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# Gigabit Ethernet Interface Processor (GEIP) Installation and Configuration

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**Product Numbers: GEIP(=), GBIC-SX=, GBIC-LX=, GBIC-LH=, CAB-GELX-625=**

## Introduction

This configuration note is a standalone publication that provides instructions for installing and configuring the Gigabit Ethernet Interface Processor (GEIP). The GEIP operates in all Cisco 7500 series routers and in Cisco 7000 series routers using the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI). (For specific compatibility requirements, see the “Software and Hardware Requirements” section on page 3.) Included in this configuration note are steps for GEIP hardware installation and cable connection, and basic GEIP configuration steps and examples.

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- Cisco Connection Online, page 47
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## Related Documentation

Your router and the Cisco IOS software running on it contain extensive features and functionality. For information on Cisco IOS software and for general installation and maintenance information for your router, use the following resources:

- For Cisco IOS software configuration information and support, refer to the modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software installed on your Cisco hardware. You can also refer to the Cisco IOS software release notes for the version of software you are using on your hardware.
- For hardware installation and maintenance information on Cisco 7000 series routers that have the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI) installed, refer to the *Cisco 7000 Hardware Installation and Maintenance* publication or to the *Cisco 7010 Hardware Installation and Maintenance* publication, which shipped with your Cisco 7000 or Cisco 7010 router, respectively.
- For hardware installation and maintenance information on Cisco 7500 series routers, refer to the *Cisco 7500 Series Installation and Configuration Guide* that shipped with your Cisco 7500 series router.

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**Note** You can access Cisco IOS software documentation and hardware installation and maintenance documentation on the World Wide Web at <http://www.cisco.com>, <http://www-china.cisco.com>, <http://www-europe.cisco.com>.

If you are reading Cisco documentation on the World Wide Web, you can submit comments electronically. Click **Feedback** on the toolbar and select **Documentation**. After you complete the form, click **Submit** to send it to Cisco. We appreciate your comments.

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- To view Cisco documentation or obtain general information about documentation, refer to the following sources:
  - Documentation CD-ROM. (See the “Documentation CD-ROM” section on page 48.)
  - Cisco Connection Online (CCO). (See the “Cisco Connection Online” section on page 47.)
  - Customer Service at 800 553-6387 or 408 526-7208. Customer Service hours are 5:00 a.m. to 6:00 p.m. Pacific time, Monday through Friday (excluding company holidays). You can also send e-mail to [cs-rep@cisco.com](mailto:cs-rep@cisco.com).

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## Installation Prerequisites

This section provides installation prerequisites to ensure a successful GEIP installation, and includes the following sections:

- Software and Hardware Requirements, page 3
- Tools and Parts Required, page 3
- Safety Guidelines, page 4
- Guidelines for Interface Processor Installation and Removal, page 7
- IEEE 802.3z Gigabit Ethernet Overview, page 9
- GEIP Link Distance Limitations, page 9

If you plan to install a new GEIP and, therefore, prepare your site and plan network connections, be sure to review the Gigabit Ethernet descriptions and interface cable distance limitations in the “IEEE 802.3z Gigabit Ethernet Overview” section on page 9.

## Software and Hardware Requirements

The GEIP operates with the CyBus in Cisco 7500 series routers and requires that the host router run Cisco IOS Release 11.1(22)CC or a later release of 11.1 CC.

The GEIP operates with the CxBus in Cisco 7000 series routers and requires that the host router run Cisco IOS Release 11.1(22)CC or a later release of 11.1 CC.

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**Note** The GEIP operates in Cisco 7000 series routers providing these routers have the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI) installed.

For proper operation with the GEIP, we recommend that your RSP or RSP7000 have at least 32 MB of DRAM.

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**Caution** To prevent problems associated with data transmission, you must attach this device only to IEEE 802.3x-compliant devices.

## Tools and Parts Required

You need the following tools and parts to install or upgrade a GEIP:

- Number 1 Phillips and a 3/16-inch, flat-blade screwdriver.
- ESD-prevention equipment or disposable grounding wrist strap included with all Cisco products.
- GEIP= and at least one available interface processor slot in your Cisco 7000 series or Cisco 7500 series router. (For specific compatibility requirements, see the section “Software and Hardware Requirements.”)

- Gigabit interface converter (GBIC) appropriate for your application: GBIC-SX(=), GBIC-LX(=), or GBIC-LH(=). (For specific GBIC requirements, see the “Gigabit Interface Converter” section on page 17.)
- Mode conditioning patch cord appropriate for your application. (For specific requirements related to the mode conditioning patch cord, see the “Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH” section on page 19.)

The mode conditioning patch cord is available from Cisco Systems as Product Number CAB-GELX-625= and is recommended for 62.5/125-micron ( $\mu$ )<sup>1</sup> multimode optical fiber, 1000Base-LX applications where transmission distances are greater than 984.25 feet (300 meters).

- Multimode or single-mode optical fiber cables appropriate for your application. These optical fiber cables must have SC-type connections. Cisco Systems does not supply optical fiber cables; these cables are available commercially. (For specific cable requirements, see Table 4 and the “Optical Fiber Cables” section on page 18.)

If you need additional equipment, contact a service representative for ordering information.

## Safety Guidelines

Following are safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

### Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, may harm you. A warning symbol precedes each warning statement.



**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, see the *Regulatory Compliance and Safety Information* document that accompanied this device.

**Waarschuwing** Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.

**Varoitus** Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnttouwksien ehkäisykeinoista. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).

1. One micron ( $\mu$ ) =  $1 \times 10^{-6}$  meters (or 1 micrometer).

**Attention** Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez le document *Regulatory Compliance and Safety Information* (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.

**Warnung** Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.

**Avvertenza** Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.

**Advarsel** Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.

**Aviso** Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento *Regulatory Compliance and Safety Information* (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.

**¡Advertencia!** Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado *Regulatory Compliance and Safety Information* (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.

**Varning!** Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förekommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.

### Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard or makes the equipment unsafe.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

### Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

### Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures.

Use the following guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed board component-side-up on an antistatic surface or in a static shielding container; otherwise, immediately place it in a static shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.



**Caution** For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohms).

## Guidelines for Interface Processor Installation and Removal

This section describes mechanical functions of system components, emphasizes the importance of following correct procedures to avoid unnecessary board failures, and is for background only; specific installation procedures follow in the “GEIP Installation” section on page 21.

You can remove and replace interface processors while the system is operating; you do not need to notify the software or reset the system power. This functionality enables you to add, remove, or replace interface processors with the system online, which provides a method that is seamless to end users on the network, maintains all routing information, and ensures session preservation.

After an interface processor is reinstalled, the system brings on line only interfaces that match the current configuration and were previously configured as up; all others require that you configure them with the **configure** command.



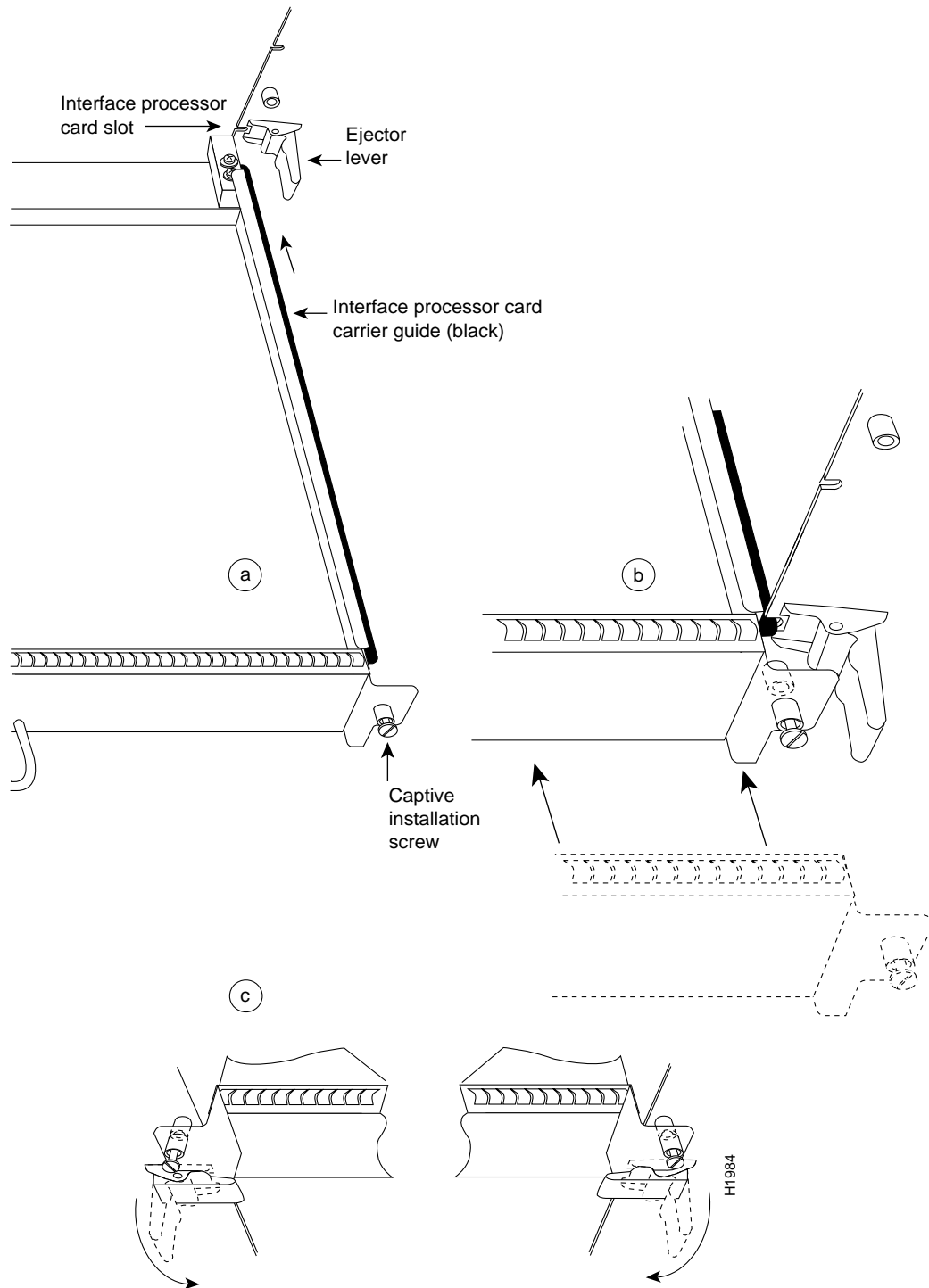
**Caution** The system can indicate a hardware failure if you do not follow proper procedures. We strongly recommend that you remove or insert only one interface processor at a time. You must allow at least 20 to 30 seconds for the system to complete the preceding tasks before removing or inserting another interface processor. Disrupting the sequence before the system completes its verification can cause the system to interpret hardware failures.

Cisco 7000 series and Cisco 7500 series routers have ejector levers located on the ends of the interface processor slots. (See Figure 1a.) The function of the ejector levers is to align and seat the card connectors in the backplane. Failure to use the ejector levers and insert the interface processor properly can disrupt the order in which the pins make contact with the card or interface processor. Follow the GEIP installation and removal instructions carefully, and review the following examples of *incorrect* insertion practices and their results:

- Using the handle to force the interface processor all the way into the slot can pop the ejector levers out of their springs. If you then try to use the ejector levers to seat the interface processor, the first layer of pins (which are already mated to the card or interface processor) can disconnect and then reconnect with the backplane, which the system interprets as a board failure.
- Using the handle to force or slam the interface processor all the way into the slot can damage the pins on the board connectors if they are not aligned properly with the backplane.
- When using the handle (rather than the ejector levers) to seat the interface processor in the backplane, you might need to pull the interface processor back out and push it in again to align it properly. Even if the backplane pins are not damaged, the pins mating with and disconnecting from the card or interface processor might cause the system to interpret a board failure. Using the ejector levers ensures that the board connector mates with the backplane in one continuous movement.
- Using the handle to insert or remove an interface processor, or failing to push the ejector levers fully against the interface processor, can leave some (not all) of the connector pins mated to the card or interface processor, a state that hangs the system. Using the ejector levers and making sure that they are pushed fully into position ensures that all three layers of pins are mated with (or free from) the backplane.

Use the ejector levers when removing an interface processor to ensure that the backplane connector pins disconnect from the interface processor in the sequence expected by the system. Any interface processor that is only partially connected to the backplane can hang the bus. Steps for correctly performing online insertion and removal are included with the following procedures for installing and removing the GEIP.

