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Santa Clara, CA 95054

Installing 8600 Switch Modules

NORTEL NETWORKS™

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National safety statements of compliance

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Input:	(8003 Chassis only)
	100 to 240 VAC, 50 to 60 Hz, 9 A max. per power supply single supply, or + one redundant supply configurations
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Fax:	52 5 480 2199
Embarcar a:	(8003 Chassis)
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Contents

Figures

Tables

Preface

The Nortel Networks* 8000 Series chassis provides the physical enclosure for the 8000 Series switch modules. When 8600 modules are installed in the chassis, the resulting 8600 Switch provides a range of data speeds and high-performance switching and routing features.

This guide provides instructions for installing the 8600 modules in a 8000 Series chassis.

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 need to install or replace a 8600 module in the chassis. A qualified service person should have appropriate technical training and experience and be aware of the hazards involved in installing and replacing customer-replaceable units.

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This guide uses the following text conventions:

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Chapter 1
8600 modules

The 8600 modules provide a full complement of core routing and switching capabilities in a 8000 Series chassis. The 8600 modules include a switch management module and input/output (I/O) modules. A 8000 Series 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 types including:

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

This chapter includes the following topics:

Table 1 lists the maximum port densities available with each type of I/O module.

Table 1 Maximum port densities for 8600 modules

Module type	Port type	Maximum number of ports per chassis		
		8003	8006	8010 and 8010co
8608GBE and 8608GBM	1000BASE-SX	16	32	64
	1000BASE-LX	16	32	64
	1000BASE-ZX	16	32	64
	1000BASE-XD	16	32	64
	1000BASE-CWDM	16	32	64
	1000BASE-T	16	32	64
8608GTE and 8608GTM	1000BASE-T	16	32	64
8608SXE	1000BASE-SX	16	32	64
8616GTE	1000BASE-T	32	64	128
8616SXE	1000BASE-SX	32	64	128
8624FXE	100BASE-FX	48	96	192
8632TXE and 8632TXM	10BASE-T/100BASE-TX	64	128	256
	1000BASE-SX	4	8	16
	1000BASE-LX	4	8	16
	1000BASE-ZX	4	8	16
	1000BASE-XD	4	8	16
	1000BASE-CWDM	4	8	16
	1000BASE-T	4	8	16

Table 1 Maximum port densities for 8600 modules (continued)

Module type	Port type	Maximum number of ports per chassis		
		8003	**8006**	**8010 and 8010co**
8648TXE and 8648TXM	10BASE-T/100BASE-TX	96	192	384
8672ATME and 8672ATMM[1]	OC-3c MDA	16	32	48
	OC-12c MDA	4	8	12
	DS-3 MDA	8	16	24
8681XLR	10GBASE-LR	2	4	8
8681XLW	10GBASE-LW	2	4	8
8683POSM[2]	OC-3c MDA	12	24	24
	OC-12c MDA	6	12	12

1 For information about these MDAs, see "8672ATME and 8672ATMM Modules" on page 41.

2 For information about these MDAs, see "8683POSM Module" on page 47.

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 *Managing Platform Operations and Using Diagnostic Tools*.

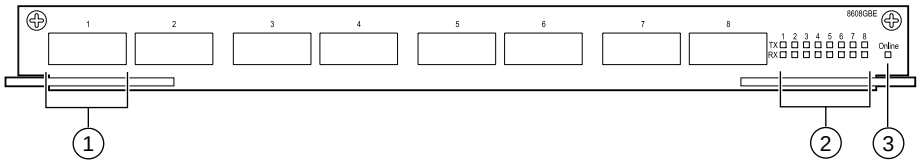
The 8608GBM Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. The 8608GBM module will only operate with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

- The chassis must include at least one 8691SF CPU module. 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 (128K records mode). For instructions on enabling MMode, see *Managing Platform Operations and Using Diagnostic Tools*.

Both the 8608GBE and 8608GBM Modules (Figure 1) 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 1 8608GBE/8608GBM Module



1 = GBIC bay
2 = Port link LEDs
3 = Module Online LED

9717EC

The following types of GBICs are available:

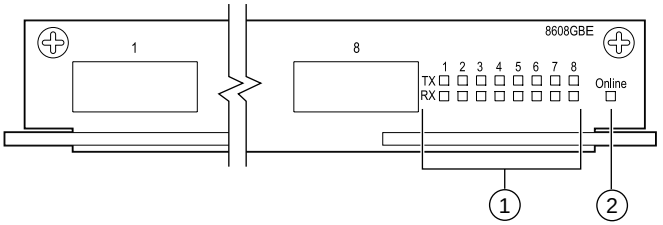
- 1000BASE-CWDM
- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-ZX
- 1000BASE-XD
- 1000BASE-T

Note: Only GBICs qualified by Nortel Networks are supported for use in the 8608GBE Module. For specific model numbers, refer to the Nortel Networks price list.

For more information about the GBICs and instructions for installing them, see *Installing Gigabit Interface Converters (GBICs)*.

Figure 2 shows the location of the 8608GBE and 8608GBM Module LEDs.

Figure 2 8608GBE/8608GBM Module LEDs



1 = Port TX and RX LEDs
2 = Module Online LED

9718EB

Table 2 describes the 8608GBE and 8608GBM Module LEDs.

Table 2 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. If the switch power is on, 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 *Managing Platform Operations and Using Diagnostic Tools*.

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 (128K records mode). For instructions on enabling MMode, see *Managing Platform Operations and Using Diagnostic Tools*.

Both the 8608GTE and 8608GTM Module (Figure 3) provide eight 1000BASE-T, copper gigabit ports. Each port operates in 1000 Mb/s full-duplex mode and supports IEEE 802.3 1998 Clause 28 autonegotiation and remote fault identification when the connected device also supports autonegotiation.

