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Installing GBIC and Gigabit SFP Transceivers

NORTEL NETWORKS

318034-A

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Caution: Use of controls or adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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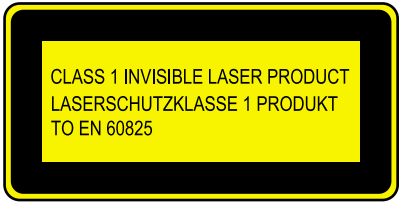
Place all printed circuit boards on an antistatic mat until you are ready to install them. If you do not have an antistatic mat, wear a discharge leash to free yourself of static before touching any of the printed circuit boards, or free yourself of static by touching a grounded metal object before handling a printed circuit board.

Product Safety

Meets requirements of:

IEC 60950 3rd edition
CSA 22.2 No. 60950, 3rd edition.
UL 60950 3rd edition:
EN60950, 3rd edition
EN60825-1 ,+A11, +A2



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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.

Vorsicht: Glasfaserkomponenten können Laserlicht bzw. Infrarotlicht abstrahlen, wodurch Ihre Augen geschädigt werden können. Schauen Sie niemals in einen Glasfaser-LWL oder ein Anschlußteil. Gehen Sie stets davon aus, daß das Glasfaserkabel an eine Lichtquelle angeschlossen ist.

Avertissement: L'équipement à fibre optique peut émettre des rayons laser ou infrarouges qui risquent d'entraîner des lésions oculaires. Ne jamais regarder dans le port d'un connecteur ou d'un câble à fibre optique. Toujours supposer que les câbles à fibre optique sont raccordés à une source lumineuse.

Advertencia: Los equipos de fibra óptica pueden emitir radiaciones de láser o infrarrojas que pueden dañar los ojos. No mire nunca en el interior de una fibra óptica ni de un puerto de conexión. Suponga siempre que los cables de fibra óptica están conectados a una fuente luminosa.

Avvertenza: Le apparecchiature a fibre ottiche emettono raggi laser o infrarossi che possono risultare dannosi per gli occhi. Non guardare mai direttamente le fibre ottiche o le porte di collegamento. Tenere in considerazione il fatto che i cavi a fibre ottiche sono collegati a una sorgente luminosa.

警告：光ファイバ装置は目に有害なレーザー光や赤外線を放射することがあります。光ファイバやコネクタ・ポートを覗き込まないでください。光ファイバ・ケーブルは光源に接続されているものと思ってください。

Introduction

This document provides technical specifications and installation instructions for:

- Gigabit Interface Converters (GBICs):

  Which includes Course Wavelength Division Multiplexed (CWDM) GBICs.

- Small Form Factor Pluggable (SFP) transceivers:

  Which includes Course Wavelength Division Multiplexed (CWDM) SFPs.

Unless otherwise specified, the terms GBIC and SFP also apply to CWDM GBICs and CWDM SFPs. In this guide, when instructions apply only to a specific GBIC or SFP type (for example, a CWDM GBIC or a CWDM SFP type), that term will be specified.

For a list of supported GBICs, and SFPs, see your latest product-specific release notes.

This document includes the following topics:

Topic	Page
Handling, safety, and environmental guidelines	4
GBICs	5
SFPs	8
Installation	13
Technical Specifications	18
How to get help	38

Handling, safety, and environmental guidelines

Before installing your GBIC or SFP, read the following handling, safety, and environmental guidelines:

- GBICs and SFPs are static sensitive. To prevent damage from electrostatic discharge (ESD), follow your normal board and component handling procedures.
- GBICs and SFPs, are dust sensitive. When you store a GBIC or SFP, or when you disconnect it from a fiber optic cable, always keep the dust cover over the GBIC or SFP optical bore.
- To clean contaminants from the optical bores of a GBIC or SFP, use an alcohol swab or equivalent to clean the ferrules of the optical connector.
- Dispose of this product according to all national laws and regulations.

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.

GBICs

GBICs are hot-swappable input/output enhancement components designed for use with Nortel Networks* products to allow Gigabit Ethernet ports to link with other Gigabit Ethernet ports over various media types.

This section provides a GBIC model list and describes the typical GBIC labeling structure:

- Table 1 lists and describes the standard GBIC models.
- See Table 2 on page 6 for a list of CWDM GBIC models.