**Figure 1** Ejector Levers and Captive Installation Screws on the GEIP—Horizontal Orientation Shown



**Note** The GEIP is oriented horizontally in the Cisco 7010 and Cisco 7505 and vertically in the Cisco 7000, Cisco 7507, Cisco 7513, and Cisco 7576.



## IEEE 802.3z Gigabit Ethernet Overview

This section provides an overview of IEEE 802.3z and Gigabit Ethernet. The term *Ethernet* is commonly used for all local-area networks (LANs) that generally conform to Ethernet specifications, including Gigabit Ethernet under IEEE 802.3z, which is well suited to applications where a local communication medium must carry sporadic, occasionally heavy traffic at high peak data rates.

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**Note** The GEIP does not support half-duplex operation; it supports only full-duplex operation.

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The IEEE 802.3z specification includes the following three physical layer protocols:

- 1000Base-CX—full duplex over copper wire
- 1000Base-SX—full duplex short-wavelength (850-nm) devices over multimode optical fiber
- 1000Base-LX—full duplex long-wavelength (1300-nm) devices over multimode or single-mode optical fiber

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**Note** Cisco Systems offers another version of 1000Base-LX called *Long Haul* (LH), which complies with IEEE 802.3z 1000Base-LX but extends the transmission distance up to 6.21 miles (10 km). The GEIP provides connection options for 1000Base-SX, 1000Base-LX, and Long Haul.

The GEIP does not support the 1000Base-CX physical layer protocol.

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Each physical layer protocol has a name that summarizes its characteristics in the format speed/signaling method/segment length, where speed is the LAN speed in megabits per second (Mbps), signaling method is the signaling method used (either baseband or broadband), and segment length is typically the maximum length between stations in hundreds of meters. For example, 1000Base-SX specifies a 1000-Mbps, baseband LAN, with maximum network segments (operating distances) as defined in Table 1. Table 2 and Table 3 define maximum network segments for 1000Base-LX and Long Haul, respectively.

## GEIP Link Distance Limitations

The GEIP uses two types of optical fiber: single-mode and multimode. Modes can be thought of as bundles of light rays entering the fiber at a particular angle. Single-mode fiber allows only one mode of light to propagate through the fiber, whereas multimode fiber allows multiple modes of light to propagate through the fiber.

Multiple modes of light propagating through the fiber travel different distances depending on the entry angles, which cause them to arrive at the destination at different times (a phenomenon called modal dispersion); therefore, single-mode fiber is capable of higher bandwidth and greater cable run distances than multimode fiber.

According to IEEE 802.3z, power budget is defined as the minimum optical power available to overcome the sum of attenuation plus power penalties of the optical path between the transmitter and receiver calculated as the difference between the transmitter launch power (minimum) and the receiver power (minimum). Further, channel insertion loss is defined as the static loss of a link between a transmitter and a receiver. It includes the loss of the fiber, connectors, and splices, and is used to calculate link distance.

## Installation Prerequisites

Finally, for fiber-optic links, the power penalties of a link are not attributes of link attenuation. Power penalties include modal noise, relative intensity noise (RIN), intersymbol interference (ISI), mode partition noise, extinction ratio, and eye-opening penalties.

The following tables list typical maximum distances for single-mode and multimode transmission with 1000Base-SX (Table 1), 1000Base-LX (Table 2), and LH (Table 3). Table 4 lists optical fiber cable requirements.

**Note** If the distance between two connected stations is greater than the maximum distances listed, significant signal loss can result, making transmission unreliable.

Minimum distance between two connected stations is 6.56 feet (2.0 meters).

A mode conditioning patch cord is needed for 1000Base-LX and LH multimode connections if these connections are greater than 984.25 feet (300 meters). (For information on the mode conditioning patch cord, see the “Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH” section on page 19.)

**Table 1 Worst-Case 1000Base-SX Link Power Budget and Penalties**

Parameter <sup>1</sup>	62.5- $\mu^2$ Multimode		50- $\mu$ Multimode	
Modal bandwidth as measured at 850 nm (minimum, overfilled launch)	160 MHz*km	200 MHz*km	400 MHz*km	500 MHz*km
Link power budget	7.5 dB	7.5 dB	7.5 dB	7.5 dB
Operating distance	721.78 feet (ft.) 220 meters (m)	902.23 ft. 275 m	1,640.42 ft. 500 m	1,804.46 ft. 550 m
Channel insertion loss <sup>3 4</sup>	2.38 dB	2.60 dB	3.37 dB	3.56 dB
Link power penalties <sup>4</sup>	4.27 dB	4.29 dB	4.07 dB	3.57 dB
Unallocated margin in link power budget <sup>4</sup>	0.84 dB	0.60 dB	0.05 dB	0.37 dB

1 Link penalties are used for link budget calculations. They are not requirements and are not meant to be tested.

2  $10^{-6}$  meters (or 1 micrometer) = 1 micron ( $\mu$ ).

3 Operating distances used to calculate the channel insertion loss are the maximum values.

4 A wavelength of 830 nm is used to calculate channel insertion loss, link power penalties, and unallocated margin.

**Table 2 Worst-Case 1000Base-LX Link Power Budget and Penalties**

Parameter <sup>1</sup>	62.5- $\mu^2$ Multimode	50- $\mu$ Multimode		10- $\mu$ Single-Mode
Modal bandwidth as measured at 1300 nm (minimum, overfilled launch)	500 MHz*km	400 MHz*km	500 MHz*km	–
Link power budget	7.5 dB	7.5 dB	7.5 dB	8.0 dB
Operating distance	1,804.46 feet (ft.) 550 meters (m)	1,804.46 ft. 550 m	1,804.46 ft. 550 m	16,404.2 ft. 5000 m
Channel insertion loss <sup>3 4</sup>	2.35 dB	2.35 dB	2.35 dB	4.57 dB
Link power penalties <sup>4</sup>	3.48 dB	5.08 dB	3.96 dB	3.27 dB
Unallocated margin in link power budget <sup>4</sup>	1.67 dB	0.07 dB	1.19 dB	0.16 dB

1 Link penalties are used for link budget calculations. They are not requirements and are not meant to be tested.

2  $10^{-6}$  meters (or 1 micrometer) = 1 micron ( $\mu$ ).

3 Operating distances used to calculate the channel insertion loss are the maximum values.

4 A wavelength of 1270 nm is used to calculate channel insertion loss, link power penalties, and unallocated margin.

**Table 3 Worst-Case Long Haul Link Power Budget and Penalties**

Parameter <sup>1</sup>	10-μ <sup>2</sup> Single-Mode
Link power budget	10.5 dB
Operating distance	32,808.4 feet (ft.) 10,000 meters (m)
Channel insertion loss <sup>3 4</sup>	7.8 dB
Link power penalties <sup>4</sup>	2.5 dB
Unallocated margin in link power budget <sup>4</sup>	0.2 dB

- 1 Link penalties are used for link budget calculations. They are not requirements and are not meant to be tested.
- 2 10<sup>-6</sup> meters (or 1 micrometer) = 1 micron (μ).
- 3 Operating distances used to calculate the channel insertion loss are the maximum values.
- 4 A wavelength of 1280 nm is used to calculate channel insertion loss, link power penalties, and unallocated margin.

**Table 4 Optical Fiber and Cable Characteristics**

Description	62.5-μ <sup>1</sup> Multimode		50-μ Multimode		10-μ Single-Mode
Nominal fiber specification wavelength	850 nm <sup>2</sup>	1300 nm	850 nm	1300 nm	1300 nm
Fiber cable attenuation (maximum)	3.75 dB/km <sup>3</sup>	1.5 dB/km	3.5 dB/km	1.5 dB/km	0.5 dB/km
Modal bandwidth (minimum, overfilled launch)	160 MHz*km	500 MHz*km	400 MHz*km	400 MHz*km	–
	200 MHz*km	500 MHz*km	500 MHz*km	500 MHz*km	–
Zero dispersion wavelength	1320–1365 nm		1295–1320 nm		1300–1324 nm

- 1 10<sup>-6</sup> meters (or 1 micrometer) = 1 micron (μ)
- 2 nm = nanometers
- 3 dB/km = decibels per kilometer

**Table 5 Minimum and Maximum Transmit and Receive Power by Transmission and Optical Fiber Types**

Transmission Type Optical Fiber Type	Wavelength	Transmit Power Minimum/Maximum	Receive Power Minimum/Maximum
1000Base-SX			
50-μ <sup>1</sup> multimode	770–860 nm <sup>2</sup>	–9.5 dBm / –4 dBm <sup>3</sup>	–17 dBm / 0 dBm
62.5-μ multimode	770–860 nm	–9.5 dBm / –4 dBm	–17 dBm / 0 dBm
1000Base-LX			
50-μ multimode	1270–1355 nm	–11.5 dBm / –3 dBm	–19 dBm / –3 dBm
62.5-μ multimode	1270–1355 nm	–11.5 dBm / –3 dBm	–19 dBm / –3 dBm
10-μ single-mode	1270–1355 nm	–11 dBm / –3 dBm	–19 dBm / –3 dBm
Long Haul			
10-μ single-mode	1280–1350 nm	–9.5 dBm / –3 dBm	–20 dBm / –3 dBm

- 1 10<sup>-6</sup> meters (or 1 micrometer) = 1 micron (μ).
- 2 nm = nanometers
- 3 dBm = decibels per milliwatt

## Evaluating the Power Budget

To design an efficient optical data link, you should evaluate the power budget. Proper operation of an optical data link depends on modulated light reaching the receiver with enough power to be correctly demodulated. Data link efficiency is effected by the losses introduced by splices and connectors.

The maximum operating distance listed in Tables 1, 2, and 3 is an estimate and is based on the following assumptions:

- Total loss from connectors and splices on multimode optical fiber is 1.5 dB
- Total loss from connectors and splices on single-mode optical fiber is 2.0 dB

Therefore, for a real network, you could adjust the operating distance as follows:

- If the total loss from connectors and splices is larger than indicated in these assumptions, then you could use shorter optical fiber cable (as with the single-mode power margin example that follows).
- If the total loss from connectors and splices is smaller than that indicated in these assumptions, then you could use longer optical fiber cable.

You should note that exceeding the maximum operating distance is only feasible with single-mode optical fiber, *not* with multimode optical fiber because the penalty of the differential mode delay (DMD) of a laser source over multimode fiber. We strongly recommend that you follow operating distance guidelines.

### Multimode Power Margin Example with Sufficient Power for Transmission

Power margin (PM) is defined as channel insertion loss or cable loss (connector loss + splice loss). The result should be greater than or equal to 0 and is expressed in decibels (dB).

The following is an example of a power margin (PM) calculation for a 1000Base-SX GEIP over multimode optical fiber, and based on the following variables:

- Type of multimode: 62.5  $\mu\text{m}$
- Modal bandwidth (BW) of multimode: 200 MHz\*km
- Link length of 250 meters, with a loss of 3.75 dB per km (see Table 4)
- 2 connectors, each with a loss of 0.5 dB
- 1 splice, each with a loss of 0.5 dB

Estimate the multimode power margin as follows:

From Table 1, the channel insertion loss is 2.60 dB, so

$$\text{PM} = 2.60 \text{ dB} - 250 \text{ m} (3.75 \text{ dB/km}) - 2 (0.5 \text{ dB}) - 1 (0.5 \text{ dB})$$

$$\text{PM} = 2.60 \text{ dB} - 0.94 \text{ dB} - 1 \text{ dB} - 0.5 \text{ dB}$$

$$\text{PM} = 0.16 \text{ dB}$$

The positive value 0.16 dB indicates that this link has sufficient power for transmission.

### Single-Mode Power Margin Example with Sufficient Power for Transmission

The following example of PM for a Long-Haul GEIP over a single-mode optical fiber is based on two buildings, 5 kilometers apart (with a loss of 0.5 dB/km; see Table 4), connected through a patch panel in an intervening building with a total of 10 connectors (each with a loss of 0.5 dB).

Estimate the single-mode power margin as follows:

From Table 3, the channel insertion loss is 7.8 dB, so

$$PM = 7.8 \text{ dB} - 5 \text{ km} (0.5 \text{ dB/km}) - 10 (0.5 \text{ dB})$$

$$PM = 7.8 \text{ dB} - 2.5 \text{ dB} - 5 \text{ dB}$$

$$PM = 0.3 \text{ dB}$$

The positive value of 0.3 dB indicates that this link has sufficient power for transmission.

### Using Statistics to Estimate the Power Budget

Statistical models more accurately determine the power budget than the worst-case method.

Determining the link loss with statistical methods requires accurate knowledge of variations in the data link components. Statistical power budget analysis is beyond the scope of this publication. For further information, refer to ITU-T standards and your equipment specifications.