Figure 3 8608GTE/8608GTM Module

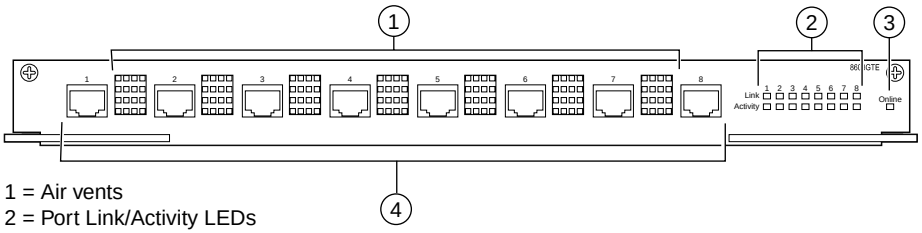
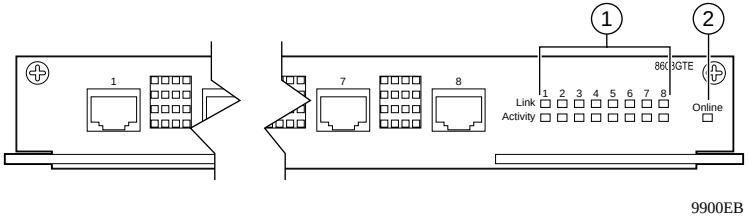


Figure 4 shows the location of the 8608GTE and 8608GTM Module LEDs.

Figure 4 8608GTE/8608GTM Module LEDs



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

Table 3 describes the 8608GTE and 8608GTM Module LEDs.

Table 3 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.

Table 3 8608GTE/8608GTM 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.
		Amber/Blinking	The module has been inserted into the chassis and diagnostics are running.
		Off	The switch power is off. If the switch power is on, the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

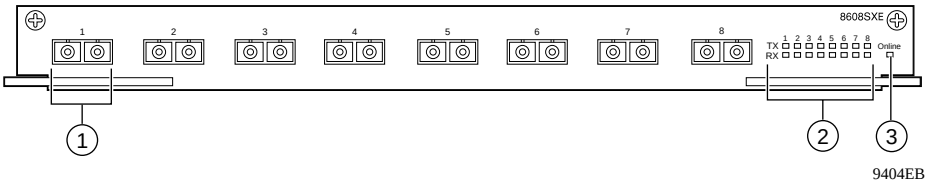
8608SXE Module

The 8608SXE Module (Figure 5) 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 *Managing Platform Operations and Using Diagnostic Tools*.

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 5 8608SXE Module



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

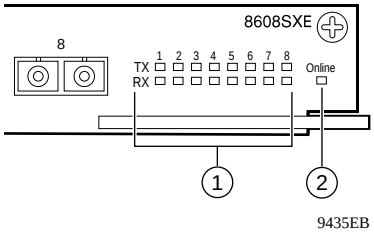
The shortwave optical transceivers provide transmission ranges as follows:

- 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 6 shows the location of the 8608SXE Module LEDs.

Figure 6 8608SXE Module LEDs



1 = Port TX and RX LEDs
2 = Module Online LED

Table 4 describes the 8608SXE Module LEDs.

Table 4 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.

Table 4 8608SXE 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. If the switch power is on, 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 7) is a 32K records module.

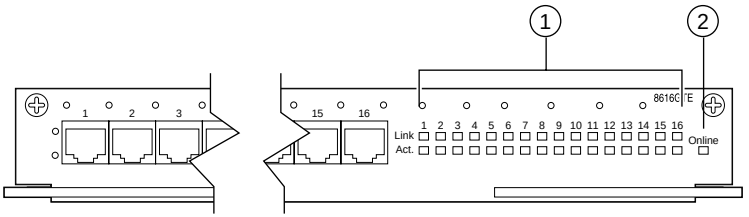
Note: If one, or more modules installed in the chassis is a 32K records module, these modules will be disabled if the chassis is configured to operate in MMode (128K records mode). For instructions on enabling or disabling MMode, see *Managing Platform Operations*.

The 8616GTE Module provides sixteen 1000BASE-T, copper gigabit ports. Each port operates in 1000 Mb/s full-duplex mode and supports the IEEE 802.3ae standard.

Figure 7 8616GTE Module

Figure 8 shows the location of the 8616GTE Module LEDs.

Figure 8 8616GTE Module LEDs



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

10529EB

Table 5 describes the 8616GTE Module LEDs.

Table 5 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. If the switch power is on, the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

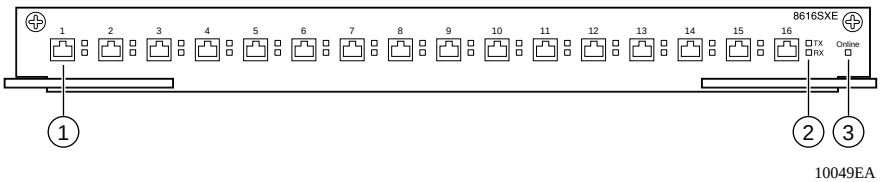
8616SXE Module

The 8616SXE Module (Figure 9) 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 *Managing Platform Operations and Using Diagnostic Tools*.

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

Figure 9 8616SXE Module



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

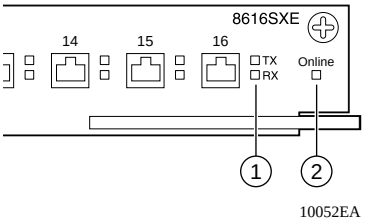
The shortwave optical transceivers provide transmission ranges as follows:

- 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 10 shows the location of the 8616SXE Module LEDs.

Figure 10 8616SXE Module LEDs



1 = Port TX and RX LEDs

2 = Module Online LED

Table 6 describes the 8616SXE Module LEDs.

Table 6 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. If the switch power is on, the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

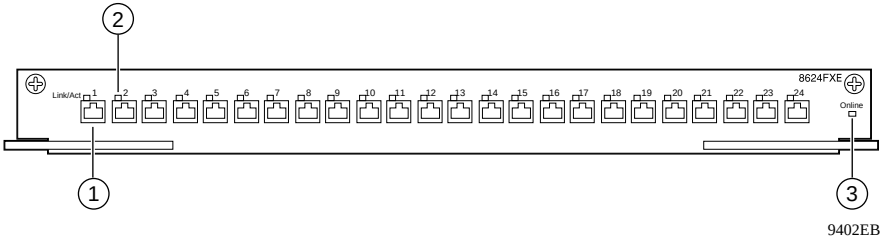
8624FXE Module

The 8624FXE Module (Figure 11) 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 *Managing Platform Operations and Using Diagnostic Tools*.