Table 1 GBIC models

Model number	Product number	Description
1000BASE-SX	• AA1419001	Short wavelength 550 m
1000BASE-LX	• AA1419002	Long wavelength 5 km
1000BASE-XD	• AA1419003	Extended distance 50 km
1000BASE-ZX	• AA1419004	Extended distance 70 km
1000BASE-T	• AA1419041 • AA1419042	Copper category 5 unshielded twisted pair (UTP) Maximum distance 100 m

Note: GBIC wavelength distance may vary, depending on the quality of fiber optic cable used.

Table 2 lists and describes the CWDM GBIC models.

There are eight different CWDM GBICs, one for each supported wavelength. Note that Table 2 lists the CWDM GBICs and corresponding multiplexers by wavelength and color code. Color matching simplifies the CWDM GBICs-multiplexer connection.

Table 2 CWDM GBIC model numbers

Wave-length (nm)/ color code	Part number			
	CWDM SFP GBIC	CWDM OADM	CWDM OMUX-4	CWDM OMUX-8
1470 /Gray	AA1419017	AA1402002		AA1402010
1490 /Violet	AA1419018	AA1402003	AA1402009	
1510 /Blue	AA1419019	AA1402004		
1530 /Green	AA1419020	AA1402005	AA1402009	
1550 /Yellow	AA1419021	AA1402006		
1570 /Orange	AA1419022	AA1402007	AA1402009	
1590 /Red	AA1419023	AA1402008		
1610 /Brown	AA1419024	AA1402011	AA1402009	

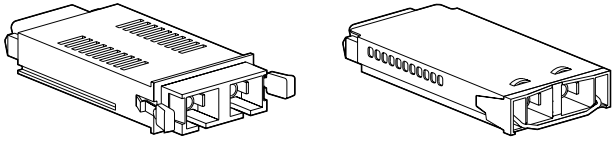
See *Installation and Networking Guidelines for Optical Routing*, for the following CWDM GBICs information:

- Determining maximum transmission distance for your point-to-point, mesh ring, or hub and spoke network configuration.
- Connecting CWDM GBICs to multiplexers.

Note: Depending on the GBIC manufacture, your GBIC can have various locking/extractor mechanisms as shown in Figure 1.

Figure 1 shows the two GBIC insertion and removal mechanisms—extractor tabs and extractor handle.

Figure 1 GBIC extraction tabs and extractor handle



GBIC model with extractor tabs

GBIC model with extractor handle

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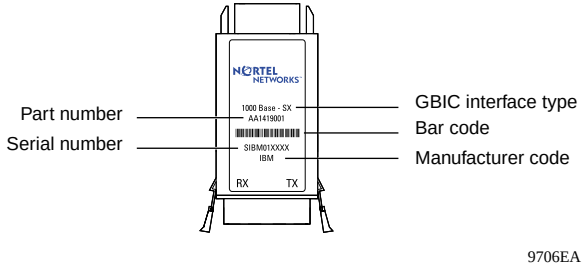
For installation instructions, see “Installation” on page 13.

GBIC labeling

The Nortel Networks label on a typical GBIC (See Figure 2 on page 8) contains a Nortel Networks serial number, a bar code, a manufacturer’s code, an interface type, and a part number.

Figure 2 Nortel Networks GBIC label



Note: When you contact a Nortel Networks service representative for troubleshooting purposes, you must have the following information available:

- Nortel Networks serial number
- Manufacturer's code
- Interface type
- GBIC part number

SFPs

This section describes the SFP and label, and provides a model list for 1000BASE-SX, 1000BASE-LX SFPs, and 1000BASE-T SFPs. It also describes the Nortel Networks* coarse wavelength division multiplexed (CWDM) SFPs and provides a CWDM SFP model list.

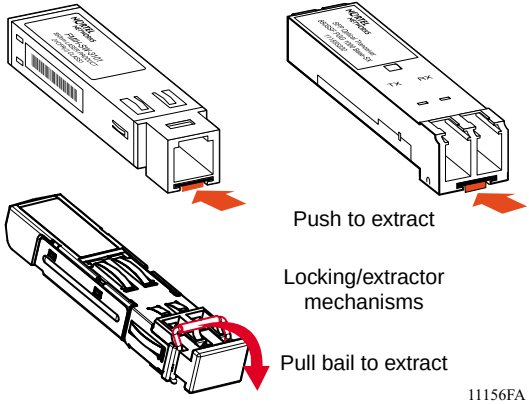
This section includes the following topics:

- “SFP locking/extractor mechanisms,” next
- “SFP labeling” on page 10
- “SFP models” on page 10
- “CWDM SFP models” on page 11

SFP locking/extractor mechanisms

Depending on the SFP manufacturer, your SFP or CWDM SFP can have various types of locking/extractor mechanisms. Figure 3 shows two versions; other locking/extractor mechanisms exist, although not shown here.

