requirements

Electromagnetic emissions regulatory requirements:	
Global basis for certification:	CISPR 22-1997 Class A
US:	FCC CFR47 Part 15, Subpart B, Class A
Canada:	ICES-003, Issue-2, Class A
Europe:	EN 55022-1998 Class A; EN 61000-3-2/A14, EN 61000-3-3 (CE Marking)
Australia/New Zealand:	AS/NZS 3548:1995, Class A
Japan:	VCCI-V3/97.04, Class A
Taiwan:	CNS 13438, Class A
Electromagnetic immunity regulatory requirements:	
Global basis for certification:	CISPR 24:1997
Europe:	EN 55024:1998
Safety regulatory requirements:	
Global basis for certification:	IEC 60950 current edition with all CB member deviations
US:	UL60950
Canada:	CSA 22.2 No. 60950

International regulatory requirements (continued)

Europe:	EN60950 (CE Marking)
Australia/New Zealand:	AS/NZS 3260
Mexico:	NOM-019-SCFI-1998

→ **Note:** The GBICs installed in the 8108GBIC Module must also meet these standards.In addition, the GBICs are certified to FDA requirement 21 CFR, Chapter 1, Subchapter J and the international requirements of IEC 60825 for Class 1 Laser.

8108GBIC Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8 lb (4 kg)

Electrical specifications

Input power:	65 W maximum
Thermal rating:	224 Btu/hr maximum

MTBF rating

93,284 hr

Connector type

Duplex SC

GBICs

Physical specifications

Height:	12 mm
Width:	30 mm
Depth:	65 mm
Weight:	Varies with GBIC type

Connector type

Duplex SC

1000BASE-SX GBIC

Cable specifications

Type:	62.5 µm or 50 µm multimode fiber
Maximum distance:	1804 ft (550 m)

Optical Specifications

Wavelength:	850 nm (VCSEL)
Average transmit output power:	-9.5 to -4 dBm
Average receiver sensitivity:	-17 dBm (minimum)

1000BASE-LX GBIC

Cable specifications

Type	62.5 µm multimode fiber or
	10 µm single-mode fiber
	Note: Multimode fiber may require a DMD patch cord.
Maximum distance:	Multimode fiber: 1804 ft (550 m)
	Single-mode fiber: 16,405 ft (5 km)

Optical specifications

Wavelength:	1300 nm (FP laser diode)
Average transmit output power:	-5.2 to 0 dBm
Average receiver sensitivity:	-22 dBm (minimum)

1000BASE-XD GBIC

Cable specifications

Type: 9 µm single-mode fiber

Maximum distance: 31 mi (50 km)

Note: For a shorter link distance, you may need an in-line attenuator to prevent overloading the receiver.

Optical specifications

Wavelength: 1550 nm (DFB laser diode)

Average transmit output power: -5.2 to 0 dBm

Average receiver sensitivity: -24 dBm

1000BASE-ZX GBIC

Cable specifications

Type: 9 µm single-mode fiber

Maximum distance: 43 mi (70 km)

Note: For a shorter link distance, you may need an in-line attenuator to prevent overloading the receiver.

Optical specifications

Wavelength: 1550 nm (DFB laser diode)

Average transmit output power: 0 to 5.2 dBm

Average receiver sensitivity: -22 dBm (minimum)

8116FX Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8 lb (3.6 kg)

Electrical specifications

Input power:	76 W maximum
Thermal rating:	261 Btu/hr maximum

MTBF rating 102,814 hr

Connector type MT-RJ

Cable specifications

Type:	62.5 μm or 50 μm multimode fiber optic cable
Maximum distance:	1352 ft (412 m) for half-duplex links
	6562 ft (2 km) for full-duplex links

Optical specifications

Wavelength:	1300 nm
Optical budget:	4 dB to 11 dB
Transmitter characteristics:	Minimum optical power: -20 dBm
	Maximum optical power: -14 dBm

8132TX Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.06 lb (4 kg approximate)

Electrical specifications

Input power:	75 W maximum
Thermal rating:	250 Btu/hr maximum

MTBF rating

244,700 hr

Connector types

10/100 Ethernet ports:	RJ-45 connector wired as MDI-X (Table 51)

Cable specifications

Type:	Category 3, 4, or 5 UTP cable (10 Mb/s operation) Category 5 UTP cable (100 Mb/s operation)
Maximum distance:	328 ft (100 m)

Data port connectors

The data ports on the 8132TX Module are RJ-45 ports wired as MDI-X connectors (Table 51).