### Additional Power Budget and Attenuation References

The following publications contain information on determining attenuation and power budget:

- T1E1.2/92-020R2 ANSI, the Draft American National Standard for Telecommunications entitled *Broadband ISDN Customer Installation Interfaces: Physical Layer Specification*.
- *Power Budget Analysis*, AT&T Technical Note, TN89-004LWP, May 1989

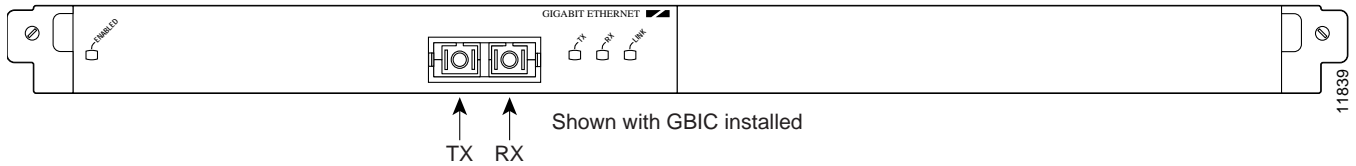
## Product Description

This section provides information about the GEIP and includes the following sections:

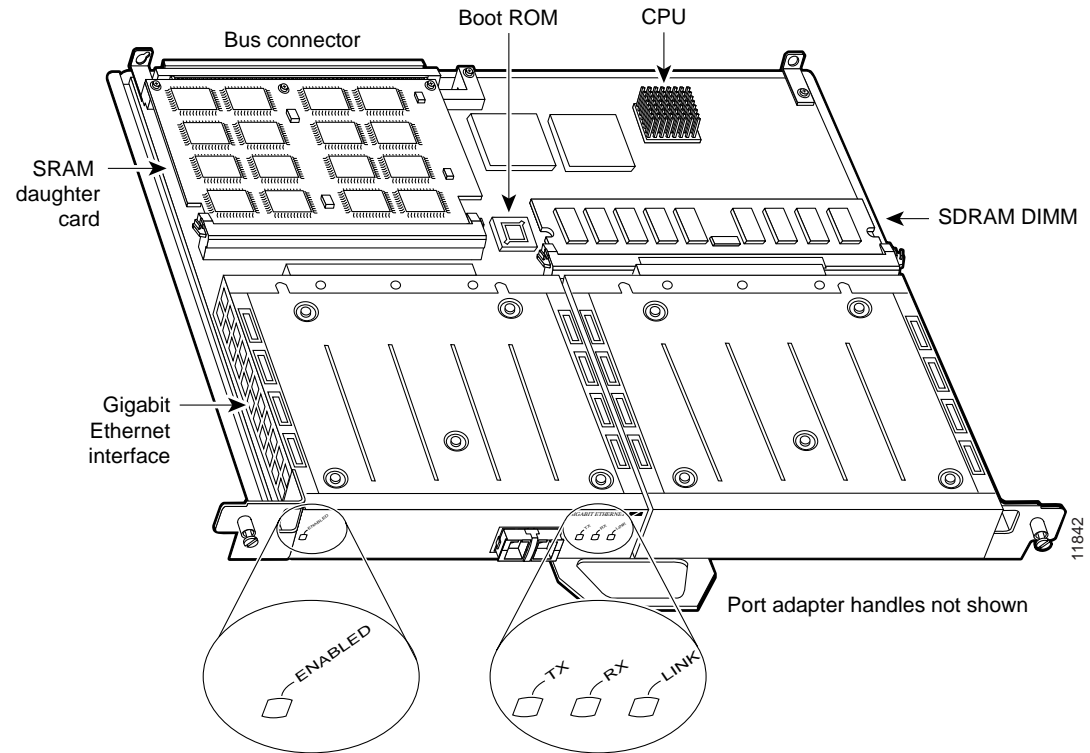
- GEIP LEDs, page 16
- Gigabit Interface Converter, page 17
- Optical Fiber Cables, page 18
- Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH, page 19
- Agency Approvals, page 20

The GEIP (see Figure 2 and Figure 3) is a single-port, fixed-configuration interface processor that, when combined with the appropriate optical fiber cable, provides one 1000-Mbps, IEEE 802.3z-compliant Gigabit Ethernet (GE) interface. The GE interface on a GEIP operates in full-duplex mode at 1000 Mbps in each direction—transmit (TX) and receive (RX).

**Figure 2 Gigabit Ethernet Interface Processor (GEIP)—Front-Panel View, Horizontal Orientation Shown**



**Figure 3 GEIP—Horizontal Orientation Shown**



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**Note** The GEIP is a fixed-configuration assembly; therefore, individual GE interfaces are not available as spare parts, do not have handles, and are not field-replaceable or removable. The entire GEIP assembly must be treated as a field-replaceable unit (FRU).

---

The GEIP supports the following features:

- Applicable IEEE 802.3z standards; full-duplex operation only
- IEEE 802.3x flow control
- Layer 3 distributed services, including Router Switch Processor (RSP) packet forwarding, distributed optimum switching, fast switching, distributed flow switching, and distributed committed access rate (DCAR)
- IEEE 802.1Q frames (in tagged or untagged modes)

---

**Note** IEEE 802.1Q frames are available *only* with Cisco IOS Release 12.0(3)T or a later release of 12.0 T.

---

- Maximum transmission unit (MTU) of 4,476 bytes
- Ethernet Inter-Switch Link (ISL) encapsulation
- Gigabit EtherChannel feature for fault tolerance and load sharing
- Online insertion and removal of the GEIP and the Gigabit interface converter (GBIC)
- Support for 1000Base-SX (short wavelength—850 nanometers [nm]), 1000Base-LX (long wavelength—1300 nm), and Long-Haul (long wavelength—1300 nm) operation by way of Gigabit Interface Converters (GBICs). (For specific GBIC requirements, see the “Gigabit Interface Converter” section on page 17.)

The synchronous dynamic random access memory (SDRAM) configurations for the GEIP are 32 to 128 megabytes (MB), and the static random access memory (SRAM) configurations for the GEIP are 4 to 8 MB. You can install a GEIP in any available interface processor slots in a Cisco 7000 series or Cisco 7500 series router. (For additional hardware requirements associated with Cisco 7000 series routers, see the “Software and Hardware Requirements” section on page 3.)

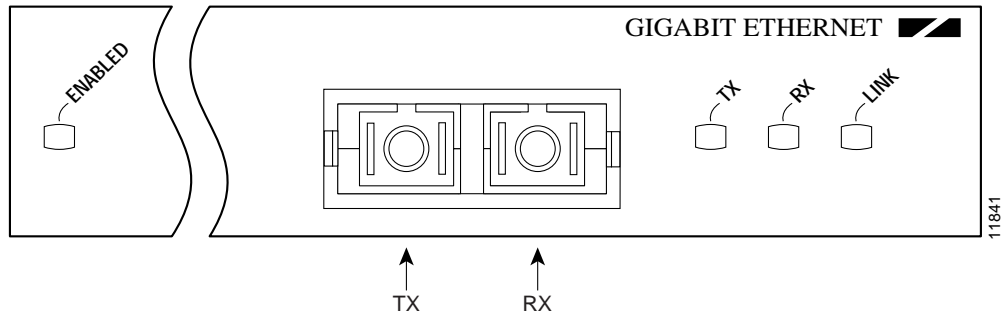


**Caution** To prevent system problems, we recommend that you not attempt to replace or remove a GE interface, or otherwise attempt to disassemble a GEIP. The entire GEIP assembly must be treated as a field-replaceable unit (FRU).

## GEIP LEDs

The GE interface contains the enabled LED and a bank of three status LEDs for the GE interface and the GEIP LEDs. After system initialization, the enabled LED goes on to indicate that the GEIP has been enabled for operation. (The LEDs are shown in Figure 4.)

**Figure 4 LEDs on a GE Interface—Partial Faceplate View**



The following conditions must be met before the enabled LED goes on:

- The GEIP is correctly connected and receiving power.
- The system bus recognizes the GEIP.
- The GEIP contains a valid microcode version that has been downloaded successfully.

If any of these conditions is not met, or if the initialization fails for other reasons, the enabled LED does not go on.

Following are the three status LEDs and an explanation of what each indicates:

LED <sup>1</sup>	Color	Indications
Transmit (TX)	Green	Flickers on as data is transmitted.
Receive (RX)	Green	Flickers on as data is received.
LINK	Green	On when the interface is receiving a carrier signal from the network.

<sup>1</sup> If no cable is connected to the GBIC, or a GBIC is not installed, the TX, RX, and LINK LEDs blink on and off in sequence.



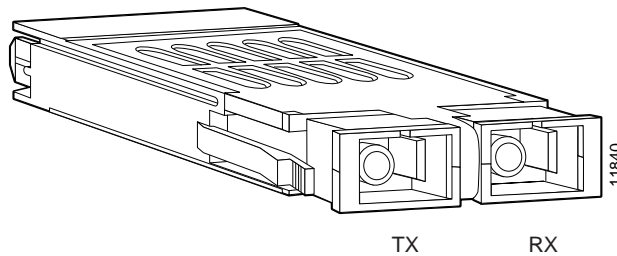
## Gigabit Interface Converter

This section provides information about the Gigabit Ethernet Converter (GBIC) (see Figure 5), which is installed between your GEIP and your 1000Base-X-based network.



**Caution** To prevent system problems, do not use GBICs from third-party vendors. Use only the GBIC that shipped with your GEIP.

**Figure 5** Gigabit Interface Converter (GBIC)



The 1000Base-SX (GBIC-SX), 1000Base-LX (GBIC-LX), and Long-Haul (GBIC-LH) GBICs have one optical interface in the form of an SC-type duplex receptacle, which supports IEEE 802.3z interfaces compliant with the 1000Base-X standard. (See Figure 5.)

---

**Note** The GEIP ships with a GBIC installed.

---

Depending on the GBIC you plan to use, it contains either a Class-1 laser of 850 nm for 1000Base-SX (short-wavelength) applications, a Class-1 laser of 1300 nm for 1000Base-LX (long-wavelength) applications, or a Class-1 laser of 1300 nm for Long-Haul (long-wavelength) applications.



**Warning** Because invisible laser radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to laser radiation and do not stare into open apertures.



**Warning** Class 1 laser product.

## Optical Fiber Cables

This section provides information about the optical fiber cables you should use with the GEIP.

Figure 6 and Figure 7 show the simplex and duplex SC-type connectors on your multimode or single-mode optical fiber cables. For simplex connections, one cable is required for transmit (TX) and a second cable is required for receive (RX). For duplex connections, one duplex connection is required for TX and RX. You can use either simplex or duplex connections for the GEIP. (Optical fiber cables are commercially available; they are not available from Cisco Systems.)



**Warning** Because invisible laser radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to laser radiation and do not stare into open apertures.

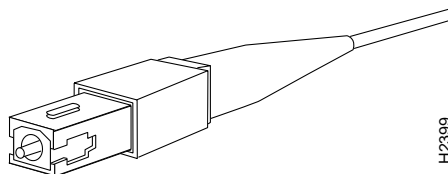


**Warning** Class 1 laser product.

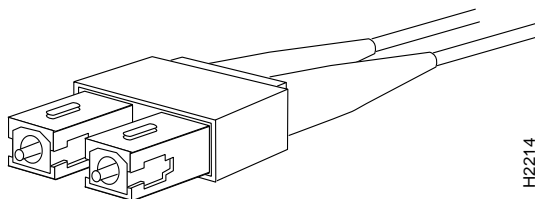
The optical fiber cables you can use with the GBIC on a GEIP are as follows:

- 1000Base-SX—50/125- $\mu$  or 62.5/125- $\mu$  multimode optical fiber
- 1000Base-LX—9/125- $\mu$  or 10/125- $\mu$  single-mode optical fiber, or 50/125- $\mu$  or 62.5/125- $\mu$  multimode optical fiber where transmission distances are less than 984.25 feet (300 meters)
- Long Haul—9/125- $\mu$  or 10/125- $\mu$  single-mode optical fiber or 50/125- $\mu$  or 62.5/125- $\mu$  multimode optical fiber where transmission distances are greater than 984.25 feet (300 meters)

**Figure 6** Simplex SC-Type Connector



**Figure 7** Duplex SC-Type Connector



## Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH

The GBIC-LX option for the GEIP has a 1300-nm (long-wavelength) Class 1 laser as a light source and provides a connection to 50/125- $\mu$  or 62.5- $\mu$  multimode optical fiber.

The GBIC-LH option for the GEIP has a 1300-nm (long-wavelength) Class 1 laser as a light source and provides a connection to 50/125- $\mu$  or 62.5- $\mu$  multimode optical fiber.