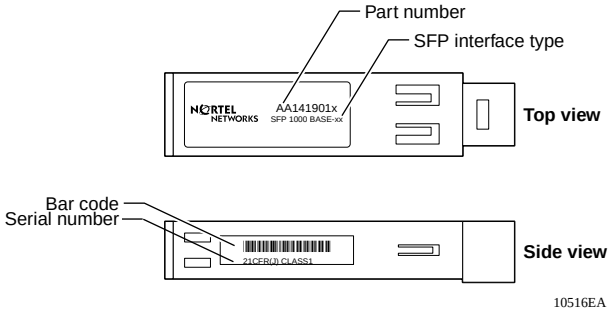
Figure 3 SFP locking/extractor mechanism



SFP labeling

The Nortel Networks label on a typical SFP (Figure 4) contains a Nortel Networks serial number, a bar code, a manufacturer's code, an interface type, and a part number.

Figure 4 Nortel Networks SFP label



SFP models

SFPs are hot-swappable input/output enhancement components designed for use with Nortel Networks* products to allow Gigabit Ethernet ports to link with other Gigabit Ethernet ports over various media types.

Table 3 on page 11 lists and describes the Nortel Networks SFP models.

Table 3 1000BASE-SX and 1000BASE-LX SFP models

Model number	Product number	Description
1000BASE-SX (LC Type)	AA1419013	Small Form Factor Pluggable, short wavelength 550 m
1000BASE-SX (MT-RJ Type)	AA1419014	Small Form Factor Pluggable, short wavelength 550 m
1000BASE-LX (LC Type)	AA1419015	Small Form Factor Pluggable, long wavelength 5 km
1000BASE-T	AA1419043	Copper category 5 unshielded twisted pair (UTP) Maximum distance 100 m

Note: The cable distance may vary depending on the quality of fiber optic cable used.

CWDM SFP models

CWDM SFPs are transceivers that link Gigabit Ethernet ports with fiber optic networks. WDM technology consolidates multiple optical channels, using specific wavelengths to expand available bandwidth, on a common optical fiber.

CWDM SFPs are components in the optical routing system, designed to support high speed data communications for Metropolitan Area Networks (MANs). The system uses a grid of eight CWDM optical wavelengths in both ring and point-to-point configurations. All components are color-coded by wavelength.

Table 4 lists the Nortel Networks CWDM SFPs and describes their wavelengths, color codes, part numbers, and cable lengths.

Table 4 Nortel Networks CWDM SFP GBIC list

CWDM SFP	Product number	Cable Length
1470nm/Gray	• AA1419025 • AA1419033	• 40 KM • 70 KM
1490nm/Violet	• AA1419026 • AA1419034	• 40 KM • 70 KM
1510nm/Blue	• AA1419027 • AA1419035	• 40 KM • 70 KM
1530nm/Green	• AA1419028 • AA1419036	• 40 KM • 70 KM
1550nm/Yellow	• AA1419029 • AA1419037	• 40 KM • 70 KM
1570nm/Orange	• AA1419030 • AA1419038	• 40 KM • 70 KM
1590nm/Red	• AA1419031 • AA1419039	• 40 KM • 70 KM
1610nm/Brown	• AA1419032 • AA1419040	• 40 KM • 70 KM

Note: The cable distance may vary depending on the quality of fiber optic cable used.

Installation

This section describes how to install and remove GBICs and SFPs.

This section includes the following topics:

- "Installing a GBIC," next
- "Removing a GBIC" on page 14
- "Installing an SFP" on page 15
- "Removing an SFP" on page 16

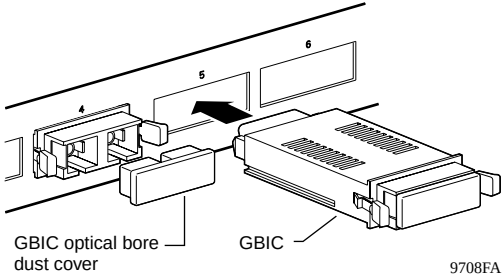
Installing a GBIC

To install a GBIC:

Caution: GBICs and SFPs are keyed to prevent incorrect insertion. If the GBIC or SFP resists pressure, do not force it; turn it over, and reinsert it.