Table 51 Pin assignments: 8132TX Module port
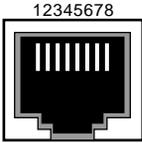
Connector	Pin number	Signal
12345678 8020EA	1	Input receive data + (RX+)
	2	Input receive data - (RX-)
	3	Output transmit data + (TX+)
	6	Output transmit data - (TX-)
	4, 5, 7, 8	Not used

MDAs

450-1SR MDA, 450-1SX MDA

Required cable: Multimode fiber optic

Maximum distance: 1804 ft (550 m)

Wavelength: 850 nm

Average transmit output power: -9.5 to -4 dBm

Average receiver sensitivity: -17 dBm (minimum)

Connector type: SC

450-1LR MDA, 450-1LX MDA

Required cable: Multimode or single-mode fiber optic

Maximum distance: Multimode: 1804 ft (550 m)
                                   Single-mode: 9843 ft (3 km)

Wavelength: 1300 nm

Average transmit output power: -5.2 to 0 dBm

Average receiver sensitivity: -22 dBm (minimum)

Connector type: SC

8100-4TX MDA

Required cable: Category 3, 4, or 5 UTP cable (10 Mb/s operation)
                                   Category 5 UTP cable (100 Mb/s operation)

Connector type: RJ-45

8100-2FX MDA

Required cable: 62.5/125 µm multimode fiber optic

Maximum distance: 1804 ft (550 m)

Wavelength: 1300 nm

Average transmit output power: -5.2 to 0 dBm

Average receiver sensitivity: -22 dBm (minimum)

Connector type: SC

8100-4FX MDA

Required cable:	62.5/125 µm multimode fiber optic
Maximum distance:	1804 ft (550 m)
Wavelength:	1300 nm
Average transmit output power:	-5.2 to 0 dBm
Average receiver sensitivity:	-22 dBm (minimum)
Connector type:	MT-RJ

8148TX Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	9 lb (4 kg)

Electrical specifications

Input power:	75 W maximum
Thermal rating:	250 Btu/hr maximum

MTBF rating   72,213 hr

Connector type   RJ-45 connector wired as MDI-X (Table 52)

Cable specifications

Type:	Category 3, 4, or 5 UTP cable (10 Mb/s operation)
	Category 5 UTP cable (100 Mb/s operation)
Maximum distance:	328 ft (100 m)

Port connectors

The ports on the 8148TX Module are RJ-45 ports wired as MDI-X connectors (Table 52).

Table 52   Pin assignments: 8148TX Module port

Connector	Pin number	Signal
12345678 8020EA	1	Input receive data + (RX+)
	2	Input receive data - (RX-)
	3	Output transmit data + (TX+)
	6	Output transmit data - (TX-)
	4, 5, 7, 8	Not used

8190SM Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	7 lb (3.15 kg)

Electrical specifications

Input power:	75 W
Thermal rating:	250 Btu/hr maximum

MTBF rating

229,623 hr

Connector types

Ethernet Management port:	RJ-45 connector wired as MDI (Table 53)
Console port:	DB-9 connector (Table 54)
Modem port:	DB-9 connector (Table 55)

Required cables

Ethernet Management port:	Category 3, 4, or 5 UTP cable (10 Mb/s operation)
	Category 5 UTP cable (100 Mb/s operation)
Console port:	RS-232 cable
Modem port:	DTE-to-DCE cable (straight or transmit cable)

Management port

The Management port is a 10/100 Mb/s Ethernet port implemented on an RJ-45 connector wired as an MDI connection. Table 53 shows the pin assignments for this connector.

Table 53   Pin assignments: 8190SM Module Management port

Connector	Pin number	Signal
12345678	1	Output transmit data + (TX+)
	2	Output transmit data - (TX-)
	3	Input receive data + (RX+)
	6	Input receive data - (RX-)
8020EA	4, 5, 7, 8	Not used

Console serial port

The Console serial port is implemented as a DB-9 connector. This port can operate as a data terminal equipment (DTE) or data communication equipment (DCE) device. Use the switch to the left of the port to set the port to DTE (left) or DCE (right). Default settings for this port are 9600 bits/s, 8 data bits, no parity, and one stop bit.

Because the Console port expects to receive data set ready (DSR) and clear to send (CTS) signals before transmitting, these control lines are required in the cabling. The Console port does not support any inbound flow control; that is, the port does not toggle control lines to indicate an input buffer full condition.