When an unconditioned laser source designed for operation on single-mode optical fiber is directly coupled to a multimode optical fiber cable, an effect known as differential mode delay (DMD) might result in a degradation of the modal bandwidth of the optical fiber cable.

This degradation results in a decrease in the link span (the distance between a transmitter and a receiver) that can be supported reliably. The effect of DMD can be overcome by conditioning the launch characteristics of a laser source. A practical means of performing this conditioning is to use a device called a *mode conditioning patch cord*.

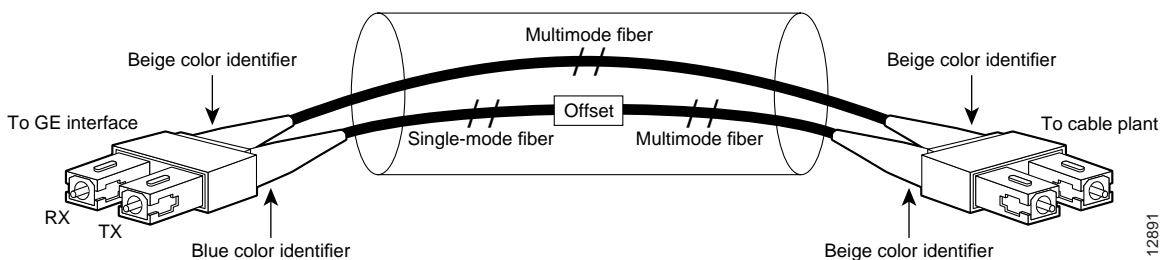
A mode conditioning patch cord is an optical fiber cable assembly that consists of a pair of optical fibers terminated with connector hardware. Figure 8 shows a diagram of the mode conditioning patch cord assembly. Specifically, the mode conditioning patch cord is composed of a single-mode optical fiber permanently coupled off center to a graded-index multimode optical fiber. (See *Offset* in Figure 8.)

---

**Note** The mode conditioning patch cord is not required with 1000Base-SX multimode connections or 1000Base-LX single-mode or Long-Haul single-mode connections.

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**Figure 8** Mode Conditioning Patch Cord Assembly



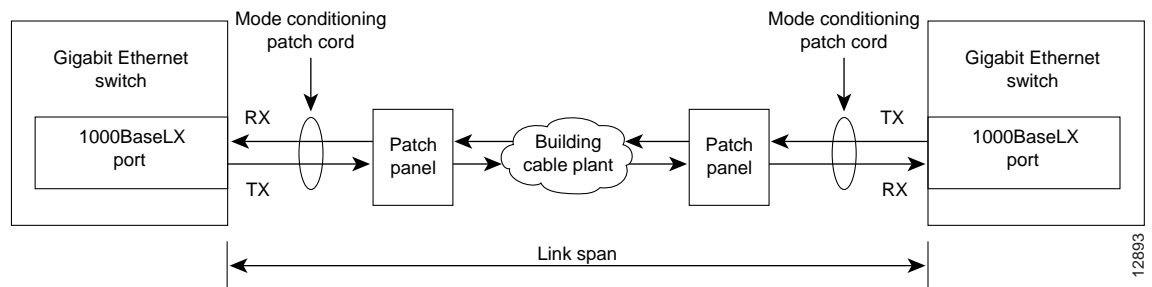
The mode conditioning patch cord assembly is composed of duplex optical fibers, including a single-mode-to-multimode offset launch fiber connected to the transmitter, and a second conventional graded-index multimode optical fiber connected to the receiver. The use of a plug-to-plug patch cord maximizes the power budget of multimode 1000Base-LX and LH links.



**Caution** To prevent data transmission problems, you *must* use a mode conditioning patch cord whenever you connect 1000Base-LX (1300-nm) or Long-Haul GE interfaces through 50/125- $\mu$  or 62.5/125- $\mu$  multimode optical fiber at distances greater than 984.25 feet (300 meters).

A typical application of a mode conditioning patch cord is shown in Figure 9.

**Figure 9 Typical Application of the Mode Conditioning Patch Cord**



## Agency Approvals

The GEIP is designed to comply with and meet the following agency approvals:

Approvals	Agencies
Safety	CSA-C22.2 No. 950 (Canada) EN60950 (Germany) IEC 950 (International) TS001, AS/NZS 3269 (Australia) UL 1950 (United States)
Emissions	CE mark (Europe) CISPR 22 Class B (International) FCC Part 15 Class A (United States) EN55022 Class B (Europe) ICES-003 Class A (Canada) VCCI Class 2 (Japan)

## GEIP Installation

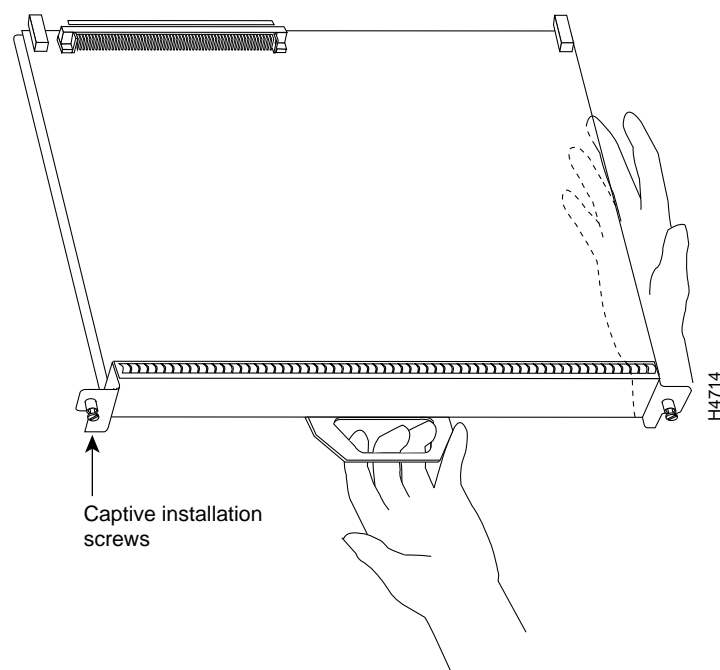
The following sections describe the procedures for removing or installing a GEIP in the Cisco 7000 series or Cisco 7500 series routers:

- Removing a GEIP, page 22
- Installing a GEIP, page 23
- Attaching Cables to the GEIP, page 24
- Using LEDs to Check GEIP Status, page 27

GEIP installation functionality is the same for each router model; therefore, the term *the router* is used except where specific model issues arise. The online insertion and removal function allows you to install and remove a GEIP without first shutting down the system; however, you must follow the instructions carefully. Failure to insert the GEIP properly can cause system error messages indicating a board failure.

For a complete description of recommended guidelines for interface processor installation and removal, see the “Guidelines for Interface Processor Installation and Removal” section on page 7. Handle interface processors as shown in Figure 10.

**Figure 10 Handling Interface Processors—Horizontal Orientation Shown**



Each unused interface processor slot must contain an interface processor filler (which is an interface processor carrier without a printed circuit board) to keep dust out of the router and to maintain proper airflow through the interface processor compartment. If you plan to replace a GEIP or if you plan to install a new GEIP that is not a replacement—and you must first remove the interface processor filler from an unused slot—proceed to the next section, “Removing a GEIP.”

---

**Note** To ensure compliance with EMI approvals by providing a tight EMI-preventive seal for the Cisco 7507, Cisco 7513, and Cisco 7576 routers, we recommend that you first install interface processors in the interface processor slots closest to the RSP slots, and then work out to the interface processor slots furthest from the RSP slots.

---

## Removing a GEIP

This section describes the procedure for removing a GEIP, an interface processor, or an interface processor filler, and replacing them with a new GEIP.

You do not need to shut down the interface or the system power when removing a GEIP or other interface processor. To help prevent dust and contaminants from entering the router and to prevent electromagnetic interference (EMI), do not leave the interface processor slot open. To prevent ESD damage, use an ESD-preventive wrist strap.

---

**Note** In Cisco 7507 or Cisco 7513 systems with the high system availability (HSA) feature active, online insertion and removal of any interface processor in either CyBus might cause the slave RSP2 to reboot with a bus error or a processor memory parity error. The master RSP recovers from this event and issues a “cBus Complex Restart” message. Cisco 7507 and Cisco 7513 systems that are configured with an RSP4 as the system slave are not affected and do not experience this problem.

---

If you do *not* have a Cisco 7507 or Cisco 7513 with the HSA feature active and an RSP2 configured as the system slave, perform *only* Step 3 in the following procedure.

If you have a Cisco 7507 or a Cisco 7513 with the HSA feature active and an RSP2 configured as the system slave, we strongly recommend that you perform *all* the steps in the following procedure:

- Step 1** Remove the slave RSP2.
- Step 2** Wait 20 to 30 seconds.
- Step 3** Remove the appropriate GEIP or interface processor and then replace it with your new GEIP.
  - (a) If you plan to replace a failed GEIP, disconnect all cables from the GEIP ports.
  - (b) Use a screwdriver to loosen the captive installation screws at both ends of the board. (See Figure 1.)



**Caution** Always use the ejector levers to remove a GEIP or interface processor. Failure to do so can cause erroneous system error messages indicating a board failure.

- (c) Place your thumbs on the ejector levers and simultaneously pull both of the ejector levers outward (in the opposite direction from that shown in Figure 1c) to release the GEIP from the backplane connector.
- (d) Use the board’s handle to carefully pull it straight out of the slot, keeping your other hand under the carrier to guide it. (See Figure 10.) Keep the board parallel to the backplane.

If you removed a GEIP or interface processor and the interface processor slot is to remain empty, install an interface processor filler (Product Number MAS7K-BLANK) to keep dust out of the router and to maintain proper air flow inside the router. *Do not* leave the interface processor slot open.

- (e) Place the removed board on an antistatic mat or foam pad, or place it in an antistatic container if you plan to return it to the factory.

---

**Note** If you do *not* have a Cisco 7507 or Cisco 7513 with the HSA feature active and an RSP2 configured as the system slave, immediately proceed to the section “Installing a GEIP”; otherwise, proceed to step 4.

---

**Step 4** Wait 20 to 30 seconds.

**Step 5** Reinsert the slave RSP2.

This completes the procedure for removing a GEIP or interface processor from your Cisco 7000 series or Cisco 7500 series router. Proceed to the section “Installing a GEIP.”

## Installing a GEIP

This section describes the procedure for installing a GEIP. The GEIP slides into an open interface processor slot and connects directly to the backplane. The interface processors are keyed to guide pins on the backplane, so the GEIP can be installed only in an interface processor slot.

---

**Note** To ensure compliance with EMI approvals by providing a tight EMI seal for the Cisco 7507, Cisco 7513, and Cisco 7576 routers, we recommend that you first install interface processors in the interface processor slots closest to the RSP slots, and then work out to the interface processor slots furthest from the RSP slots.

---

Figure 1 shows the functional details of inserting an interface processor and using the ejector levers. Figure 10 shows proper handling of an interface processor during installation.



**Caution** Remove or insert only one interface processor at a time. Allow at least 20 to 30 seconds for the system to complete its discovery and initialization before removing or inserting another interface processor. Disrupting the sequence before the system has completed verification can cause the system to interpret hardware failures.

Use the following procedure to install a new GEIP:

**Step 1** Ensure that a console terminal is connected to the console port (on the RSP or RSP7000) and that your console is turned on, or that you have a reliable Telnet connection to the system.

**Step 2** Hold the GEIP handle with one hand and place your other hand under the carrier to support the GEIP and guide it into the slot. (See Figure 10.) Avoid touching the card or any connector pins.



**Caution** To prevent ESD damage, handle interface processors by the handles and carrier edges only.

**Step 3** Place the back of the GEIP in the slot and align the notch on the carrier with the groove in the slot. (See Figure 1 on page 8.)

**Step 4** While keeping the GEIP parallel to the backplane, carefully slide it into the slot until the back of the faceplate makes contact with the ejector levers, and then *stop*. (See Figure 1b on page 8.)



**Caution** Always use the ejector levers when installing or removing interface processors. An interface processor that is partially seated in the backplane might cause the system to hang and subsequently crash, and shoving or slamming the interface processor into the slot can damage the backplane pins and board.

**Step 5** Using your thumbs, simultaneously push both ejector levers inward until the GEIP is pushed entirely into its slot. (See Figure 1c on page 8.)

**Step 6** Tighten both of the captive installation screws.



**Caution** To ensure proper electromagnetic interference (EMI) isolation for the router, make certain to tighten the captive installation screws on each GEIP immediately after you install it and *before* proceeding with the installation of each remaining GEIP or other interface processor.

This completes the procedure for installing a GEIP in a Cisco 7000 series or Cisco 7500 series router.