1. Remove the GBIC from its protective packaging.
2. Verify that the GBIC is the correct model for your network configuration (See "GBICs" on page 5).
3. Grasp the GBIC between your thumb and forefinger.
4. Insert the GBIC into the slot on the front panel of the Gigabit Ethernet switching module (See Figure 5 on page 14).

Figure 5 Inserting the GBIC into the switching module



5 Remove the dust cover from the GBIC's optical bores.

Note: If you are installing a CWDM GBIC, see *Installation and Networking Guidelines for Optical Routing*, for instructions about connecting a CWDM GBIC to a multiplexer.

Removing a GBIC

To remove a GBIC:

1 Disconnect the network fiber cable from the GBIC connector.

2 Depending on your GBIC model, either grasp the extraction tabs (See Figure 1 on page 7) located on either side of the GBIC with your thumb and forefinger, or lift the extractor handle attached to the GBIC.

3 Slide the GBIC out of the Gigabit Ethernet module slot.

4 If the GBIC does not slide easily from the module slot, use a gentle side-to-side rocking motion while firmly pulling the GBIC from the slot.

5 Attach a dust cover over the fiber optic bores and store the GBIC in a safe place until needed.

Note: If you are discarding the GBIC, be sure to dispose of the GBIC according to all national laws and regulations.

Installing an SFP

CWDM SFPs are installed similar to the LC type SFPs.

Caution: GBICs and SFPs are keyed to prevent incorrect insertion. If the GBIC or SFP resists pressure, do not force it; turn it over, and reinsert it.

To install an SFP:

1 Remove the SFP from its protective packaging.

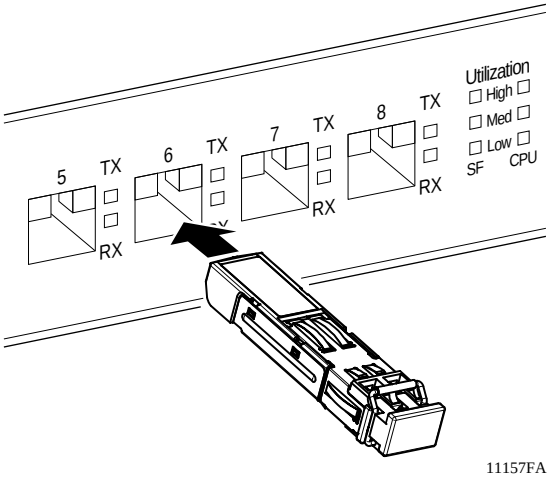
2 Verify that the SFP is the correct model for your network configuration (See Table 3 on page 11 and Table 4 on page 12).

3 Grasp the SFP between your thumb and forefinger.

4 Insert the SFP into the SFP slot on the module (See Figure 6 on page 16).

Apply a light pressure to the SFP until the device clicks and locks into position in the module.

Figure 6 Inserting an SFP



5 Remove the dust cover from the SFP optical bores.

Removing an SFP

CWDM SFP removal steps are similar to removal steps of any other LC type SFP.

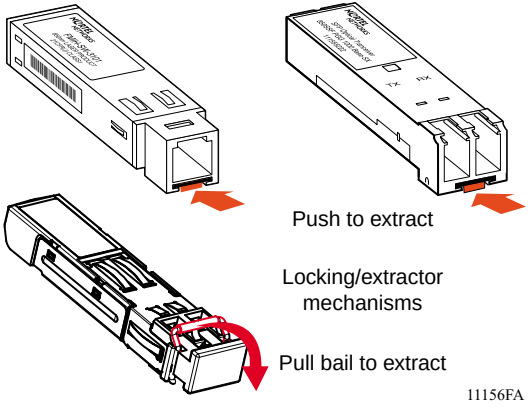
To remove an SFP:

1 Disconnect the network fiber cable from the SFP connector.

2 Depending on your SFP model, press the locking/extractor mechanism on the SFP to release the SFP (Figure 7).

Note: Your SFP locking/extractor mechanism may be different than the models shown.

Figure 7 Removing an SFP



3 Slide the SFP out of the module SFP slot.

4 If the SFP does not slide easily from the module slot, use a gentle side-to-side rocking motion while firmly pulling the SFP from the slot.

5 Attach a dust cover over the fiber optic bores and store the SFP in a safe place until needed.

Note: If you are discarding the SFP, be sure to dispose of the SFP according to all national laws and regulations.