The 8624FXE Module 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 11 8624FXE Module

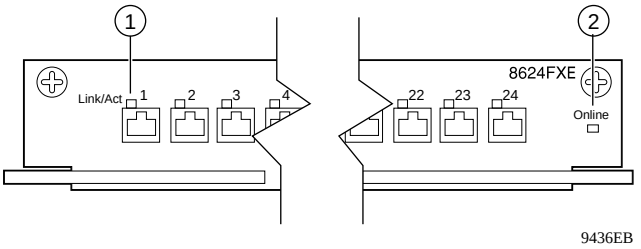


1 = 100BASE-FX port
2 = Port LED
3 = Module Online LED

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

Figure 12 shows the location of the LEDs.

Figure 12 8624FXE Module LEDs



1 = Port Link/Activity LEDs

2 = Module Online LED

Table 7 describes the 8624FXE Module LEDs.

Table 7 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. If the switch power is on, 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 *Managing Platform Operations and Using Diagnostic Tools*.

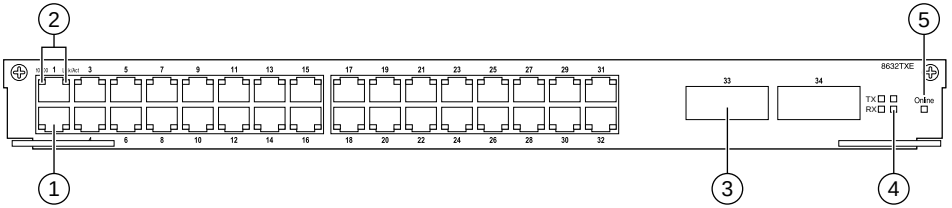
The 8632TXM Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. The 8632TXM module will only operate with 8000 Series software release 3.3 and later.

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 (128K records mode). For instructions on enabling MMode, see *Managing Platform Operations and Using Diagnostic Tools*.

Both the 8632TXE and 8632TXM Modules (Figure 13) 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 13 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 8632TXE and 8632TXM Module ports 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.

The following types of GBICs are available:

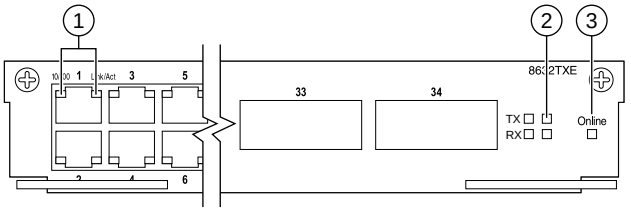
- 1000BASE-CWDM
- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-ZX
- 1000BASE-XD

Note: Only GBICs qualified by Nortel Networks are supported for use in the 8608GBE Module. For specific model numbers, refer to the Nortel Networks price list.

For more information about the GBICs and instructions for installing them, see *Installing Gigabit Interface Converters (GBICs)*.

Figure 14 shows the location of the 8632TXE and 8632TXM Module LEDs.

Figure 14 8632TXE/8632TXM Module LEDs



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

10459EA

Table 8 describes the 8632TXE and 8632TXM Module LEDs.

Table 8 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. If the switch power is 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.

Table 8 8632TXE/8632TXM Module LEDs (continued)

Type	Label	Color/State	Meaning
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 *Managing Platform Operations and Using Diagnostic Tools*.

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.

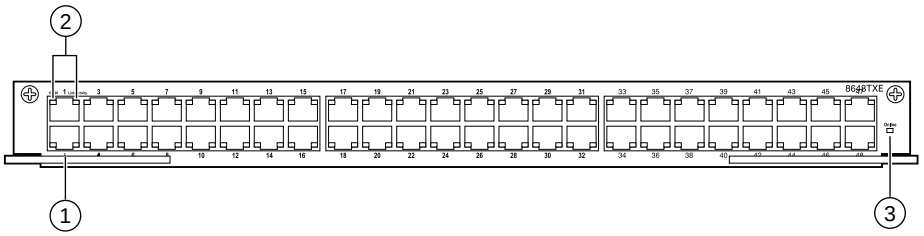
For 128K record support the following configurations are required:

- 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 (128K records mode). For instructions on enabling MMode, see *Managing Platform Operations and Using Diagnostic Tools*.

Both the 8648TXE and 8648TXM Module (Figure 15) consist of a printed circuit board with status LEDs and 48 autonegotiating 10/100 Mb/s ports.

Figure 15 8648TXE/8648TXM Module



1 = 10/100BASE-T port

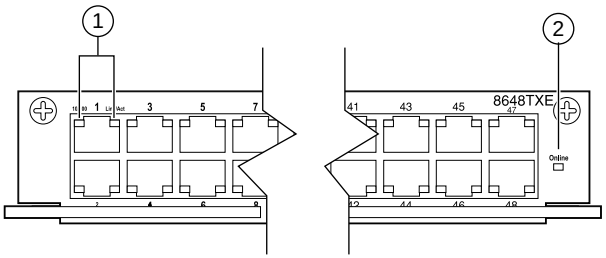
2 = Port LEDs: 10/100 (speed)
Link/Activity

3 = Module Online LED

Both the 8648TXE and 8648TXM Module ports 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 16 shows the location of the 8648TXE Module LEDs.

Figure 16 8648TXE/8648TXM Module LEDs



1 = Port LEDs: 10/100 (speed) and Link/Activity
2 = Module Online LED

Table 9 describes the 8648TXE and 8648TXM Module LEDs.

Table 9 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. If the switch power is on, 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 *Managing Platform Operations and Using Diagnostic Tools*.

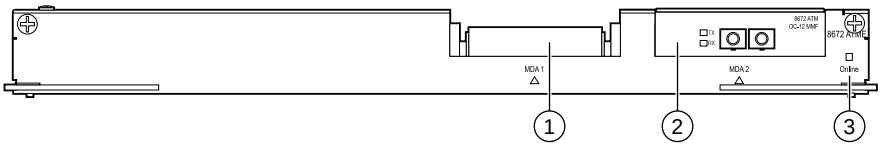
The 8672ATMM Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. The 8672ATMM module will only operate with 8000 Series software release 3.3 and later.

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 (128K records mode). For instructions on enabling MMode, see *Managing Platform Operations and Using Diagnostic Tools*.

Both the 8672ATME a nd 8672ATMM Modules (Figure 17) 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 17 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 Module, see *Installing Media Dependent Adapters for the 8672ATME and 8672ATMM Modules*.