Table 54 lists the pin assignments for the Console port for both the DTE and DCE settings.

Table 54 Pin assignments: 8190SM Module Console port

Connector	Pin number	DCE signal	DTE signal
	2	RXD	TXD
	3	TXD	RXD
	4	DTR	DSR
	5	GND	GND
	6	DSR	DTR
	7	RTS	CTS
	9	CTS	RTS

Modem serial port

The Modem serial port is implemented on a DB-9 connector wired as a DTE connection.

To set up modem access, you need a DTE-to-DCE cable (straight or transmit cable) between the Modem port and a modem or terminal server. The cable should have the pin assignments listed in Table 55.

Table 55 Pin assignments: DTE to DCE

| Signal | Switch | Modem | |
	Pin number	DCE DB-9 pin number	DCE DB-25 pin number
RXD	2	2	3
TXD	3	3	2
DTR	4	4	20
GND	5	5	7
DSR	6	6	6
RTS	7	7	4
CTS	8	8	5

MDI and MDI-X connections

For communication to take place between two devices, the transmitter of one device must connect to the receiver of the other device. The connection must be achieved through a crossover function, which could be a crossover cable or a port that implements the crossover function internally.

Ports that implement the crossover function internally are known as MDI-X ports (where "X" refers to the crossover function). The 8100 modules use MDI-X ports that allow you to connect directly to end stations without using crossover cables (Figure 123).

Figure 123   MDI-X to MDI cable connections
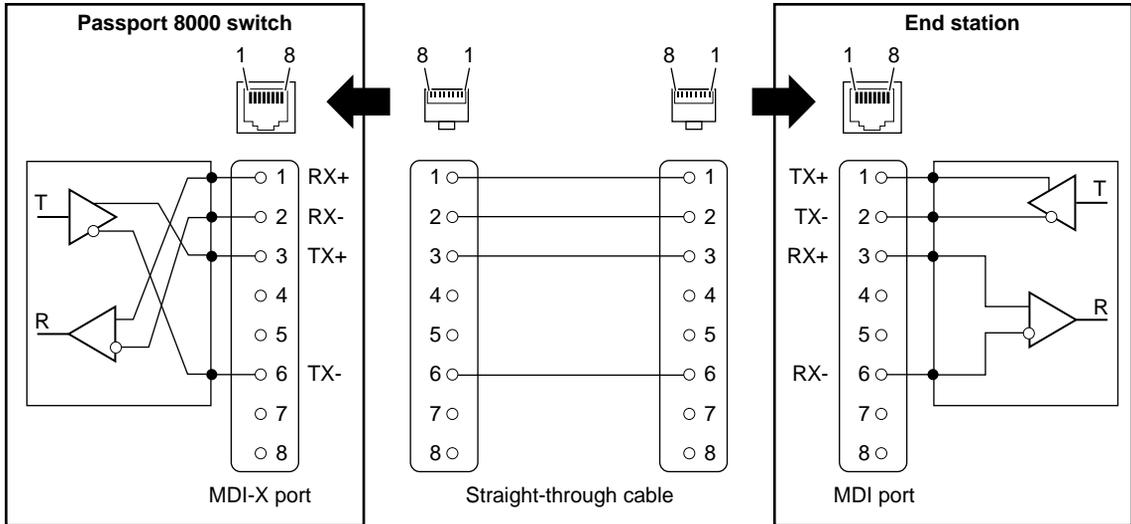
617EF

If you are connecting a device to the 8100 module that also implements MDI-X
ports, use a crossover cable (Figure 124).