## Attaching Cables to the GEIP

The two cabling options for the GEIP are discussed in the following sections:

- Attaching Multimode and Single-Mode Optical Fiber Cables to a GBIC, page 25

This cabling option is for the following connections:

- GEIP with a GBIC-SX
- GEIP with a GBIC-LX or a GBIC-LH, where you expect transmission distances to be less than 984.25 feet (300 meters) over 50/125- $\mu$  or 62./125- $\mu$  multimode fiber

(For specific information about multimode and single-mode optical fiber cables, refer Table 4 and the “Optical Fiber Cables” section on page 18.)

- Attaching a Mode Conditioning Patch Cord to a GBIC-LX, page 26

This cabling option is for a GEIP with a GBIC-LX or a GBIC-LH, where you expect transmission distances to be greater than 984.25 feet (300 meters) over 50/125- $\mu$  or 62./125- $\mu$  multimode fiber. (For specific information about the mode conditioning patch cord, see the “Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH” section on page 19.)



**Caution** To prevent transmission problems, do not use the mode conditioning patch cord with 9/125- or 10/125- $\mu$  single-mode optical fiber under any circumstances.



### Attaching Multimode and Single-Mode Optical Fiber Cables to a GBIC

This section provides the cable-attachment procedure for the following connections:

- GBIC-SX with 50/125- $\mu$  or 62.5/125- $\mu$  multimode optical fiber cables
- GBIC-LX or GBIC-LH with 50/125- $\mu$  or 62.5/125- $\mu$  multimode optical fiber cables, where you expect maximum transmission distances to be less than 984.25 feet (300 meters)
- GBIC-LX with 10/125- $\mu$  single-mode optical fiber cables
- GBIC-LH with 10/125- $\mu$  single-mode optical fiber cables



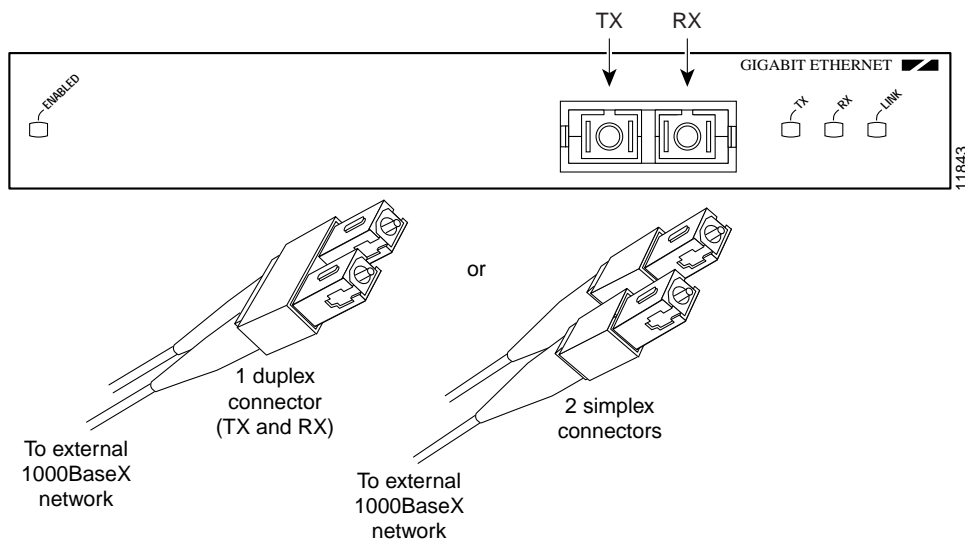
**Caution** If you plan to use a GBIC-LX or a GBIC-LH in your GEIP at distances greater than 984.25 feet (300 meters) over 50/125- $\mu$  or 62.5/125- $\mu$  multimode fiber, to prevent data transmission problems you *must* use the mode conditioning patch cord. Do *not* use the procedure in this section. Instead, proceed to the “Attaching a Mode Conditioning Patch Cord to a GBIC-LX” section on page 26.

**Note** Optical fiber cables are not available from Cisco Systems; they are available from outside commercial cable vendors. (For information on the proper cables to use, see Table 4 and the “Optical Fiber Cables” section on page 18.)

Use the following procedure to attach multimode or single-mode optical fiber cables to your GBIC:

**Step 1** Attach the appropriate optical fiber cable directly to the SC-type receptacle on the GBIC. (See Figure 11.) Use a cable with either one duplex SC-type connector, or two simplex SC-type connectors.

**Figure 11 Attaching Multimode or Single-Mode Optical Fiber Cables to a GBIC—Horizontal Orientation Shown**



**Caution** To prevent transmission problems, ensure that you connect the TX and RX ports on one end of the optical fiber cable to the RX and TX ports (respectively) on the other end. In other words, connect TX to RX and RX to TX.



**Warning** Because invisible laser radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to laser radiation and do not stare into open apertures.



**Warning** Class 1 laser product.

**Step 2** Attach the network ends of your optical fiber cables to the 1000Base-X equipment in your cable plant.

This completes the procedure for attaching optical fiber cable to your GBIC.

### Attaching a Mode Conditioning Patch Cord to a GBIC-LX

This section describes the procedure for attaching a mode conditioning patch cord to your GBIC-LX or GBIC-LH, where you expect transmission distances to be greater than 984.25 feet (300 meters) over 50/125- $\mu$  or 62./125- $\mu$  multimode fiber. (For specific information about the mode conditioning patch cord, see the “Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH” section on page 19.)

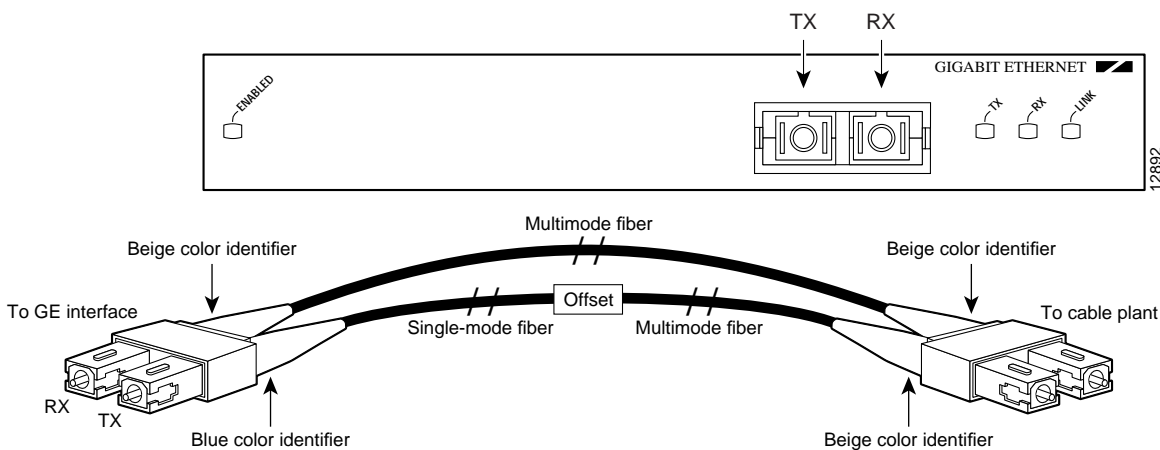
**Note** If you use a GBIC-LX or GBIC-LH with single-mode optical fiber connections, you do not need to use the mode conditioning patch cord; therefore, proceed to the “Attaching Multimode and Single-Mode Optical Fiber Cables to a GBIC” section on page 25. The mode conditioning patch cord is available from Cisco Systems as Product Number CAB-GELX-625=.

The network end of the GBIC has a duplex SC-type receptacle. You must attach the mode conditioning patch cord to the SC-type receptacle on your GBIC.

Use the following procedure to attach the mode conditioning patch cord to your GBIC:

**Step 1** Attach the mode conditioning patch cord to the SC-type receptacle on the GBIC. (See Figure 12.)

**Figure 12 Attaching a Mode Conditioning Patch Cord to a GBIC—Horizontal Orientation Shown**





**Caution** To prevent transmission problems, ensure that you connect the TX and RX ports on one end of the patch cord to the RX and TX ports (respectively) on the other end. In other words, connect TX to RX and RX to TX.



**Warning** Because invisible laser radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to laser radiation and do not stare into open apertures.



**Warning** Class 1 laser product.

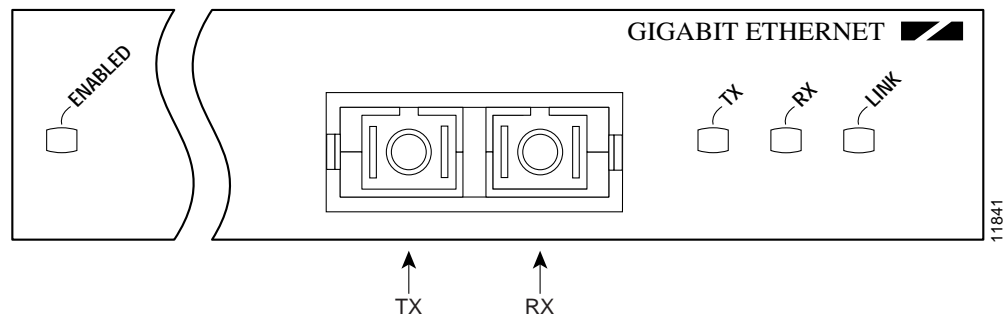
**Step 2** Attach the network ends of your mode conditioning patch cord to the appropriate 1000Base-X equipment in your building cable plant. (See Figure 12.)

This completes the procedure for attaching a mode conditioning patch cord to your GBIC.

## Using LEDs to Check GEIP Status

The GEIP has four status LEDs on its faceplate that indicate status on the GEIP and its GE interface. (See Figure 13.)

**Figure 13** LEDs—Partial Faceplate View of GEIP



Observe the LED states and the console display as the router initializes. When the system has reinitialized all interfaces, the enabled LED on the GEIP should go on. (For complete descriptions of the GEIP LEDs, see the “GEIP LEDs” section on page 16.)

The console screen also displays a message as the system discovers each interface during its reinitialization. After system initialization, the enabled LED goes on to indicate that the GEIP is enabled for operation.

Use the following procedure to verify that the GEIP is connected correctly:

**Step 1** While the system reinitializes each interface, observe the console display messages and verify that the system discovers the GEIP. The system should recognize the GEIP interface but leave it configured as *down*.

**Step 2** When the reinitialization is complete, verify that the enabled LED on the GEIP is on and remains on. If the LED does stay on, proceed to Step 5. If the enabled LED does not stay on, proceed to the next step.

**Step 3** If an enabled LED fails to go on, suspect that the GEIP board connector is not fully seated in the backplane. Loosen the captive installation screws and then firmly push the top (or left) ejector lever down while pushing the bottom (or right) ejector lever up until both are parallel to the GEIP faceplate. Tighten the captive installation screws. After the system reinitializes the interfaces, the enabled LED on the GEIP should go on.

If the enabled LED goes on, proceed to Step 5.

If the enabled LED does not go on, proceed to the next step.

**Step 4** If an enabled LED still fails to go on, remove the GEIP and try installing it in another available interface processor slot.

If the enabled LED goes on when the GEIP is installed in the new slot, suspect a failed backplane port in the original interface processor slot.

If the enabled LED still fails to go on, but other LEDs on the GEIP go on to indicate activity, proceed to Step 5 to resume the installation checkout and suspect that the enabled LED on the GEIP has failed.

If no LEDs on the GEIP go on, suspect that the GEIP is faulty. Do not proceed with the installation. Contact a service representative to report the faulty equipment and obtain further instructions.

**Step 5** Use the **show interfaces** command to verify the status of the GEIP interface. (If the interface is not configured, you must configure it using the procedure in the section “Configuring the GEIP.”)

If an error message appears on the console terminal, refer to the appropriate reference publication for error message definitions. If you experience other problems that you are unable to solve, contact a service representative for assistance.

## Configuring the GEIP

If you installed a new GEIP or if you want to change the configuration of an existing GE interface, you must enter configuration mode using the **configuration** command. If you replaced an interface that was previously configured, the system recognizes the new interface and brings it up in its existing configuration.

After you verify that the new GEIP is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interfaces. Be prepared with the information you need, such as the following:

- Protocols you plan to route on each new interface
- Internet protocol (IP) addresses if you plan to configure the interfaces for IP routing
- Bridging protocols you plan to use

For a summary of the configuration options available and instructions for configuring the GE interface on the GEIP, refer to the appropriate configuration publications listed in the “Related Documentation” section on page 2.

The **configure** command requires privileged-level access to the EXEC command interpreter, which usually requires a password. Contact your system administrator if necessary to obtain EXEC-level access.