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 one or two 8672ATME or 8672ATMM Modules in one 8000 Series chassis.

Both the 8672ATME and 8672ATMM Modules have an Online LED that indicates overall status for the module. Table 10 describes the Online LED.

Table 10 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 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

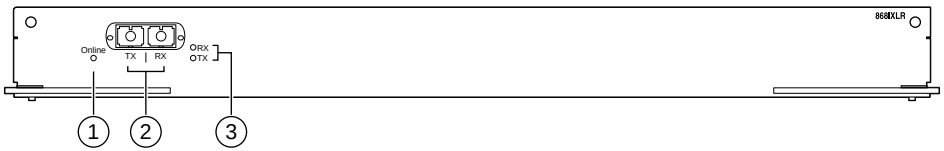
The 8681XLR Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. This module only operates with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

- The chassis must include 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 *Managing Platform Operations and Using Diagnostic Tools*.

The 8681XLR Module (Figure 18) consists of a printed circuit board with status LEDs, and one 10GBASE-LR 1310nm 10gigabit 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.

Figure 18 8681XLR Module



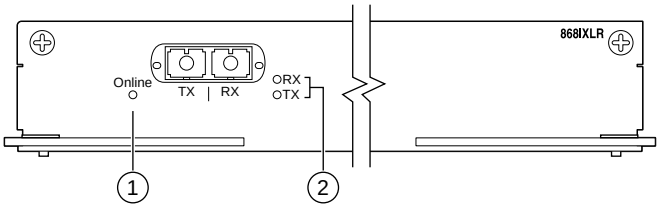
1 = Online LED
2 = 10GBASE LR port
3 = Port RX and TX LEDs

10548EA

Figure 19 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 19 8681XLR Module LEDs



1 = Online LED
2 = Port RX and TX LEDs

10550EA

Table 11describes the 8681XLR Module LEDs.

Table 11 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. If the switch power is on, the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8681XLW Module

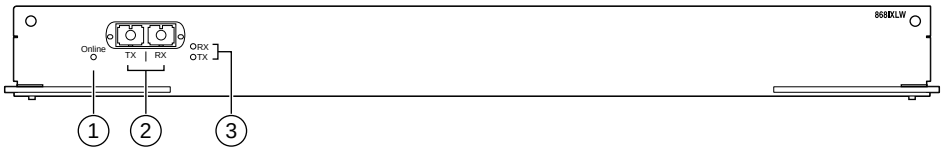
The 8681XLW Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. This module only operates with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

- The chassis must include at least one 8691SF CPU module. 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 (128K records mode). For instructions on enabling MMode, see *Managing Platform Operations and Using Diagnostic Tools*.

The 8681XLW Module (Figure 20) 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.

Figure 20 8681XLW Module



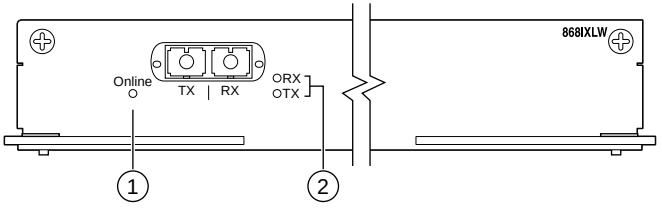
1 = Online LED
2 = 10GBASE LW port
3 = Port RX and TX LEDs

10547EA

Figure 21 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 21 8681XLW Module LEDs



1 = Online LED
2 = Port RX and TX LEDs

10549EA

Table 12 describes the 8681XLW Module LEDs.

Table 12 8681XLW Module LEDs

Type	Label	Color/State	Meaning
Port	TX	Green/Blinking	The port is transmitting data.
		Green/Steady	The port is enabled but not 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. If the switch power is on, the module is going through its power-on self-test and software initialization. A module in this state is not yet functional.

8683POSM Module

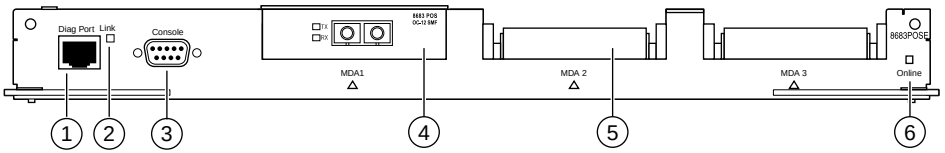
The 8683POSM Module is a 128K records module which allows support for large layer 2 and layer 3 configurations. This module only operates with 8000 Series software release 3.3 and later.

For 128K record support the following configurations are required:

- The chassis must include at least one 8691SF CPU module. 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 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 (128K records mode). For instructions on enabling MMode, see *Managing Platform Operations and Using Diagnostic Tools*.

The 8683POSM Module (Figure 22) 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 22 8683POSM Module with an OC-12c/STM-4 MDA



1 = Diag port
2 = Link LED
3 = Console port
4 = Installed MDA
5 = MDA bay
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

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.

For more information about the MDAs for the 8683POSM Module, see *Installing Media Dependent Adapters for the 8683POSM Module*.

The 8683POSM Module has an Online LED that indicates overall status for the module. Table 13 describes the Online LED.

Table 13 8683POSM Module LED

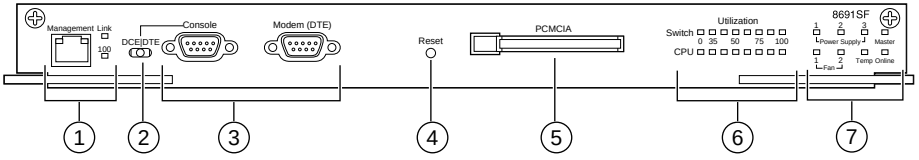
Color/State	Meaning
Green	The module is receiving power and is ready to receive and transmit traffic.
Amber	The module is initializing and performing diagnostic self-tests.
Off	The module is offline and is not receiving power.

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 23) 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 8600 modules. The CPU subsystem manages the routing switch fabric and the other I/O modules.

Figure 23 8691SF Module



1 = Management port and LEDs
2 = DCE/DTE switch
3 = Console and Modem ports
4 = Reset button
5 = PCMCIA card slot
6 = Utilization LEDs
7 = Module status LEDs

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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 128 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).