Figure 124 MDI-X to MDI-X cable connections
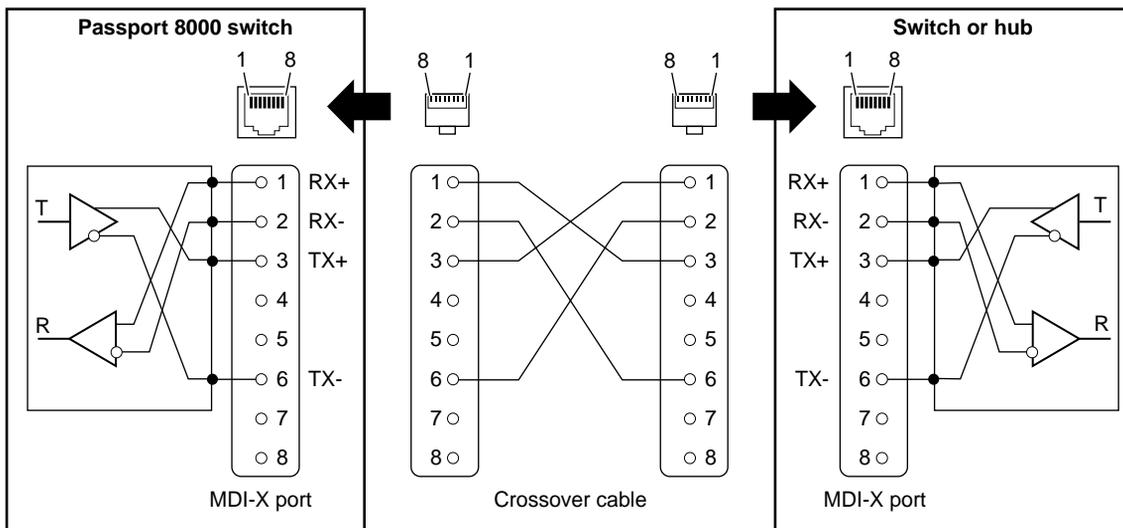
618EF

Appendix C
Technical specifications for 8600 modules

This appendix lists technical specifications for the 8600 modules. The appendix includes the following information:

General specifications

Standards supported

IEEE Std 802.3, 1998 Clause 4 Media Access Control CSMA/CD
IEEE Std 802.3, 1998 Clause 14 10Base T New
IEEE Std 802.3, 1998 Clause 21 100Base T
ANSI/IEEE Std 802.1D, 1998 Media Access Control (MAC) Bridges
IEEE 802.1Q Virtual Bridged Local Area Networks
IEEE Std 802.3, 1998 Clause 34-42
IEEE Std 802.3, 1998 Clause 31 (MAC Control)
IEEE Std 802.3ab
IEEE Std 802.3ae

Data rate and encoding

10 Mb/s Manchester encoding
100 Mb/s 4B/5B encoding
1000 Mb/s 8B/10B encoding
10 Gb/s 64/66B encoding

Environmental specifications

Operating temperature:	0°C to 32°C (41°F to 104°F)
Storage temperature:	–25°C to 70°C (–13°F to 158°F)
Operating humidity:	85% maximum relative humidity, noncondensing
Storage humidity:	95% maximum relative humidity, noncondensing
Operating altitude:	3000 m (10,000 ft) maximum
Free fall/drop:	ISO 4180-s, NSTA 1A
Vibration:	IEC 68-2-6/34
Shock/bump:	IEC 68-2-27/29

Performance specifications (64-byte packets)

Aggregate throughput:	10 Mb/s; 100 Mb/s; 1000 Mb/s: 100 million pps 10Gb/s: 8x488,100 pps
Routing and switching forwarding rates:	10 Mb/s: 14,880 pps maximum 100 Mb/s: 148,810 pps maximum 1000 Mb/s: 1,488,100 pps maximum 10 Gb/s: 8x1,488,100 pps maximum
Latency:	10 Mb/s; 100 Mb/s; 1000 Mb/s: 10 microseconds (LIFO)

Gigabit link power budget

1000BASE-SX:	7.5 dBm
1000BASE-SX SMF:	8.0 dBm
10GBASE-LR:	-6.0 dBm
10GBASE-LW:	-6.0 dBm

Address database size

Addressing:	48-bit MAC address
Frame length:	64 to 1518 bytes (IEEE 802.1Q Untagged)
	64 to 1522 bytes (IEEE 802.1Q Tagged)

International regulatory requirements

Electromagnetic emissions
regulatory requirements:

Global basis for certification:	CISPR 22-1997 Class A
US:	FCC CFR47 Part 15, Subpart B, Class A
Canada:	ICES-003, Issue-2, Class A
Europe:	EN 55022-1998 Class A; EN 61000-3-2/A14, EN 61000-3-3 (CE Marking)
Australia/New Zealand:	AS/NZS 3548:1995, Class A
Japan:	VCCI-V3/97.04, Class A
Taiwan:	CNS 13438, Class A

Electromagnetic immunity regulatory requirements:

Global basis for certification:	CISPR 24:1997
Europe:	EN 55024:1998

Safety regulatory requirements:

Global basis for certification:	IEC 60950 current edition with all CB member deviations
US:	UL60950
Canada:	CSA 22.2 No. 60950
Europe:	EN60950 (CE Marking)
Australia/New Zealand:	AS/NZS 3260
Mexico:	NOM-019-SCFI-1998

> ➡️ **Note:** The GBICs installed in the 8608GBE and 8608GBM Modules must also meet these standards.In addition, the GBICs are certified to FDA requirement 21 CFR, Chapter 1, Subchapter J and the international requirements of IEC 60825 for Class 1 Laser.

