CISCO SYSTEMS

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Gigabit Interface Converter Installation Note

Product Numbers: WS-G5484(=), WS-G5486(=), WS-G5487(=)

This installation note provides the technical specifications and installation instructions for the Gigabit Ethernet Converters (GBICs) that you install in Catalyst 4000 or Catalyst 5000 series Gigabit Ethernet ports that accept GBICs. This document is to be used in conjunction with the Catalyst 4000 or Catalyst 5000 Series Installation Guide.

Document Contents

This installation note contains these sections:

1

GBIC Description

The GBIC is a hot-swappable input/output device that plugs into a Gigabit Ethernet port, linking the port with the fiber-optic network. A GBIC is shown in Figure 1.
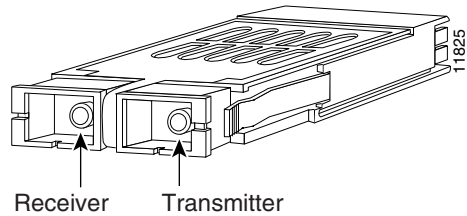
Figure 1   Gigabit Interface Converter

Receiver   Transmitter

Table 1 is a list of the available GBICs.

Table 1   GBIC List

GBIC	Product Number
Short wavelength (1000BaseSX)	WS-G5484
Long wavelength/long haul (1000BaseLX/LH)	WS-G5486
Extended distance (1000BaseZX)	WS-G5487

WS-G5484

The WS-G5484, 1000BaseSX operates on ordinary multi-mode fiber optic link spans of up to 550 m in length (See Table 4).

WS-G5486

The WS-G5486, 1000BaseLX/LH interfaces fully comply with the IEEE 802.3z 1000BaseLX standard. However, their higher optical quality allows them to reach 10 km over single-mode fiber (SMF) versus the 5 km specified in the standard.

WS-G5487

The WS-G5487, 1000BaseZX operates on ordinary single mode fiber optic link spans of up to 70 km in length. Link spans of up to 100 km are possible using premium single mode fiber or dispersion shifted single mode fiber (premium single mode fiber has a lower attenuation per unit length than ordinary single mode fiber; dispersion shifted single mode fiber has both lower attenuation per unit length, and less dispersion).

The WS-G5487 must be coupled to single mode fiber optic cable, which is the type of cable typically used in long haul telecommunications applications. The WS-G5487 will not operate correctly when coupled to multi-mode fiber, and it is not intended to be used in application environments (e.g. building backbones, horizontal cabling) where multi-mode fiber is frequently used.

The WS-G5487 is intended to be used as a Physical Medium Dependent (PMD) component for Gigabit Ethernet interfaces, as found on various switch and router products. It will operate at a signaling rate of 1250 MBaud, transmitting and receiving 8B/10B encoded data.

When shorter distances of single mode fiber are used, it may be necessary to insert an in-line optical attenuator in the link, to avoid overloading the receiver:

- A 10 dB in-line optical attenuator should be inserted between the fiber optic cable plant and the receiving port on the WS-G5487 GBIC at each end of the link whenever the fiber optic cable span is less than 25 km.

- A 5 dB in-line optical attenuator should be inserted between the fiber optic cable plant and the receiving port on the WS-G5487 GBIC at each end of the link whenever the fiber optic cable span is equal to or greater than 25 km, and less than 50 km.

Note The maximum number of installed 1000BASE-ZX GBICs is limited in each Catalyst chassis. These limits are necessary in order to fall within the emission specifications for these products. Table 2 is a list of the GBIC limits for the different Catalyst systems.

Table 2   Maximum Number of GBICs Per Platform

Platform	Maximum number of GBICs
Catalyst 4000	12
Catalyst 5000	6
Catalyst 6000	4

Safety Recommendations

This section describes the warning symbol used in this document and GBIC handling recommendations.

Warning This warning symbol means *danger.* You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the appendix "Translated Safety Warnings" in the *Catalyst 4000 or 5000 Series Installation Guide*.

Specifications

GBIC specifications are listed in Table 3.

Table 3   **GBIC Specifications**

Specification	Description
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
Wavelength	SX: 850 nm LX/LH: 1300 nm ZX: 1550
Cabling Distance (Maximum)	SX: 1804 feet (550 m) LX/LH: 32,810 feet (10 km) ZX: 70 to 100 km

Port Cabling Specifications

Table 4 provides cabling specifications for the GBICs that you install in the Gigabit Ethernet port. Note that all GBIC ports have SC-type connectors, and the minimum cable distance for all GBICs listed (multimode fiber [MMF] and SMF) is 6.5 feet (2 m).

Table 4   **GBIC Port Cabling Specifications**

GBIC	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz/km)	Cable Distance
WS-G5484SX[1]	850	MMF	62.5 62.5 50.0 50.0	160 200 400 500	722 ft (220 m) 902 ft (275 m) 1640 ft (500 m) 1804 ft (550 m)
WS-G5486LX/LH	1300	MMF[2] SMF (LX/LH)	62.5 50.0 50.0 9/10	500 400 500 -	1804 ft (550 m) 1804 ft (550 m) 1804 ft (550 m) 32,810 ft (10 km)
WS-G5487ZX	1550	SMF	Not Conditional	N/A	70 to 100 km

1   MMF only.
2   Mode-conditioning patch cord (CAB-GELX-625 or equivalent) is required. Using an ordinary patch cord with MMF, 1000BaseLX/LH GBICs, and a short link distance (10's of meters) can cause transceiver saturation resulting in an elevated bit error rate (BER).
     In addition, when using the LX/LH GBIC with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the GBIC and the MMF cable on both the transmit and receive ends of the link. The mode-conditioning patch cord is required for link distances greater than 984 ft (300 m).