## Identifying Interface Addresses

This section describes how to identify GE interface addresses.

---

**Note** Although the interface processor slots in the Cisco 7000, Cisco 7507, Cisco 7513, and Cisco 7576 are vertically oriented and those in the Cisco 7010 and Cisco 7505 are horizontally oriented, all models use the same method for interface processor slot and interface port numbering.

---

In the router, interface addresses specify the actual physical location of each interface port on the router interface processor end. This address is composed of a three-part number in the format *interface-processor-slot-number/port-adapter-slot-number/interface-port-number*.

- The first number identifies the interface processor slot in which the GEIP is installed.
- The second number identifies the port adapter slot in which the GE interface is installed, which is always port adapter slot 0.
- The third number identifies the GE interface port, which is always interface port 0.

The interface on the GEIP maintains the same address regardless of whether other interface processors are installed or removed. However, when you move a GEIP to a different interface processor slot, the first number in the address changes to reflect the new interface processor slot number.

For example, on the GEIP in interface processor slot 3, the address of the GE interface is 3/0/0. If you remove the GEIP from slot 3 and install it in interface processor slot 2, the address of the GE interface becomes 2/0/0.

You can also identify interface ports by physically checking the interface processor slot number and interface port location on the back of the router or by using software commands to display information about a specific interface or all interfaces in the router.

## Configuring the GE Interface

This section describes a basic configuration. Press **Return** after each step unless otherwise noted. At any time you can exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable

Router>
```

Use the following procedure to perform a basic configuration:

- Step 1** At the privileged-level prompt, enter configuration mode and specify that the console terminal is the source of the configuration subcommands as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

- Step 2** At the prompt, specify the first interface to configure by entering the subcommand **interface**, followed by the *type* (**gigabitethernet**) and *interface-processor-slot-number/port-adapter-slot-number/interface-port-number*. The example that follows is for the GE interface port on a GEIP in interface processor slot 1:

```
Router(config)# interface gigabitethernet 1/0/0  
Router(config-if)
```

- Step 3** If IP routing is enabled on the system, you can assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand, as in the following example:

```
Router(config-if)# ip address 10.1.1.10 255.255.255.252
```

- Step 4** Add any additional configuration subcommands required to enable routing protocols and set the interface characteristics for your configuration requirements.

---

**Note** Full-duplex operation is the default for the GEIP. Half-duplex operation is not supported.

---

- Step 5** Change the shutdown state to up and enable the interface as follows:

```
Router(config-if)# no shutdown
```

- Step 6** When you have included all the configuration subcommands to complete the configuration, press **Ctrl-Z** to exit configuration mode.

- Step 7** Write the new configuration to nonvolatile memory as follows:

```
Router# copy running-config startup-config  
[OK]  
Router#
```

After configuring the new GE interface, use **show** commands to display the status of the new interface or all interfaces, or to verify changes you have made. (For descriptions of **show** commands, see the “Checking the Configuration” section on page 31.)

---

**Note** More complex configuration options are beyond the scope of this publication.

Depending on the requirements for your system configuration and the protocols you plan to route on the interface, you might also need to enter other configuration subcommands. For complete descriptions of configuration subcommands and the configuration options available for GE interfaces, refer to the Cisco IOS software publication, feature module, or release note appropriate to the Cisco IOS software release running on your router.

For information on obtaining additional documentation, see the “Related Documentation” section on page 2.

---

## Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces and the **ping** command to check connectivity.

### Using show Commands to Verify the GEIP Status

The following steps use **show** commands to verify that the new interfaces are configured and operating correctly.

- Step 1** Use the **show version** command to display the system hardware configuration. Ensure that the list includes the new interfaces.
- Step 2** Display all the current interface processors and their interfaces with the **show controllers** command. Verify that the new GEIP appears in the correct interface processor slot.
- Step 3** Specify one of the new interfaces with the **show interfaces type interface-processor-slot-number/port-adapter-slot-number/interface-port-number** command and verify that the first line of the display specifies the interface with the correct slot number. Also verify that the interface and line protocol are in the correct state: up or down.
- Step 4** Display the protocols configured for the entire system and specific interfaces with the **show protocols** command. If necessary, return to configuration mode to add or remove protocol routing on the system or specific interfaces.
- Step 5** Display the running configuration file with the **show running-config** command. Display the configuration stored in NVRAM using the **show startup-config** command. Verify that the configuration is accurate for the system and each interface.

If the interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network interface is properly connected and terminated. If you still have problems bringing the interface up, contact a service representative for assistance.

### Using show Commands to Display Interface Information

To display information about a specific interface, use the **show interfaces** command with the interface type and interface address in the format **show interfaces type [interface-processor-slot-number/port-adapter-slot-number/interface-port-number]**.

With the **show interfaces** command, use arguments such as the interface type and the interface address to display information about a specific interface only. The following example of the **show interfaces gigabitethernet** command shows information specific to the GEIP that is installed in interface processor slot 3:

```
Router# show interfaces gigabitethernet 3/0/0
GigabitEthernet3/0/0 is up, line protocol is up
  Hardware is cyBus GigabitEthernet, address is 0000.0ca4.db61 (bia
0000.0ca4.db61)
  Internet address is 10.0.0.2/8
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  Full-duplex mode, link type is autonegotiation, media type is SX
  output flow-control is on, input flow-control is on
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:44, output 00:00:05, output hang never
  Last clearing of "show interface" counters 2d16h
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 0 bits/sec, 0 packets/sec
    3767 packets input, 1457624 bytes, 0 no buffer
    Received 3743 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 4114 multicast, 0 pause input
    26592 packets output, 2897788 bytes, 0 underruns
    0 output errors, 0 collisions, 1 interface resets
    0 babbles, 0 late collision, 2 deferred
    0 lost carrier, 0 no carrier, 0 pause output
    0 output buffers copied, 0 interrupts, 0 failures
```

(Additional displayed text omitted from this example)

To display information about all of the interface processors in your router, including the GEIP, use the **show controllers** command.

Following is an example of the **show controllers** command used with a Cisco 7500 series system:

```
Router# show controllers

(Additional displayed text omitted from this example)

slot3: GEIP, hw 2.3, sw 21.40, ccb 5800FF40, cmdq 48000090, vps 8192
  software loaded from system
  IOS (tm) VIP Software (SVIP-DW-M), Released Version 11.1(22)CC [biff]
  ROM Monitor version 115.0
  GigabitEthernet2/0/0, addr 0060.3e73.5640 (bia 0060.3e73.5640)
    gfreeq 48000148, lfreeq 48000190 (1536 bytes), throttled 0
    rxlo 4, rxhi 231, rxcurr 0, maxrxcurr 0
    txq 48001A00, txacc 48001A02 (value 145), txlimit 145
```

(Additional displayed text omitted from this example)



To display the configuration of the system hardware (number of each interface processor type installed), the software version, the names and sources of configuration files, and the boot images, use the **show version** (or **show hardware**) command.

Following is an example of the **show version** command used with a Cisco 7500 series system:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) GS Software (RSP-JV-M), Released Version 11.1(22)CC [biff 227]
FIB_branch Synced to mainline version: 11.1(19.1)CA
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Sun 10-May-98 06:02 by biff
Image text-base: 0x60010900, data-base: 0x60A64000

ROM: System Bootstrap, Version 11.1(14426) [biff 424], RELEASED SOFTWARE
ROM: GS Software (RSP-BOOT-M), Released Version 11.1(6075)CC [biff 2257]

Router uptime is 2 days, 16 hours, 47 minutes
System restarted by reload
System image file is "rsp-jv-mzge.111cc.w13", booted via tftp
from 223.255.254.254

cisco RSP4 (R5000) processor with 65536K/2072K bytes of memory.
R5000 processor, Implementation 35, Revision 2.1 (512KB Level 2 Cache)
Last reset from power-on
G.703/E1 software, Version 1.0.
G.703/JT2 software, Version 1.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).
Chassis Interface.

(additional displayed text omitted from this example)

1 GEIP controllers (1 GigabitEthernet).
1 Gigabit Ethernet/IEEE 802.3z interfaces.

(additional displayed text omitted from this example)

123K bytes of non-volatile configuration memory.
20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).

(additional displayed text omitted from this example)

Configuration register is 0x0
```

To determine specific hardware configuration information about a GEIP installed in your system, use the **show diag slot** command. Specific information is displayed, as shown in the following example of a GEIP that is installed in interface processor slot 3:

```
Router# show diag 3
Slot 3:
  Physical slot 3, ~physical slot 0xC, logical slot 3, CBus 0
  Microcode Status 0x4
  Master Enable, LED, WCS Loaded
  Board is analyzed
  Pending I/O Status: None
  EEPROM format version 1
  GEIP controller, HW rev 2.02, board revision A0
  Serial number: 09452341 Part number: 73-2167-05
  Test history: 0x00 RMA number: 00-00-00
  Flags: cisco 7000 board; 7500 compatible

  EEPROM contents (hex):
    0x20: 01 21 02 02 00 90 3B 35 49 08 77 05 00 00 00 00
    0x30: 50 00 00 01 00 00 00 00 00 00 00 00 00 00 00 00

  Slot database information:
  Flags: 0x4 Insertion time: 0x2B00 (2d16h ago)

  Controller Memory Size: 32 MBytes DRAM, 4096 KBytes SRAM

  PA Bay 0 Information:
    Gigabit-Ethernet PA, 1 ports
    EEPROM format version 1
    HW rev 1.00, Board revision A0
    Serial number: 09428253 Part number: 73-3144-02
```

In the preceding example, the GE interface on the GEIP is clearly marked *Gigabit-Ethernet*.

### Using the ping Command to Verify Network Connectivity

This section provides brief descriptions of the **ping** command. The **ping** command allows you to verify that an interface port is functioning properly and to check the path between a specific port and connected devices at various locations on the network. After you verify that the system and GEIP have booted successfully and are operational, you can use this command to verify the status of interface ports. Refer to the publications listed in the “Related Documentation” section on page 2, for detailed command descriptions and examples.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal; each signal that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate that the connection failed.