Technical Specifications

This section includes the following topics:

- "GBIC specifications," next
- "CWDM GBIC specifications" on page 26
- "SFP specifications" on page 30
- "CWDM SFP specifications" on page 36

GBIC specifications

This section provides technical specifications for the supported GBIC models and includes the following topics:

- "GBIC physical specifications," next
- "1000BASE-SX specifications" on page 19
- "1000BASE-LXspecifications" on page 20
- "1000BASE-XD specifications" on page 22
- "1000BASE-ZX specifications" on page 24
- "1000BASE-T specifications" on page 26

GBIC physical specifications

This section describes general GBIC specifications (Table 5).

Table 5 GBIC specifications

Specification	Descriptions
Dimensions (H x W x D)	0.39 x 1.18 x 2.56 inches (1 x 3 x 6.5 cm)
Connectors	• Multimode fiber optic: SC • Single-mode fiber optic: SC • RJ-45

GBIC ports for both multi-mode and single-mode fiber have SC-type connectors and a minimum cable distance of 6.5 feet (2 m).

1000BASE-SX specifications

The Model 1000BASE-SX GBIC provides 1000BASE-SX (850 nm, short wavelength, Gigabit Ethernet) connectivity using SC duplex multimode fiber connectors.The Model 1000BASE-SX GBIC supports full-duplex operation only.

Table 6 describes standards, connectors, cabling, and distance for the Model 1000BASE-SX GBIC.

Table 6 1000BASE-SX specifications

Type	Specifications
Standards	Conforms to the following standards: • 802.3z, 1000BASE-SX
Connectors	Duplex SC fiber optic connector

Table 6 1000BASE-SX specifications (continued)

Type	Specifications
Cabling	• 62.5 μm MMF optic cable • 50 μm MMF optic cable
Distance	• 902 ft. (275 m) using 62.5 μm MMF optic cable • 1804 ft. (550 m) using 50 μm MMF optic cable
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

1000BASE-LXspecifications

The Model 1000BASE-LX GBIC provides 1000BASE-LX (1310 nm, wavelength, Gigabit Ethernet) connectivity using SC duplex fiber connectors. The long wavelength optical transceivers used in the LX model provide variable distance ranges using both multimode and single-mode fiber optic cabling. The Model 1000BASE-LX GBIC supports full-duplex operation only.

Table 7 describes standards, connectors, cabling, and distance for the Model 1000BASE-LX GBIC.

Table 7 1000BASE-LX specifications

Type	Specifications
Standards	Conforms to the following standards: • 802.3z, 1000BASE-LX
Connectors	Duplex SC fiber optic connector
Cabling	• 62.5 μm MMF optic cable • 50 μm MMF optic cable • 10 μm SMF optic cable
Distance	• 1804 ft. (550 m) using 62.5 μm MMF optic cable • 1804 ft. (550 m) using 50 μm MMF optic cable • 16405 ft. (5 km) using 10 μm SMF optic cable
Wavelength	1310 nm
Optical budget	10.5 dB
Laser Transmitter Characteristics	
Minimum launch power	-9.5 dBm
Maximum launch power	-3 dBm
Receiver Characteristics	
Minimum receiver sensitivity	-20 dBm
Maximum input power	-3 dBm

Note: When multimode fiber is used in long-distance applications, external, removable, mode-conditioning patch cords may be required to prevent differential mode delay (DMD). You can order mode conditioning patch cords through Nortel Networks:

- SC-SC Mode-Conditioning Patch Cord 62.5/125 (part number AA0018035)
- SC-SC Mode-Conditioning Patch Cord 50/125 (part number AA0018036)

1000BASE-XD specifications

The Model 1000BASE-XD GBIC provides Gigabit Ethernet connectivity using SC duplex single-mode fiber connectors. High-performance optical transceivers enable Gigabit Ethernet link distances up to 50 kilometers (km) over single-mode fiber. The ports operate in full-duplex mode only.

Table 8 describes standards, connectors, cabling, and distance for the Model 1000BASE-XD GBIC.

Table 8 1000BASE-XD GBIC specifications

Type	Specifications
Standards	Conforms to the following standards: • 802.3z, Ethernet full duplex
Connectors	Duplex SC single-mode fiber optic connector
Cabling	Single-mode fiber optic cable

Table 8 1000BASE-XD GBIC specifications (continued)

Type	Specifications
Distance	Up to 50 km using single-mode fiber cable, depending on the quality of the fiber
Optical budget	17 dB
Laser Transmitter Characteristics	
Wavelength	1550 ± 10 nm
Maximum spectral width	0.2 nm
Maximum launch power	0 dBm or 1.0 mW
Minimum launch power into fiber	-5 dBm or 0.3 mW
Distance	50 km
Receiver Characteristics	
Wavelength	1200 to 1620 nm
Minimum receiver sensitivity	-22 dBm
Maximum input power	-3 dBm

Note: Nortel Networks recommends that you use an in-line attenuator for shorter link distances to avoid overloading the receiver.