8608GBE and 8608GBM Modules

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.0 lb (3.6 kg)

Electrical specifications

Input power:	65 W maximum
Thermal rating:	224 Btu/hr maximum

MTBF rating   197,096 hr

Connector type   Duplex SC

GBICs

Physical specifications

Height:	12 mm
Width:	30 mm
Depth:	65 mm
Weight:	Varies with GBIC type
Connector type	Duplex SC

1000BASE-SX GBIC

Cable specifications

Type:	62.5 µm or 50 µm multimode fiber
Maximum distance:	1804 ft (550 m)

Optical specifications

Wavelength:	850 nm (VCSEL)
Average transmit output power:	-9.5 to -4 dBm
Average receiver sensitivity:	-17 dBm (minimum)

1000BASE-LX GBIC

Cable specifications

Type:	62.5 µm multimode fiber or 9 µm single-mode fiber
	Note: Multimode fiber may require a DMD patch cord.
Maximum distance:	Single-mode fiber: 32,810 ft (10 km) Multimode fiber: 1804 ft (550 m)

Optical specifications

Wavelength:	1300 nm (FP laser diode)
Average transmit output power:	-5.2 to 0 dBm
Average receiver sensitivity:	-22 dBm (minimum)

1000BASE-XD GBIC

Cable specifications

Type:	9 µm single-mode fiber
Maximum distance:	31 mi (50 km)

Note: For a shorter link distance, you may need an in-line attenuator to prevent overloading the receiver.

Optical specifications

Wavelength:	1550 nm (DFB laser diode)
Average transmit output power:	-5.2 to 0 dBm
Average receiver sensitivity:	-24 dBm

1000BASE-ZX GBIC

Cable specifications

Type:	9 µm single-mode fiber
Maximum distance:	43 mi (70 km)

Note: For a shorter link distance, you may need an in-line attenuator to prevent overloading the receiver.

Optical specifications

Wavelength:	1550 nm (DFB laser diode)
Average transmit output power:	0 to 5.2 dBm
Average receiver sensitivity:	-22 dBm (minimum)

1000BASE-CWDM GBIC

Cable specifications

Type:	9 µm single-mode fiber
Maximum distance:	74.5 mi (120 km)
	Note: Given 30dB loss budget and 0.25 db/Km fiber loss, up to 120 Km in transmission distance is supported with no intermediate multiplexer.

Optical specifications

Wavelength:	1450 to 1620 nm
Average transmit output power:	+2.0 to 6 dBm
Receiver optical input power:	-30 dBm (minimum at 60° case temperature)
	-28 dBm (minimum at 70° case temperature)

8608GTE and 8608GTM Modules

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.0 lb (3.6 kg)

Electrical specifications

Input power:	100 W maximum
Thermal rating:	344 Btu/hr maximum

MTBF rating   180,449 hr

Connector type   RJ-45 (see Table 56)

Cable specifications

Type:	Category 5 or better UTP cable for 1000 Mb/s operation. Cables must use all four pairs. Wiring configuration and performance are defined by EIA/TIA Standard 568 and IEEE Standard 802.3 2000 edition.
Maximum distance:	328 ft (100 m)

Port connectors

The ports on the 8608GTE and 8608GTM Modules are RJ-45 ports wired as shown in Table 56.

Table 56   Pin assignments: 8608GTE/8608GTM Module port

Connector	Pin number	Signal
12345678 8020EA	1	Bidirectional Data A + (BI_DA+)
	2	Bidirectional Data A – (BI_DA–)
	3	Bidirectional Data B + (BI_DB+)
	4	Bidirectional Data C + (BI_DC+)
	5	Bidirectional Data C – (BI_DC–)
	6	Bidirectional Data B – (BI_DB–)
	7	Bidirectional Data D + (BI_DD+)
	8	Bidirectional Data D – (BI_DD–)

8608SXE Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.0 lb (3.6 kg)