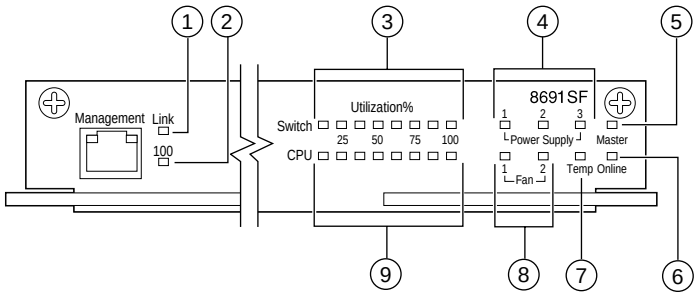
The routing switch fabric uses 10 MB of shared, high-speed memory. This memory buffers traffic destined for I/O modules. The switch logic allocates memory to the various switch priority queues according to traffic usage and current switch configuration.

In all 8000 Series chassis other than the 8003 Chassis, you can install a 8691SF Module in both slots 5 and 6 of the chassis to enable redundant operation. 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 24 shows the location of the 8691SF Module LEDs.

Figure 24 8691SF Module LEDs



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

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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 14 describes the 8691SF Module LEDs.

Table 14 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 = 10.0 Mb/s 2 LEDs = 7.6 Gb/s 3 LEDs = 11.4 Gb/s 4 LEDs = 15.2 Gb/s 5 LEDs = 19.0 Gb/s 6 LEDs = 22.8 Gb/s 7 LEDs = 26.6 Gb/s 8 LEDs = 30.4 Gb/s

Table 14 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% 2 LEDs = 24% 3 LEDs = 36% 4 LEDs = 48% 5 LEDs = 60% 6 LEDs = 72% 7 LEDs = 84% 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 the 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 the module is up 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 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 97.

Serial ports

The Module 8691SF 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 97 and “Modem serial port” on page 98.

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 2
Installing 8600 modules and connecting equipment

This chapter provides instructions for installing and connecting 8600 modules in a 8000 Series chassis to create a 8600 Switch. This chapter includes the following topics:

Removing and installing a filler panel

Nortel Networks ships the 8000 Series chassis with a filler panel covering each empty module slot.

Note: On a 8003, 8006, or 8010 Chassis, the filler panel covers an empty module slot. On the 8010co Chassis, the filler panel resembles a module and is installed in the 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 57.

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 chassis (Figure 25 or Figure 26).

Figure 25 Removing a filler panel: 8003, 8006, and 8010 Chassis

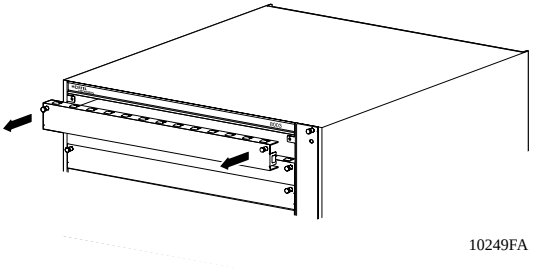
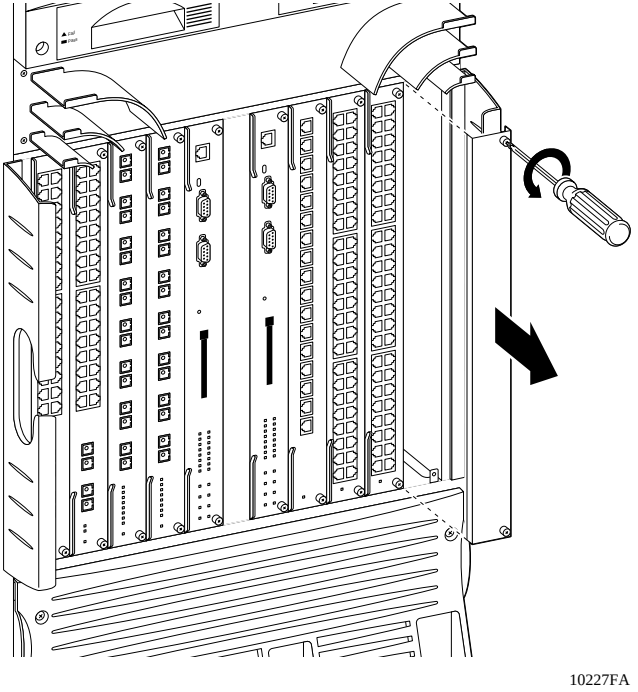


Figure 26 Removing a filler panel: 8010co Chassis



2 Pull the filler panel away from the slot.

Installing a filler panel

If you plan to remove a module from the 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 Insert the filler panel into the slot (8010co Chassis), or place the filler panel over the slot (8003, 8006, or 8010 Chassis).

3 Tighten the 2 screws with a Phillips screwdriver.

Installing and replacing a module

The 8600 modules are sensitive to static electricity. Static discharge from your clothing or other fixtures around you, even at levels that do not create a spark, can cause damage.

To prevent static discharge damage when you work with 8600 modules, place each module on a grounded antistatic mat until you are ready to install it. If you do not have an antistatic mat, wear a discharge leash or wrist strap to free yourself of static before you touch a module. (An antistatic wrist strap is shipped with the 8010co Chassis.) You can also free yourself of static by touching the metal chassis before you handle the module.

Caution: Electrostatic discharge can damage hardware. Follow the procedures in this section to protect your equipment from damage.

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 63.

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.

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Removing a module

You can remove any 8600 module from an operating switch chassis without turning off the chassis power.

Caution: Before you remove a 8691SF Module, back up your configuration. If the chassis has only one 8691SF Module and you remove that module, the switch will not operate.

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.

Caution: Do not operate the 8600 Switch 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.

2 Using a Phillips screwdriver, loosen the 2 captive screws that secure the module to the chassis (Figure 27 or Figure 28).