Following is an example of a successful **ping** command to a remote server with the IP address 10.1.1.60:

```
Router# ping 10.1.1.60 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 1.1.1.10, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the server and that the server is active (powered on), and repeat the **ping** command.

For complete descriptions of interface subcommands and the configuration options available for GEIP-related interfaces, and which commands support GEIP functionality, refer to the publications listed in the “Related Documentation” section on page 2.

## Maintenance Procedures for the GEIP

This section provides procedures that you might need to maintain your GEIP. Included is information on the following topics:

- Replacing a GBIC in the GE Interface, page 35
- Replacing and Upgrading GEIP SDRAM and SRAM, page 37

### Replacing a GBIC in the GE Interface

Your GEIP shipped with a GBIC installed, depending on the GEIP model you ordered (1000Base-SX, 1000Base-LX, or Long Haul). If your GEIP arrived without the GBIC installed and you need to install it now, or you need to change your GBIC for another reason, use the procedures in this section.

---

**Note** We strongly recommend that you do not install or remove the GBIC with optical fiber cables attached to it. Disconnect all cables before removing or installing a GBIC.

---



**Caution** To prevent system problems, do not use GBICs from third-party vendors. Use only the GBIC that shipped with your GEIP.

---

**Note** If your GBIC is already properly installed, proceed to the “Attaching Multimode and Single-Mode Optical Fiber Cables to a GBIC” section on page 25; otherwise, continue with the following procedure.

---



**Caution** To prevent problems associated with data transmission, you must attach this device only to IEEE 802.3x-compliant devices.

---

**Note** You can install and remove GBICs with power on to the system.

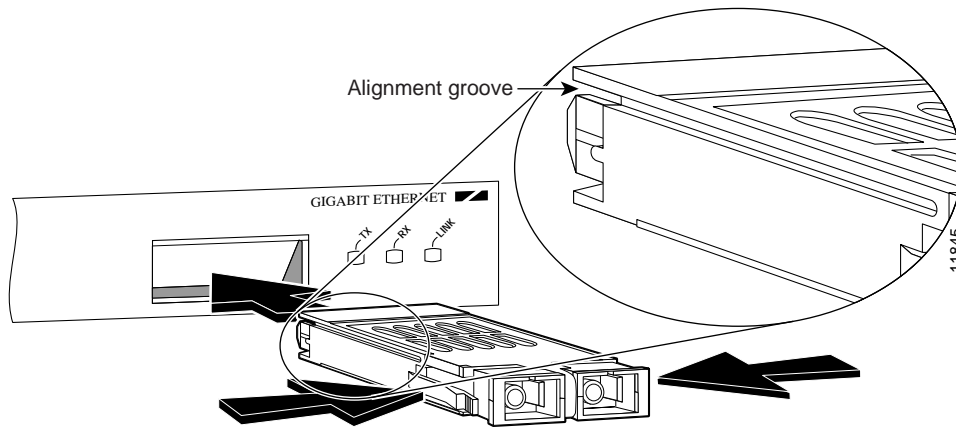
---

### Removing the GBIC from the GE Interface

Use the following procedure to remove the GBIC from your GE interface:

- Step 1** Disconnect the SC-type optical fiber cables or the mode conditioning patch cord from the GBIC; note which plug is TX and which plug is RX for reattachment.
- Step 2** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
- Step 3** Locate the tabs on either side of the exposed portion of the GBIC and squeeze them with your thumb and forefinger as you gently pull the GBIC out of the GBIC slot. (See arrows in Figure 14.)

**Figure 14** Removing and Inserting a GBIC



### Inserting a GBIC into the GE Interface

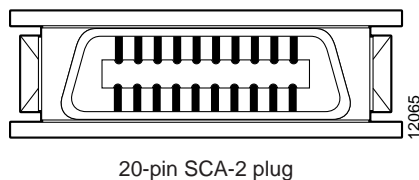
Use the following procedure to insert a GBIC into your GE interface:

- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
- Step 2** Locate the alignment groove on the GBIC. (See the enlargement in Figure 14.) Position the GBIC so that this groove is in the position shown in the enlargement, to ensure that the 20-pin plug on the GBIC is in the correct position.



**Caution** To prevent damage to the GBIC plug and receptacle before you insert the GBIC into the GBIC slot on the GE interface, ensure that the plug is in the orientation shown in Figure 15.

**Figure 15** 20-Pin Plug on the GBIC



- Step 3** Squeeze the tabs on each side of the GBIC using your thumb and forefinger, and insert the GBIC into the GBIC slot on the GE interface. (See Figure 14.)

- Step 4** Using moderate force, ensure that the GBIC is fully inserted into the 20-pin receptacle at the rear of the GBIC slot. The tabs on either side of the GBIC snap into place when you have completely and properly inserted the GBIC.
- Step 5** Reattach the SC-type optical fiber cable or the mode conditioning patch cord to the GBIC. (Use the appropriate procedure in the “Attaching Cables to the GEIP” section on page 24.)

This completes the procedures for replacing the GBIC in your GE interface.

## Replacing and Upgrading GEIP SDRAM and SRAM

This section provides the procedures for replacing the SDRAM dual in-line memory module (DIMM) and the SRAM daughter card on the GEIP.

---

**Note** Depending on your system configuration and the Cisco IOS your system is running, you might need to upgrade SDRAM or SRAM as required.

---

You can upgrade SDRAM and SRAM independently by ordering the appropriate memory configurations. The following Cisco Systems memory kits are compatible with the GEIP:

- MEM-VIP250-8M-S= upgrades a GEIP to 8 MB of SRAM
- MEM-VIP250-64M-D= upgrades a GEIP to 64 MB of SDRAM
- MEM-VIP250-128M-D= upgrades a GEIP to 128 MB of SDRAM

---

**Note** You can use any combination of these SRAM and SDRAM configurations on the GEIP.

---

The following sections describe how to upgrade SDRAM and SRAM:

- Replacing the GEIP SDRAM DIMM, page 37
- Replacing the GEIP SRAM Daughter Card, page 41
- Checking an SDRAM and SRAM Replacement, page 46

### Replacing the GEIP SDRAM DIMM

The procedures in this section are required only if you need to upgrade or replace the GEIP SDRAM DIMM.

---

**Note** Use only the SDRAM DIMM from Cisco Systems. A Cisco manufacturing part number appears on the SDRAM DIMM.

---



**Caution** To prevent ESD damage, handle the DIMM by the card edges only. (See Figure 19 on page 40.) Place a removed DIMM on an antistatic mat and store it in an antistatic container.

### Removing a GEIP DIMM

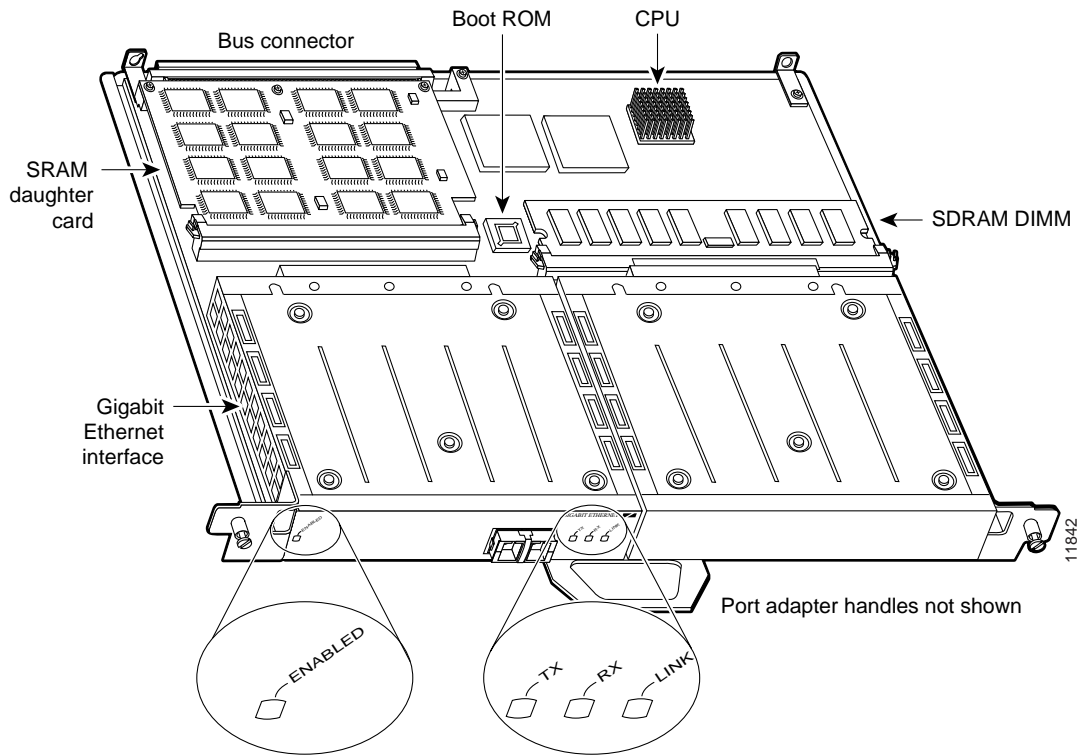
Use the following procedure to remove the existing DIMM:

- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
- Step 2** Remove the GEIP from the system. (Follow the steps in the “Removing a GEIP” section on page 22.)
- Step 3** Place the GEIP on an antistatic mat or pad and ensure that you are wearing an antistatic device, such as a wrist strap.

Position the GEIP so that the handle is away from you and the bus connector is toward you—opposite of the position shown in Figure 16.

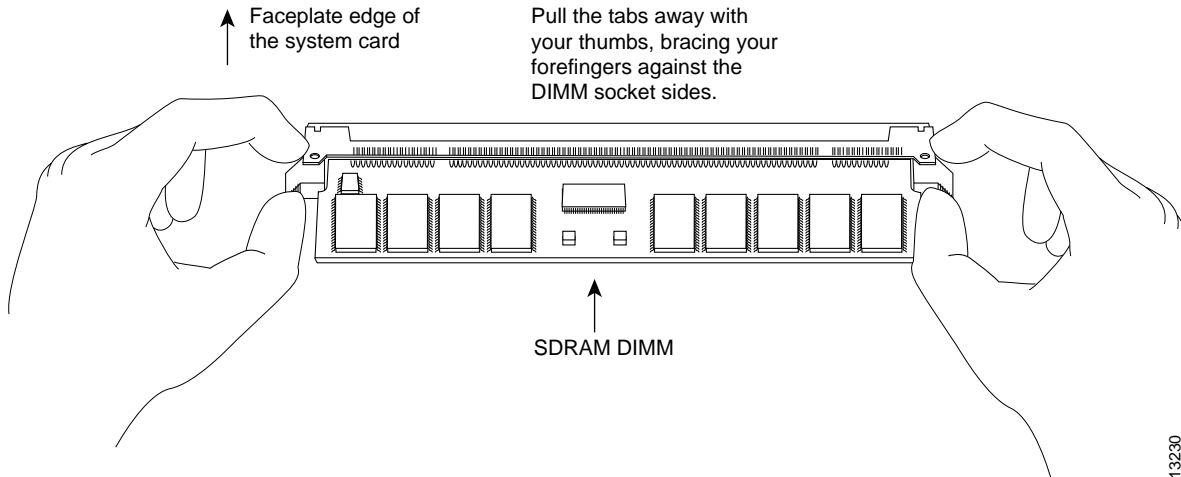
- Step 4** Locate the SDRAM DIMM. (See Figure 16.)

**Figure 16** Location of SRAM Daughter Card and SDRAM DIMM



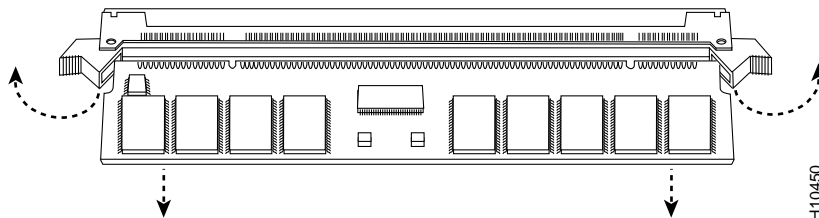
**Step 5** Open the DIMM socket tabs on the DIMM to release it from the socket. (See Figure 17.)

**Figure 17** Opening DIMM Socket Tabs



**Step 6** With the DIMM socket tabs open, grasp the ends of the DIMM between your thumbs and forefingers and pull it completely out of the socket. (See Figure 18.) Handle the edges of the DIMM only; avoid touching the memory module or pins, and the metal traces, or fingers, along the socket edge. (See Figure 19.)

**Figure 18** Removing the DIMM

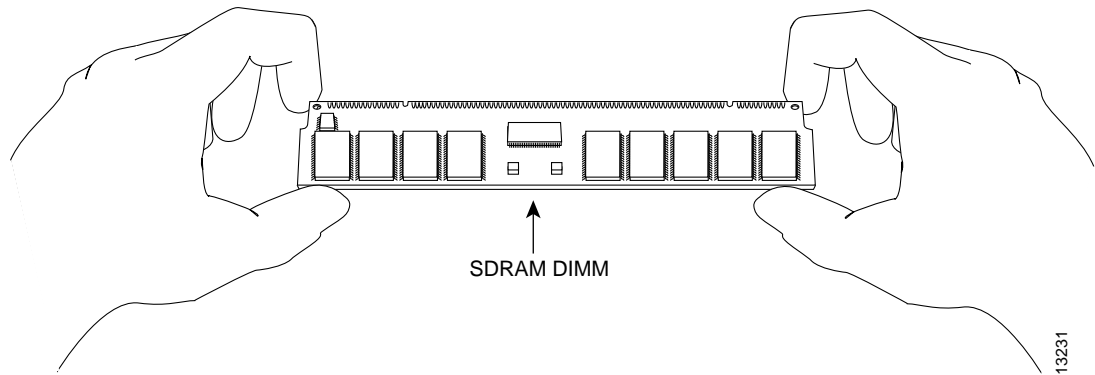


**Step 7** Place the DIMM in an antistatic container to protect it from ESD damage. This completes the DIMM removal procedure. Proceed to the next section to install a new DIMM.

### Installing a New GEIP DIMM

The DIMM is a sensitive component that is susceptible to ESD damage. Handle the DIMM by the edges only; avoid touching the memory modules, pins, or traces (the metal fingers along the connector edge of the DIMM). (See Figure 19.)

**Figure 19** Handling the DIMM



**Caution** To prevent ESD damage, handle the DIMM as shown in Figure 19.

With the GEIP in the same orientation as the previous procedure (with the handle away from you and the bus connector toward you), you can install the DIMM in the DIMM socket.