Electrical specifications

Input power:	65 W maximum
Thermal rating:	224 Btu/hr maximum

MTBF rating   197,887 hr

Connector type   Duplex SC

Cable specifications

Type:	62.5 µm or 50 µm multimode fiber optic cable
Maximum distance:	62.5 µm multimode fiber optic cable:
	722 ft (220 m) @ 160 MHz/km bandwidth
	902 ft (275 m) @ 200 MHz/km bandwidth
	50 µm multimode fiber optic cable:
	1604 ft (500 m) @ 400 MHz/km bandwidth
	1804 ft (550 m) @ 400 MHz/km bandwidth

Optical specifications

Wavelength:	850 nm
Optical budget:	7 dB
Laser transmitter characteristics:	Minimum launch power: -10 dBm
	Maximum launch power: -4 dBm
Receiver characteristics:	Minimum receiver sensitivity: -17 dBm
	Maximum input power: 0 dBm

8616GTE Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.0 lb (3.6 kg)

Electrical specifications

Input power:	102 W maximum
Thermal rating:	344 Btu/hr maximum

MTBF rating   147,602 hr

Connector type   RJ-45 (see Table 57)

Cable specifications

Type:	Category 5 or better UTP cable for 1000 Mb/s operation. Cables must use all four pairs. Wiring configuration and performance are defined by EIA/TIA Standard 568 and IEEE Standard 802.3 2000 edition.
Maximum distance:	328 ft (100 m)

Port connectors

The ports on the 8616GTE Module are RJ-45 ports wired as shown in Table 57.

Table 57   Pin assignments: 8616GTE Module port

Connector	Pin number	Signal
12345678 8020EA	1	Bidirectional Data A + (BI_DA+)
	2	Bidirectional Data A – (BI_DA–)
	3	Bidirectional Data B + (BI_DB+)
	4	Bidirectional Data C + (BI_DC+)
	5	Bidirectional Data C – (BI_DC–)
	6	Bidirectional Data B – (BI_DB–)
	7	Bidirectional Data D + (BI_DD+)
	8	Bidirectional Data D – (BI_DD–)

8616SXE Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.0 lb (3.6 kg)

Electrical specifications

Input power:	115 W maximum
Thermal rating:	396 Btu/hr maximum

MTBF rating   178,403 hr

Connector type   MT-RJ

Cable specifications

Type:	62.5 µm or 50 µm multimode fiber optic cable
Maximum distance:	62.5 µm multimode fiber optic cable:
	722 ft (220 m) @ 160 MHz/km bandwidth
	902 ft (275 m) @ 200 MHz/km bandwidth
	50 µm multimode fiber optic cable:
	1604 ft (500 m) @ 400 MHz/km bandwidth
	1804 ft (550 m) @ 400 MHz/km bandwidth

Optical specifications

Wavelength:	850 nm
Optical budget:	7 dB
Laser transmitter characteristics:	Minimum launch power: -10 dBm
	Maximum launch power: -4 dBm
Receiver characteristics:	Minimum receiver sensitivity: -17 dBm
	Maximum input power: 0 dBm

8624FXE Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	7.6 lb (3.4 kg)

Electrical specifications

Input power:	56 W maximum
Thermal rating:	193 BTU/hr maximum

MTBF rating   320,972 hr

Connector type   MT-RJ

Cable specifications

Type:	62.5 μm multimode fiber optic cable
Distance:	6562 ft (2 km) for full-duplex links

Optical specifications

Wavelength:	1300 nm
Optical budget:	-20 dBm to -14 dBm
Transmitter characteristics:	Minimum optical power: -10 dBm
	Maximum optical power: -4 dBm

8632TXE and 8632TXM Modules

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	9 lb (4 kg)

Electrical specifications

Input power:	56 W maximum
Thermal rating:	193 Btu/hr maximum

MTBF rating   217,744 hr

Connector type

RJ-45 connector wired as MDI-X

SC duplex connectors on GBICs; see GBIC descriptions starting on page 209.

Cable specifications

Type:	Category 3, 4, or 5 UTP cable (10 Mb/s operation)
	Category 5 UTP cable (100 Mb/s operation)
Maximum distance:	328 ft (100 m) 328 ft (100 m) for 10/100 Mb/s ports For GBIC ports, distance varies with the GBIC; see descriptions starting on page 209.