Figure 27 Loosening screws on the module: 8003, 8006, and 8010 Chassis

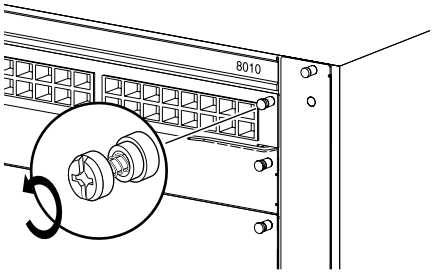

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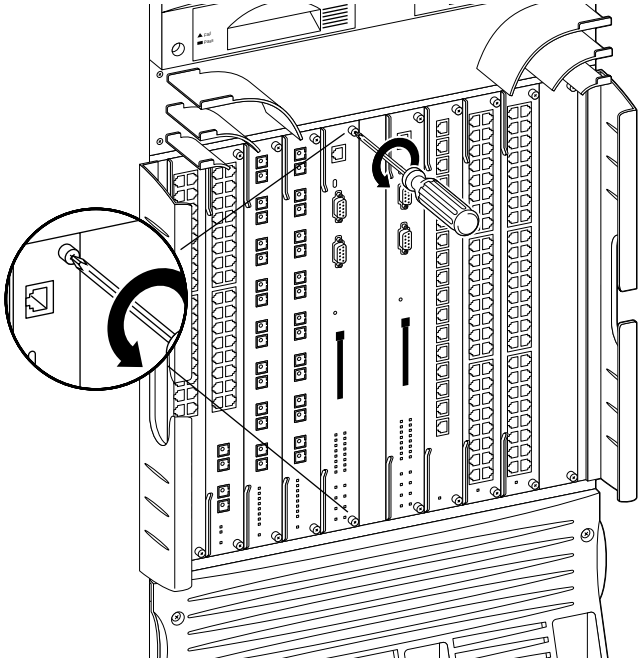
Figure 28 Loosening screws on the module: 8010co Chassis



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3 Rotate the insert/extract levers to eject the module from the chassis (Figure 29 or Figure 30).

Figure 29 Ejecting the module from the chassis: 8003, 8006, and 8010 Chassis

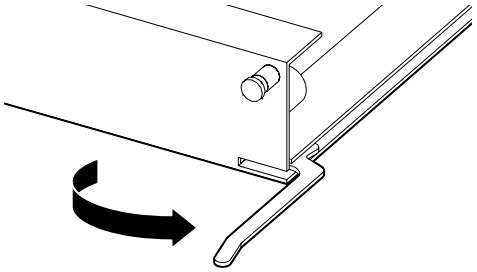

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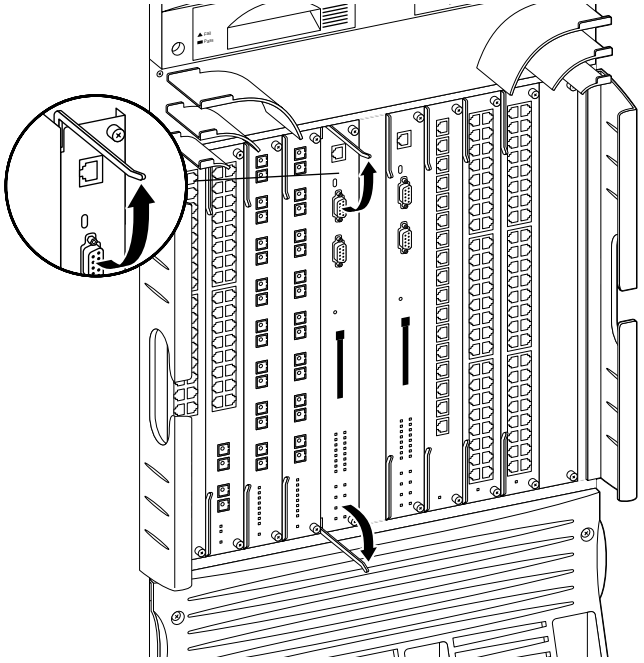
Figure 30 Ejecting the module from the chassis: 8010co Chassis



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4 Slide the module out of the chassis (Figure 31 or Figure 32).

Figure 31 Removing a module: 8003, 8006, and 8010 Chassis

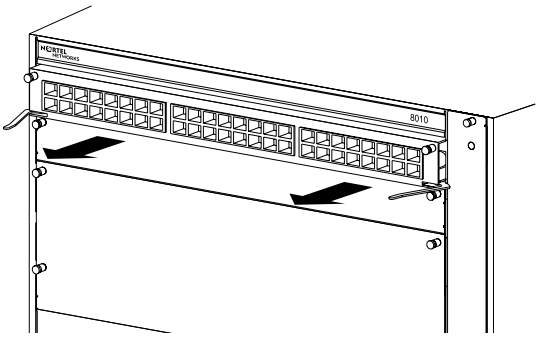

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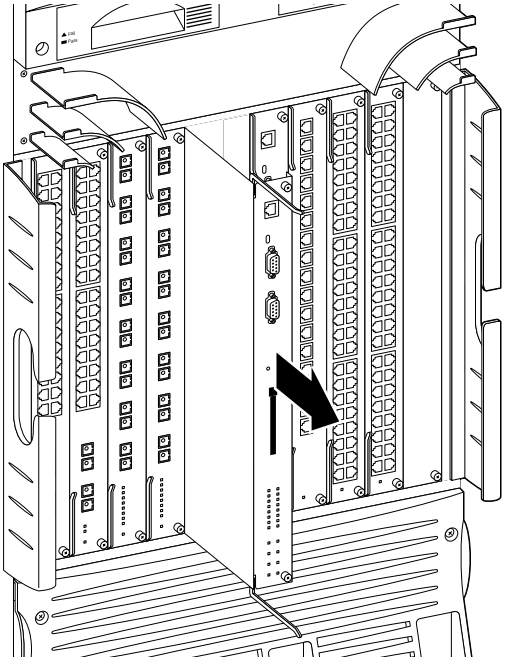
Figure 32 Removing a module: 8010co Chassis



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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 57).

Installing a module

You can install a 8600 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 that module in that slot. In all other cases, a module installed in a 8000 Series chassis is reset to factory defaults.

Caution: Electrostatic discharge can damage hardware. Review the antistatic precautions on page 57.

To install a 8600 module:

1. Locate the slot where you want to install the module.
2. Remove the installed module or the filler panel.

   For instructions, see "Removing a module" on page 58 or "Removing a filler panel" on page 56.
3. Make sure that the insert/extract levers are extended away from the front of the module (see Figure 29 or Figure 30).
4. Slide the module into the slot using the slot module guides (Figure 33 or Figure 34).