1000BASE-ZX specifications

The Model 1000BASE-ZX GBIC provides Gigabit Ethernet connectivity using SC duplex single-mode fiber connectors. High-performance optical transceivers enable Gigabit Ethernet link distances up to 70 km over single-mode fiber cable. The ports operate in full-duplex mode only.

Table 9 describes standards, connectors, cabling, and distance for the Model 1000BASE-ZX GBIC.

Table 9 1000BASE-ZX GBIC specifications

Type	Specifications
Standards	Conforms to the following standards: 802.3z, Ethernet full duplex
Connectors	SC duplex single-mode fiber optic connector
Cabling	Single-mode fiber optic cable
Distance	Up to 70 km using single-mode fiber optic cable, depending on the quality of the fiber
Optical Budget	22 dB
Laser Transmitter Characteristics	
Wavelength	1550 ± 10 nm
Maximum spectral width	0.2 nm
Maximum launch power	5 dBm or 3.0 mW
Minimum launch power	0 dBm
Distance	70 km

Table 9 1000BASE-ZX GBIC specifications (continued)

Type	Specifications
Receiver Characteristics	
Wavelength	1200 nm to 1620 nm
Minimum receiver sensitivity	-22 dBm
Maximum input power	-3 dBm

Note: When shorter lengths of single-mode fiber cable are used, there is a risk of overloading the receiver. It may be necessary to insert an in-line optical attenuator in the link to prevent overloading, as follows:

- Insert a 10 dB in-line optical attenuator between the fiber optic cable plant and the receiving port on the 1000BASE-ZX GBIC, at each end of the link, if the fiber optic cable span is less than 25 km.
- Insert a 5 dB in-line optical attenuator between the fiber optic cable plant and the receiving port on the 1000BASE-ZX GBIC, at each end of the link, if the fiber optic cable span is less than 50 km.

1000BASE-T specifications

The Model 1000BASE-T GBIC provides Gigabit Ethernet connectivity using a single eight-pin RJ-45 connector. The 1000BASE-T Model GBIC operates at 1000 Mb/s (1 Gb/s) and does not support 100BASE-T and 10BASE-T interfaces.

Note: You must disable autonegotiation before operating the 1000BASE-T GBIC. By default, GBICs inserted into certain product-specific modules are set for Autonegotiation = “True.”

The maximum power requirements of the GBIC is 375 mA at 5V.

Table 9 describes the 1000BASE-T GBIC specifications.

Table 10 1000BASE-T GBIC specifications

Type	Specifications
Standards	Conforms to the following standards: • 802.3z, 802.3ab
Connectors	RJ-45
Cabling	Category 5 copper cabling
Distance	Up to 100m

CWDM GBIC specifications

This section provides technical specifications for the supported CWDM GBIC models and includes the following topics:

• “CWDM GBIC physical specifications,” next

- “CWDM optical specifications” on page 28
- “CWDM GBIC electrical power interface specifications” on page 29

CWDM GBIC physical specifications

This section describes general CWDM GBIC specifications (Table 11).

Table 11 CWDM general specifications

Item	Specification
Physical dimensions	0.39 X 1.18 X 2.56 inches (1 X 3 X 6.5 cm)
Connectors	single mode fiber optic SC
Cabling	SMF, 9 µm
Data rate	Minimum 0.125 Gb/s Maximum 1.25 Gb/s
Total System Budget @ 1.25 Gb/s BER < 10^{-9} w/PRBS $2^{7}-1$	30 dB — Total system budget is defined as $P_{out} - P_{in}$ – typical connector losses.
Data format	8 B/10 B
Operating temperature (case temperature)	Minimum $0^{o}C$ Maximum $70^{o}C$
Storage temperature	Minimum $-10^{o}C$ Maximum $85^{o}C$
Maximum distance	120 km — Given 30 dB loss budget and 0.25 dB/km fiber loss, up to 120 km in transmission distance is supported with no intermediate multiplexer.

CWDM optical specifications

This section describes the optical characteristics for the CWDM GBIC (Table 12).