8648TXE and 8648TXM Modules

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.0 lb (3.6 kg)

Electrical specifications

Input power:	76 W maximum
Thermal rating:	261 Btu/hr maximum

MTBF rating   244,708 hr

Connector type   RJ-45 connector wired as MDI-X (see Table 58)

Cable specifications

Type:	Category 3, 4, or 5 UTP cable (10 Mb/s operation) Category 5 UTP cable (100 Mb/s operation)
Maximum distance:	328 ft (100 m)

Port connectors

The ports on the 8648TXE and 8648TXM Modules are RJ-45 ports wired as
MDI-X connectors (Table 58).

Table 58   Pin assignments: 8648TXE/8648TXM Module port

Connector	Pin number	Signal
12345678 8020EA	1	Input receive data + (RX+)
	2	Input receive data - (RX-)
	3	Output transmit data + (TX+)
	6	Output transmit data - (TX-)
	4, 5, 7, 8	Not used

8672ATME and 8672ATMM Modules

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.0 lb (3.6 kg)

Electrical specifications

Input power:	OC-3c MDA: 40 W maximum
	OC-12c MDA: 40 W maximum
	DS-3 MDA: 40 W maximum
Thermal rating:	OC-3c MDA: 138 Btu/hr maximum
	OC-12c MDA: 138 Btu/hr maximum
	DS-3 MDA: 138 Btu/hr maximum

MTBF rating   222,103 hr

Connector type   OC-3c MDA: MT-RJ
OC-12c MDA: Duplex SC
DS-3 MDA: BNC

Cable specifications

Type:	Multimode or single-mode fiber optic cable, coaxial cable
Maximum distance:	Multimode fiber optic cable:
	1.24 mi (2 km) for OC-3c connection
	1640 ft (500 m) for OC-12c connection
	Single-mode fiber optic cable:
	9.3 mi (15 km) for OC-3c connection
	9.3 mi (15 km) for OC-12c connection
	Coaxial cable: 450 ft (137 m) for DS-3 connection

Optical specifications

Wavelength:	OC-3c MDA SMF: 1274 to 1356 nm
	OC-3c MDA MMF: 1274 to 1356 nm
	OC-12c MDA SMF: 1274 to 1356 nm
	OC-12c MDA MMF: 1260 to 1360 nm

Average transmit output power:	OC-3c and OC-12c MDAs SMF: -8 to -15 dBm
	OC-3c and OC-12c MDAs MMF: -14 to -29 dBm
Average receiver sensitivity:	OC-3c MDA SMF: -14 to -28 dBm
	OC-3c MDA MMF: -14 to -29 dBm
	OC-12c MDA SMF: -7 to -18 dBm
	OC-12c MDA MMF: -14 to -28 dBm

8681XLR Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.0 lb (3.6 kg)

Electrical specifications

Input power:	150 W maximum
Thermal rating:	512 BTU/hr maximum

MTBF rating — 140,000 hr

Data Rate and encoding — 64b/66b (IEEE 802.3ae specified)

Compatible with STM-64 — No

Module Performance (64 byte packets)

Aggregate throughput	8x1,488,100 pps
Routing and Switch Forwarding Rates	8x1,488,100 pps

Port type — 10GBASE-LR 1310nm serial PMD

Connector type — SC Duplex

Cable specifications

Type:	9/125 µm single mode fiber optic cable
Distance:	6.2 miles (10 km)

Optical specifications

Wavelength:	1310 nm
Optical budget:	5 dB
Transmitter characteristics:	Minimum optical power: -6 dBm Maximum optical power: -1 dBm
Receiver characteristics:	Minimum receiver sensitivity: -12 dBm Maximum input power: -1 dBm

8681XLW Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.0 lb (3.6 kg)

Electrical specifications

Input power:	150 W maximum
Thermal rating:	512 BTU/hr maximum

MTBF rating   140,000 hr

Data Rate and encoding   64b/66b (IEEE 802.3ae specified)

Compatible with STM-64   Yes

**Module Performance
(64 byte packets)**

Aggregate throughput	8x1,488,100 pps
Routing and Switch Forwarding Rates	8x1,488,100 pps

Port type   10GBASE-LW 1310nm serial PMD

Connector type   SC Duplex

Cable specifications

Type:	9/125 µm single mode fiber optic cable
Distance:	6.2 miles (10 km)

Optical specifications

Wavelength:	1310 nm
Optical budget:	5 dB
Transmitter characteristics:	Minimum optical power: -6 dBm Maximum optical power: -1 dBm
Receiver characteristics:	Minimum receiver sensitivity: -12 dBm Maximum input power: -1 dBm