Figure 33 Installing a module: 8003, 8006, and 8010 Chassis

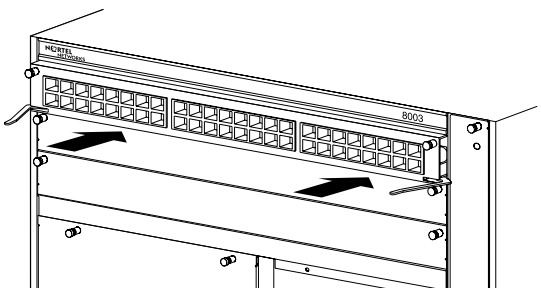

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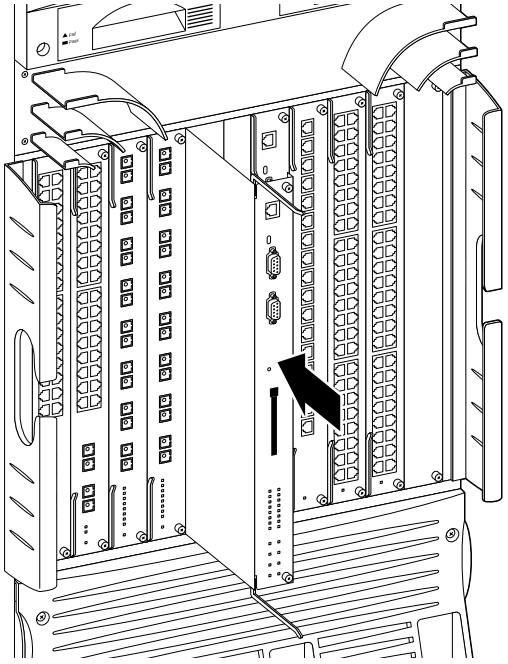
Figure 34 Installing a module: 8010co Chassis



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

6 Rotate the insert/extract levers to seat the module backplane connectors (Figure 35 or Figure 36).

Figure 35 Seating the backplane connectors: 8003, 8006, and 8010 Chassis

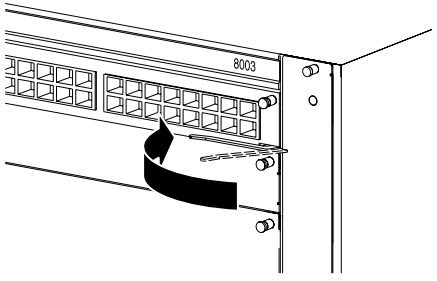

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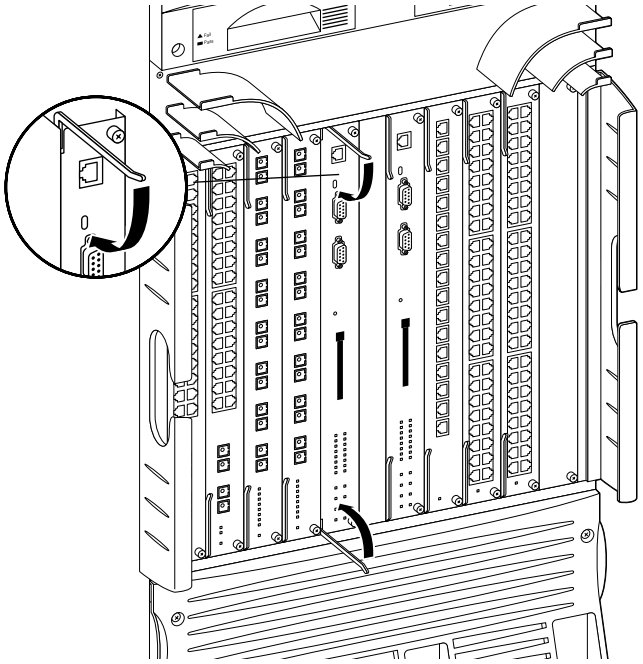
Figure 36 Seating the backplane connectors: 8010co Chassis



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7 Using a Phillips screwdriver, tighten the 2 captive screws to secure the module to the chassis (Figure 37 or Figure 38).

Note: Make sure that both screws are tight for proper module operation.

Figure 37 Securing the module in the chassis: 8003, 8006, and 8010 Chassis

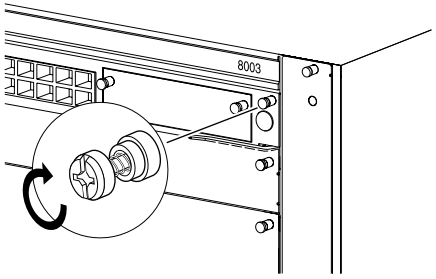

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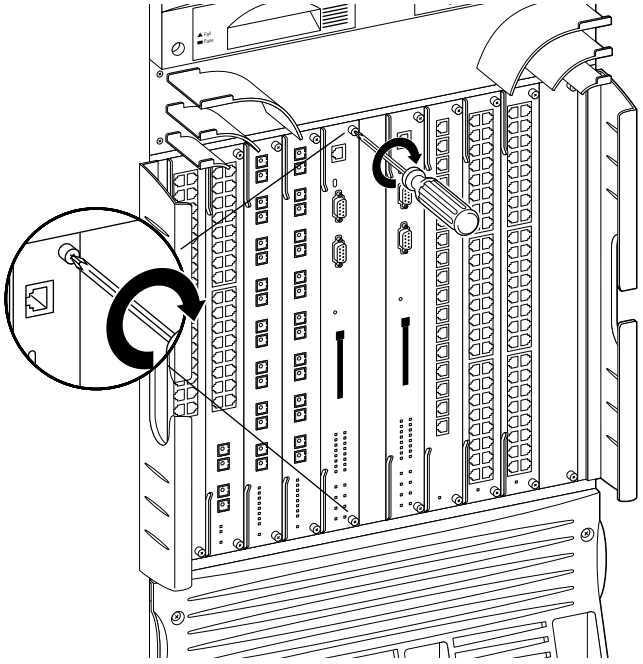
Figure 38 Securing the module in the chassis: 8010co Chassis



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

- "Connecting a PC or terminal to the switch" on page 67
- "Connecting a modem to the switch" on page 68
- "Connecting communications cables to 8600 modules" on page 70

Connecting a PC or terminal to the switch

You use Device Manager or the command line interface (CLI) to customize your 8600 Switch configuration (for example, by editing IP parameters). To establish a local CLI or Device Manager session, you must connect a PC or a VT-100 terminal to the console port on the 8691SF Module.