Table 12 Optical characteristics

Item	Symbol	Min.	Typical	Max
Transmitter center wavelength (nm) Over 0 to 70°C case temperature[a]	λ_c	(x-4)	(x+1)	(x+7)
Transmitter center wavelength (nm) Over 0 to 60°C case temperature[a]	λ_c	(x-4)	(x+1)	(x+6)
Wavelength temperature dependence			0.08 nm/°C	
Sidemode suppression ratio	SMSR	30 dB		
Transmitter optical output power Average power coupled into single mode fiber	P_{out}	+2.0 dBm		+6.0 dBm
Transmitter extinction ratio	OMI	9 dB		
Transmitter eye opening Conforms with IEEE 802.3 and Fibre Channel Eye Masks		60%		
Optical return loss	ORL	14 dB		
Optical input wavelength	λ_{in}	1450 nm		1620 nm

Table 12 Optical characteristics (continued)

Item	Symbol	Min.	Typical	Max
Receiver optical input power (BER< 10^{-9} w/PRBS 2^7-1) At 1.25 Gb/s, 60°C case temperature.	P_{in}	-30 dBm		-7 dBm
Receiver optical input power (BER < 10^{-9} w/PRBS 2^7-1) At 1.25 Gb/s, 70°C case temperature.	P_{in}	-28 dBm		-7 dBm
Dispersion penalty at 60 km			2.0 dB	
Dispersion penalty at 100 km			3.0 dB	

a. Center wavelength “x” is 1470, 1490, 1510, 1530, 1550, 1570, 1590, or 1610 nm.

CWDM GBIC electrical power interface specifications

This section describes the electrical power interface specifications for the CWDM GBIC (Table 13).

Table 13 Electrical power interface specifications

Item	Symbol	Min.	Typical	Max
Supply current	I_s		250 mA	300 mA
Maximum voltage	V_{max}			6 V
Surge current	I_{surge}			350 mA
Input voltage	V_{cc}	4.75 V	5.00 V	5.25 V

SFP specifications

This section provides technical specifications for the supported SFP models and includes the following topics:

- "SFP physical specifications," next
- "1000BASE-SX (LC Type) specifications" on page 31
- "1000BASE-LX(LC Type) specifications" on page 32
- "1000BASE-SX (MT-RJ Type) specifications" on page 33
- "1000BASE-T specifications" on page 35

SFP physical specifications

Table 14 describes general 1000BASE-SX, 1000BASE-LX SFP specifications, and 1000BASE-T specifications.

Table 14 1000BASE-SX, 1000BASE-LX SFP, and 1000BASE-T specifications

Specification	Descriptions
Dimensions (H x W x D)	0.53 x 0.33 x 2.22 inches (13.4 x 8.5 x 56.4 mm)
Connectors	• Multimode fiber optic: LC or MT-RJ • Single-mode fiber optic: LC or MT-RJ

1000BASE-SX (LC Type) specifications

The Model 1000BASE-SX SFP provides 1000BASE-SX (850 nm, short wavelength, Gigabit Ethernet) connectivity using LC duplex multimode fiber connectors. The Model 1000BASE-SX SFP supports full-duplex operation only.

Table 15 describes standards, connectors, cabling, and distance for the Model 1000BASE-SX SFP.

Table 15 1000BASE-SX SFP specifications

Type	Specifications
Standards	Conforms to the following standards: • 802.3z, 1000BASE-SX
Connectors	Duplex LC fiber optic connector
Cabling	• 62.5 μm MMF optic cable • 50 μm MMF optic cable
Distance	• 902 ft. (275 m) using 62.5 μm MMF optic cable • 1804 ft. (550 m) using 50 μm MMF optic cable
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

1000BASE-LX(LC Type) specifications

The Model 1000BASE-LX SFP provides 1000BASE-LX (1310 nm, wavelength, Gigabit Ethernet) connectivity using LC duplex fiber connectors. The long wavelength optical transceivers used in the LX model provide variable distance ranges using both multimode and single-mode fiber optic cabling. The Model 1000BASE-LXsupports full-duplex operation only.

Table 16 describes standards, connectors, cabling, and distance for the Model 1000BASE-LX.

Table 16 1000BASE-LX SFP specifications

Type	Specifications
Standards	Conforms to the following standards: 802.3z, 1000BASE-LX
Connectors	Duplex LC fiber optic connector
Cabling	• 62.5 µm MMF optic cable • 50 µm MMF optic cable • 10 µm SMF optic cable
Distance	• 1804 ft. (275 m) using 62.5 µm MMF optic cable • 1804 ft. (275 m) using 50 µm MMF optic cable • 16405 ft. (5 km) using 10 µm SMF optic cable
Wavelength	1310 nm
Optical budget	10.5 dB

Table 16 1000BASE-LX SFP specifications (continued)

Type	Specifications
Laser Transmitter Characteristics	
Minimum launch power	-9.5 dBm
Maximum launch power	-3.0 dBm
Receiver Characteristics	
Minimum receiver sensitivity	-20.0 dBm
Maximum input power	-3.0 dBm

1000BASE-SX (MT-RJ Type) specifications

The Model 1000BASE-SX (MT-RJ Type) SFP GBIC provides Gigabit Ethernet connectivity using MT-RJ multi-mode fiber connectors.