Note The mode-conditioning patch cord (CAB-GELX-625 or equivalent) is required to comply with IEEE standards. The IEEE found that link distances could not be met with certain types of fiber-optic cable cores. The solution is to launch light from the laser at a precise offset from the center, which is accomplished by using the mode-conditioning patch cord. At the output of the patch cord, the LX/LH GBIC is compliant with the IEEE 802.3z standard for 1000BaseLX.

Note The WS-G5487 1000Base-ZX GBIC provides an optical power budget of 21.5 dB. You should measure your cable plant with an optical loss test set to verify that the optical loss of the cable plant (including connectors and splices) is less than or equal to this figure. The optical loss measurement must be performed with a 1550 nm light source.

Handling a GBIC

GBIC handling guidelines follow:

- GBICs are static sensitive. To prevent electrostatic discharge (ESD) damage, follow your normal board and component handling procedures.

- GBICs are dust sensitive. When storing a GBIC or when a fiber-optic cable is not plugged in, always keep plugs in the GBIC optical bores.

- The most common source of contaminants in the optical bores is debris picked up on the ferrules of the optical connectors. Use an alcohol swab or Kim-Wipe to clean the ferrules of the optical connector.

Installing a GBIC

Gigabit Ethernet switching modules can be shipped with or without GBICs installed.

Note GBICs are hot-swappable in Gigabit Ethernet modules.

Perform the following steps to install a GBIC.

Step 1 Remove the GBIC from its protective packaging.

Step 2 Check the part number to verify that the GBIC is the correct type for your network (see the "GBIC Description" section on page 2).

Step 3 Grip the sides of the GBIC with your thumb and forefinger and insert the GBIC into the slot on the front panel of the Gigabit Ethernet switching module, as shown in Figure 2.

Note GBICs are keyed to prevent incorrect insertion.

Figure 2   Installing a GBIC

Plug
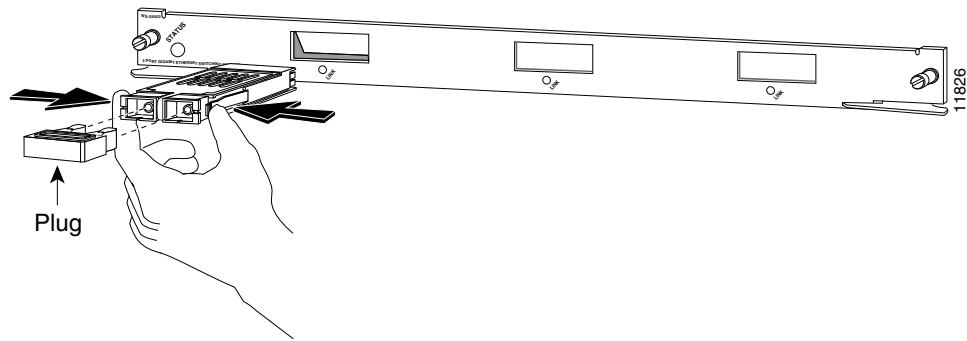
Step 4   Slide the GBIC through the flap covering the opening into the slot until you hear a click.
The click indicates the GBIC is locked into the slot.

⚠ **Warning** Class 1 laser product

⚠ **Warning** Invisible laser radiation may be emitted from the aperture ports of the single-mode fiber-optic
modules when no cable is connected. *Avoid exposure and do not stare into open apertures*.

Step 5   When you are ready to attach the network interface fiber-optic cable, remove the plug
from the GBIC and save the plug for future use.

Removing a GBIC

If you are removing a defective GBIC, perform these steps.

Step 1   Disconnect the network fiber cable from the GBIC SC connector.

Step 2   Release the GBIC from the slot by simultaneously squeezing the two plastic tabs (one on
each side of the GBIC).

Step 3   Slide the GBIC out of the Gigabit Ethernet module slot. A flap drops down to protect the
Gigabit Ethernet module connector.

⚠ **Warning** Ultimate disposal of this product should be handled according to all national laws and regulations.

FCC Class A Compliance

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

Note The maximum number of installed 1000BASE-ZX GBICs is limited in each Catalyst chassis. These limits are necessary in order to fall within the emission specifications for these products. Table 2 is a list of the GBIC limits for the different Catalyst systems.

Table 5 Maximum Number of GBICs Per Platform

Platform	Maximum number of GBICs
Catalyst 4000	12
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You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side or the other of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

Modifications to this product not authorized by Cisco Systems could void the FCC approval and negate your authority to operate the product.

Class 1 Laser Compliance

This product has been tested and found to comply with the limits for Class 1 laser for IEC825, EN60825, and 21CFR1040 specifications.

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Cisco Connection Online (CCO) is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services.

Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco's customers and business partners. CCO services include product information, product documentation, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously: a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, and Internet e-mail, and it is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

You can access CCO in the following ways:

- WWW: http://www.cisco.com

- WWW: http://www-europe.cisco.com

- WWW: http://www-china.cisco.com

- Telnet: cco.cisco.com

- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

Note If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM, a member of the Cisco Connection Family, is updated monthly. Therefore, it might be more current than printed documentation. To order additional copies of the Documentation CD-ROM, contact your local sales representative or call customer service. The CD-ROM package is available as a single package or as an annual subscription. You can also access Cisco documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

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