To connect a PC or terminal to the console port, you need a serial console cable with a 9-pin receptacle connector.

To connect a PC 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 15.

See the PC or terminal user manual for instructions.

Table 15 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 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 modem to the switch

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

To connect a modem to the 8600 Switch:

1 Turn on and configure the modem, using the parameters in Table 16.

See the modem documentation for instructions.

Table 16 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 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 a network management station to the switch

The management port on 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 8691SF Module.

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 17 lists the cable requirements for the 8600 modules.

Table 17 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 76	None	Depends on installed GBIC model; for specifications, see "GBICs" on page 76
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 band-width 902 ft (275 m) @ 200 MHz/km band-width
			50 µm multimode fiber optic cable	None	1640 ft (500 m) @ 400 MHz/km band-width 1804 ft (550 m) @ 400 MHz/km band-width
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 17 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) for full-duplex links
8632TXE or 8632TXM	1000 Mb/s Ethernet port	Duplex SC	Depends on installed GBIC model; for specifications, see "GBICs" on page 87	None	Depends on installed GBIC model; for specifications, see "GBICs" on page 87
	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	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 UTP required for 100 Mb/s operation	None	328 ft (100 m)
8672ATME OC-3 or 8672TMMM 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 or 8672ATMM 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 17 Connectors and cables for 8600 modules (continued)

Module	Port	Connector	Recommended cable type	Minimum cable length	Maximum cable length
8672ATME DS-3 or 8672ATMM 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	10 km
8681XLW	10GBASE-LW port	Duplex SC	9/125 µm single-mode fiber optic cable	None	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 UTP required for 100 Mb/s operation	None	328 ft (100 m)
	Serial ports	DB-9	RS-232		

Note: Ports on the 8632TXE, 8632TXM, 8648TXE, and 8648TXM 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.

Appendix A
8600 module technical specifications

This appendix provides 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 802.3, 1998 Media Access Control (MAC) Bridges
IEEE 802.1Q Virtual Bridged Local Area Networks
IEEE Std 802.3, 1998 Clause 34-42
IEEE 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:	5°C to 40°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: 8x1,488,100 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)

Electromagnetic emissions

Meets requirements of:

US:	FCC CFR47 Part 15, Subpart B, Class A
Canada:	ICES-003, Issue-2, Class A
Australia/New Zealand:	AS/NZS 3548:1995, Class A
Japan:	VCCI-V3/97.04, Class A
Taiwan:	CNS 13438, Class A
Europe:	EN 55022-1998 Class A; EN 61000-3-2/A14, EN 61000-3-3
Global:	CISPR 22-1997 Class A CE Mark
Electromagnetic susceptibility:	EN55024:1998/CISPR 24:1997

Safety agency approvals

US:	UL60950
Canada:	CSA 22.2 No. 60950
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)

1000BASE-TGBIC

Cable specifications

Type:	Category 5 copper unshielded twisted pair (UTP)
Maximum distance:	328 ft (100m)

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 18)

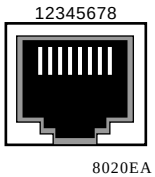
Cable specifications

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 18.

Table 18 Pin assignments: 8608GTE/8608GTM Module port

Connector	Pin number	Signal
	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: 1640 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:	100 W maximum
Thermal rating:	344 Btu/hr maximum

MTBF rating 147,602 hr

Connector type RJ-45 (see Table 19)

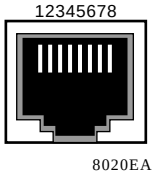
Cable specifications

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 19.

Table 19 Pin assignments: 8616GTE Module port

Connector	Pin number	Signal
	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: 1640 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:	100 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 beginning on page 87.

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) for 10/100 Mb/s ports For GBIC ports, distance varies with the GBIC; see GBIC descriptions beginning on page 87.

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)

1000BASE-TGBIC

Cable specifications

Type:	Category 5 copper unshielded twisted pair (UTP)
Maximum distance:	328 ft (100m)

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 20)

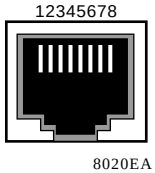
Cable specifications

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 both the 8648TXE and 8648TXM Modules are RJ-45 ports wired as MDI-X connectors (Table 20).

Table 20 Pin assignments: 8648TXE/8648TXM Module port

Connector	Pin number	Signal
	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
Connector type	SC Duplex
Port type	10GBASE-LR 1310nm serial PMD
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
Connector type	SC Duplex
Port type	10GBASE-LW 1310nm serial PMD
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:	

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 21)
Console port:	DB-9 connector (see Table 22)
Modem port:	DB-9 connector (see Table 23)

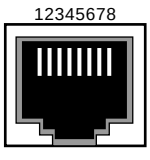
Cable specifications

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 21 shows the pin assignments for this connector.

Table 21 Pin assignments: 8691SF Module Management port

Connector	Pin number	Signal
	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

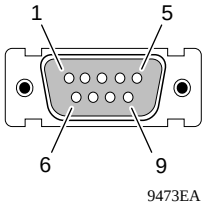
Console serial port

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 (right) or DCE (left). Default settings for this port are 9600 bits/s, 8 data bits, no parity, and one stop bit.

Connection to TXD and RXD signals and GND is sufficient for the console serial port to fully function. 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 22 lists the pin assignments for the Console port for both the DTE and DCE settings.

Table 22 Pin assignments: 8691SF Module Console port

Connector	Pin number	Switch position	
		DCE (left)	**DTE right)**
	2	TXD (Output)	RXD (Input)
	3	RXD (Input)	TXD (Output)
	4	DSR (Input)	DTR (Output)
	5	GND	GND
	6	DTR (Output)	DSR (Input)
	7	CTS (Input)	RTS (Output)
	8	RTS (Output)	CTS (Input)

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 23 describes the required cable pin assignments.

Table 23 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

Table 23 Pin assignments: DTE to DCE

Switch		Modem	
Signal	**Pin number**	**DCE DB-9 pin number**	**DCE DB-25 pin number**
RTS	7	7	4
CTS	8	8	5