Table 17 describes standards, connectors, cabling, and distance for the Model 1000BASE-SX (MT-RJ Type) SFP GBIC.

Table 17 1000BASE-SX SFP specifications

Type	Specifications
Standards	Conforms to the following standards: • 802.3z, Ethernet full duplex
Connectors	Duplex MT-RJ fiber optic connector
Cabling	• 62.5 μm MMF optic cable • 50 μm MMF optic cable

Table 17 1000BASE-SX SFP specifications (continued)

Type	Specifications
Distance	• 275 mm (62.5 μm MMF optic cable) • 550 mm (50 μm MMF optic cable)
Optical budget	7 dB
Laser Transmitter Characteristics	
Wavelength	850 nm
Maximum spectral width	0.85 nm
Maximum launch power	-4.0 dBm
Minimum launch power into fiber	-9.5 dBm
Receiver Characteristics	
Wavelength	850 nm
Minimum receiver sensitivity	-17 dBm
Maximum input power	0 dBm

1000BASE-T specifications

The Model 1000BASE-T SFP provides Gigabit Ethernet connectivity using a single eight-pin RJ-45 connector. The 1000BASE-T Model SFP operates at 1000 Mb/s (1 Gb/s) and does not support 100BASE-T and 10BASE-T interfaces).

Note: You must disable autonegotiation before operating the 1000BASE-T SFP. By default, SFPs inserted into certain product-specific modules are set for Autonegotiation = “True.”

The maximum power requirements of the SFP is 375 mA at 5V.

Table 9 describes the 1000BASE-T SFP specifications.

Table 18 1000BASE-T SFP specifications

Type	Specifications
Standards	Conforms to the following standards: • 802.3z, 802.3ab
Connectors	RJ-45
Cabling	Category 5 copper cabling
Distance	Up to 100m

CWDM SFP specifications

Table 19 lists the specifications for the CWDM SFP.

Table 19 CWDM SFP specifications

Item	Specification
Physical dimensions	0.457 X .604 X 2.18 inches (11.6 X 15.3 X 55.43 mm)
Connectors	Duplex LC fiber optic
Cabling	SMF, 9 µm
Data rate	Nominal range 1.0625 to 1250 Mbaud
Average launch power	minimum -4.0 dBm maximum +2 dBm
Optical budget	19dBm
Transmitter extinction ratio	minimum 9 dB
Data format	8 B/10 B
Average receive power	minimum -23 dBm maximum -3 dBm
Power supply	maximum 3.15 to 3.45 V, 40 mA
Operating temperature range	0^{o}C to 60^{o}C
Regulatory	Class 1 devices per FDA/CDRH and 1EC8251 Laser Safety Regulations

Note: A minimum attenuation of 5 dB must be present between the transmitter and receiver. To avoid receiver saturation, you must insert a minimum attenuation of 5 dB when:

- testing the CWDM SFP in loopback mode.
- using short runs of fiber with no intermediate CWDM OADM or CWDM OMUX.

To determine the expected signal loss for a CWDM OADM, CWDM OMUX, or fiber length, see *Installation and Networking Guidelines for Optical Routing*.

Given a loss budget of 24 dB and assuming fiber loss of .25 dB/km, up to 96 km reach is supported with no intermediate CWDM OADM or CWDM OMUX.

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 Nortel Networks Technical Support. To obtain contact information online, go to:

www.nortelnetworks.com/cgi-bin/comments/comments.cgi

From there, click on Technical Support.

From the Technical Support page, you can open a Customer Service Request online or find the telephone number for the nearest Technical Solutions Center.

If you are not connected to the Internet, you can call 1-800-4NORTEL (1-800-466-7835) to learn the telephone number for the nearest Technical Solutions Center.

Hard-copy technical manuals

You can print selected technical manuals and release notes free, directly from the Internet. Go to:

www.nortelnetworks.com/documentation

Find the product for which you need documentation. Then locate the specific category and model or version for your hardware or software product.

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