8683POSM Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	8.0 lb (3.6 kg)

Electrical specifications

Input power:	OC-3c MDA: 70 W maximum
	OC-12c MDA: 90 W maximum
Thermal rating:	OC-3c MDA: 241 Btu/hr maximum
	OC-12c MDA: 310 Btu/hr maximum

MTBF rating 255,693 hr

Connector types OC-3c MDA: MT-RJ
OC-12c MDA: Duplex SC

Cable specifications

Type:	Multimode or single-mode fiber optic cable
Maximum distance:	Multimode fiber optic cable:
	1.24 mi (2 km) for OC-3c connection
	1640 ft (500 m) for OC-12c connection
	Single-mode fiber optic cable:
	9.3 mi (15 km) for OC-3c connection
	9.3 mi (15 km) for OC-12c connection

Optical specifications

Wavelength:	OC-3c MDA SMF: 1274 to 1356 nm
	OC-3c MDA MMF: 1274 to 1356 nm
	OC-12c MDA SMF: 1274 to 1356 nm
	OC-12c MDA MMF: 1260 to 1360 nm
Average transmit output power:	OC-3c and OC-12c MDAs SMF: -8 to -15 dBm
	OC-3c and OC-12c MDAs MMF: -14 to -29 dBm
Average receiver sensitivity:	OC-3c MDA SMF: -14 to -28 dBm
	OC-3c MDA MMF: -14 to -29 dBm
	OC-12c MDA SMF: -7 to -18 dBm
	OC-12c MDA MMF: -14 to -28 dBm

8691SF Module

Physical specifications

Height:	1.5 in. (3.8 cm)
Width:	15.4 in. (39.1 cm)
Depth:	18.5 in. (47.0 cm)
Weight:	7.2 lb (3.3 kg)

Electrical specifications

Input power:	70 W maximum
Thermal rating:	241 Btu/hr maximum

MTBF rating   213,454 hr

Connector types

Ethernet Management port:	RJ-45 connector wired as MDI (see Table 59)
Console port:	DB-9 connector (see Table 60)
Modem port:	DB-9 connector (see Table 61)

Cable specifications

Ethernet Management port:	Category 3, 4, or 5 UTP cable (10 Mb/s operation)
	Category 5 UTP cable (100 Mb/s operation)
Console port:	RS-232 cable
Modem port:	DTE-to-DCE cable (straight or transmit cable)

Management port

The Management port is a 10/100 Mb/s Ethernet port implemented on an RJ-45 connector wired as an MDI connection. Table 59 shows the pin assignments for this connector.

Table 59   Pin assignments: 8691SF Module Management port

Connector	Pin number	Signal
12345678 8020EA	1	Output transmit data + (TX+)
	2	Output transmit data - (TX-)
	3	Input receive data + (RX+)
	6	Input receive data - (RX-)
	4, 5, 7, 8	Not used

Console serial port

The Console serial port is implemented as a DB-9 connector. This port can operate as a data terminal equipment (DTE) or data communication equipment (DCE) device. Use the switch to the left of the port to set the port to DTE (left) or DCE (right). Default settings for this port are 9600 bits/s, 8 data bits, no parity, and one stop bit.

Because the Console port expects to receive data set ready (DSR) and clear to send (CTS) signals before transmitting, these control lines are required in the cabling. The Console port does not support any inbound flow control; that is, the port does not toggle control lines to indicate an input buffer full condition.

Table 60 lists the pin assignments for the Console port for both the DTE and DCE settings.

Table 60   Pin assignments: 8691SFModule Console port

Connector	Pin number	DCE signal	DTE signal
1 5 6 9 9473EA	2	RXD	TXD
	3	TXD	RXD
	4	DTR	DSR
	5	GND	GND
	6	DSR	DTR
	7	RTS	CTS
	9	CTS	RTS

Modem serial port

The Modem serial port is implemented on a DB-9 connector wired as a DTE connection.

To set up modem access, you need a DTE-to-DCE cable (straight or transmit cable) between the Modem port and a modem or terminal server.

Table 61 describes the required cable pin assignments.

Table 61   Pin assignments: DTE to DCE

Switch		Modem	
Signal	Pin number	DCE DB-9 pin number	DCE DB-25 pin number
RXD	2	2	3
TXD	3	3	2
DTR	4	4	20
GND	5	5	7
DSR	6	6	6
RTS	7	7	4
CTS	8	8	5

Index

Numbers