Use the following procedure to install a DIMM:

- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
- Step 2** Remove the new DIMM from its antistatic container.
- Step 3** Hold the DIMM component-side-up between your thumbs and forefingers. (See Figure 19.)
- Step 4** Tilt the DIMM to approximately the same angle as the socket and insert the connector edge into the socket.

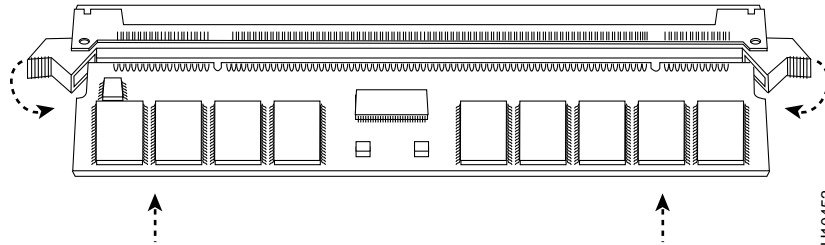


**Caution** When inserting the DIMM, use firm but not excessive pressure. If you damage a socket, you must return the GEIP to the factory for repair.



- Step 5** Gently push the DIMM into the socket until the socket tabs close over the ends of the DIMM. (See Figure 20.) If necessary, rock the DIMM gently back and forth to seat it properly.

**Figure 20** Inserting the DIMM



- Step 6** When the DIMM is installed, check to see that it is seated properly. If the DIMM appears misaligned, carefully remove it and reseat it in the socket. Push the DIMM firmly back into the socket until the socket tabs move into place.

This completes the DIMM replacement procedure. If required, proceed to the section “Replacing the GEIP SRAM Daughter Card.” Otherwise, reinstall the GEIP in the system. (Follow the steps in the “Installing a GEIP” section on page 23.)

See the “Checking an SDRAM and SRAM Replacement” section on page 46, as required.

### Replacing the GEIP SRAM Daughter Card

The procedures in this section are required only if you need to upgrade or replace the GEIP SRAM daughter card.

---

**Note** Use only the SRAM daughter card from Cisco Systems. A Cisco manufacturing part number appears on the SRAM daughter card.

---



**Caution** To prevent ESD damage, handle the SRAM daughter card by the edges only. Place a removed SRAM daughter card on an antistatic mat and store it in an antistatic container.

### Removing a GEIP SRAM Daughter Card

Use the following procedure to remove the existing SRAM daughter card:

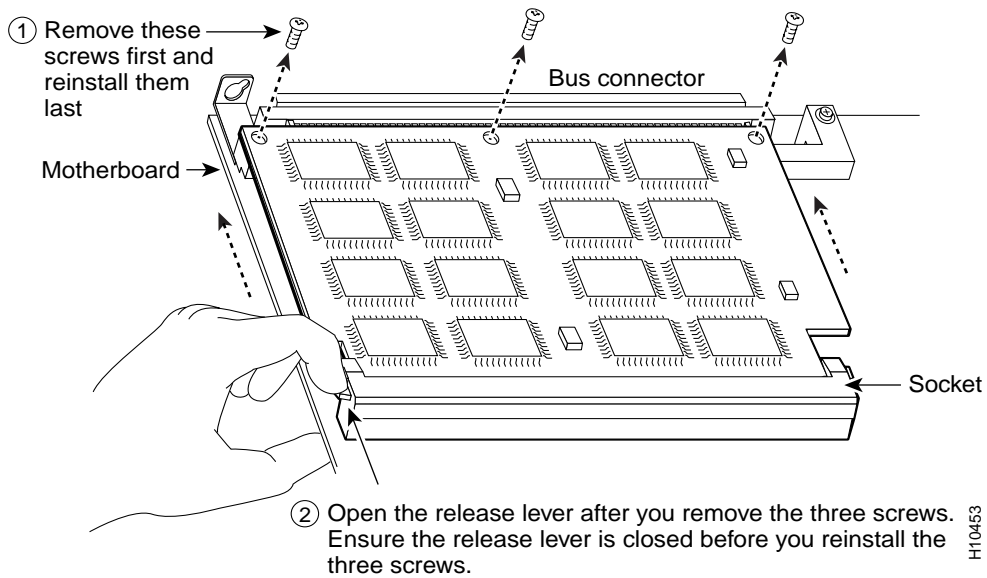
- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
- Step 2** Remove the GEIP from the system. (Follow the steps in the “Removing a GEIP” section on page 22, as required.)
- Step 3** Place the GEIP on an antistatic mat or pad, and ensure that you are wearing an antistatic device, such as a wrist strap. Position the GEIP so that the handle is toward you and the bus connector is facing away from you, approximately as shown in Figure 16.

**Step 4** Locate the SRAM daughter card on the GEIP. (See Figure 16.) The SRAM daughter card has a release lever that loosens the daughter card from its socket.



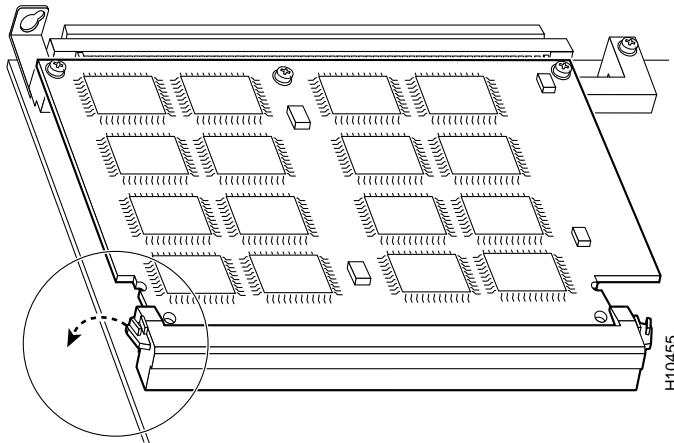
**Caution** To prevent damage to the SRAM daughter card in the steps that follow, do *not* open the release lever on the daughter card socket until *after* you remove the three screws located at the rear of the SRAM daughter card. (See Figure 21.) Further, do not reinstall the three screws until after you install the SRAM daughter card in the socket and ensure that the release lever is flush against the side of the socket.

**Figure 21** Locations of the Release Lever and the Screws on the SRAM Daughter Card

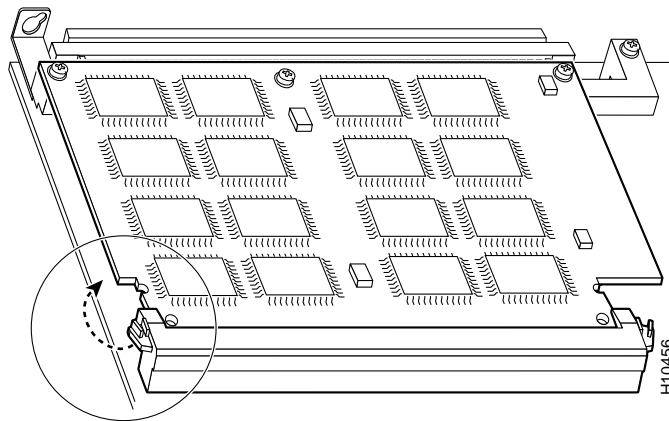


**Note** Figure 22 and Figure 23 show the functions of the release lever on the SRAM daughter card socket. To release an SRAM daughter card from the socket, first remove the three screws, and *then* open the release lever, as shown in Figure 22. When you insert an SRAM daughter card in the socket, the release lever should close automatically, as shown in Figure 23.

**Figure 22** Opening the Release Lever



**Figure 23** Ensuring the Release Lever Is Closed



**Step 5** Locate the three screws that secure the SRAM daughter card to the motherboard. (See item 1 in Figure 21.)

**Note** The SRAM daughter card lies parallel to the motherboard when the daughter card connector edge is installed in the socket.

**Step 6** Using a number 1 Phillips screwdriver, carefully remove the three screws from the SRAM daughter card (see Figure 21), and set them aside.

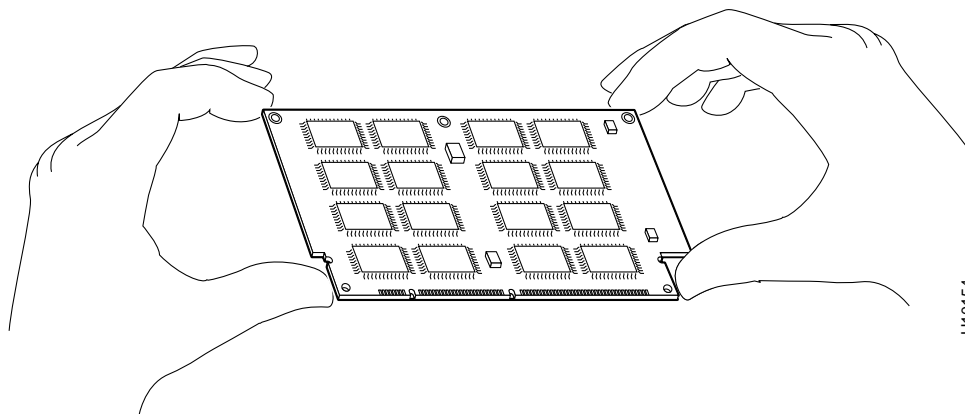
**Step 7** Locate the release lever on the socket. (See Figure 21.) Open the release lever to release the SRAM daughter card from the socket.

**Step 8** When one end of the SRAM daughter card is released from the socket, carefully pull the card away from the socket and motherboard. Handle the edges of the SRAM daughter card only. (See Figure 24.)



**Caution** To prevent ESD damage, handle the SRAM daughter card as shown in Figure 24.

**Figure 24 Handling an SRAM Daughter Card**



**Step 9** Place the SRAM daughter card in an antistatic container to protect it from ESD damage. This completes the SRAM daughter card removal procedure. Proceed to the next section to install a new SRAM daughter card.

#### Installing a New GEIP SRAM Daughter Card

The SRAM daughter card is a sensitive component that is susceptible to ESD damage. Handle the SRAM daughter card by the edges only; avoid touching the memory modules, pins, or traces (the metal fingers along the connector edge of the SRAM daughter card). (See Figure 24.)



**Caution** To prevent ESD damage, handle the SRAM daughter card as shown in Figure 24.

With the GEIP in the same orientation as in the previous procedure (with the handle toward you and the bus connector away from you), install the SRAM daughter card in the socket.

Use the following procedure to install an SRAM daughter card:

- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
- Step 2** Remove the new SRAM daughter card from its antistatic container.
- Step 3** Hold the SRAM daughter card between your thumbs and forefingers, component-side-up, with the connector edge (the metal fingers) toward you. (See Figure 24.)
- Step 4** Tilt the SRAM daughter card parallel with the socket and insert the connector edge into the socket.

Note the two notches (keys) on the connector edge of the SRAM daughter card. (See Figure 25.) These keys are intended to ensure correct orientation of the SRAM daughter card in its socket.



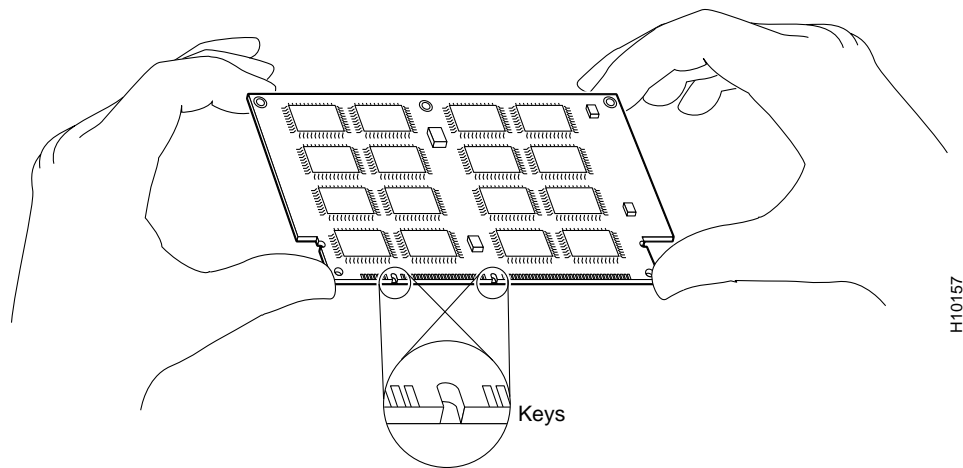
**Caution** When inserting the SRAM daughter card, use firm but not excessive pressure. If you damage a socket, you must return the GEIP to the factory for repair.

**Step 5** Note the orientation of the socket keys on the SRAM daughter card (see Figure 25) and the socket, and gently push the SRAM daughter into the socket until the release lever is flush against the side of the socket (see Figure 23) and the SRAM daughter card edge connector is fully inserted.

If necessary, rock the SRAM daughter card gently back and forth to seat it properly.

**Note** When the SRAM daughter card is properly inserted in the socket, the three screw holes at the rear of the card should align with the standoffs below the card, and the release lever should be flush against the side of the socket.

**Figure 25** Installing an SRAM Daughter Card



**Step 6** Verify that the three screw holes at the rear of the SRAM daughter card align with the standoffs below the SRAM daughter card; using the number 1 Phillips screwdriver, reinstall the three screws. (See Figure 21.)

**Step 7** After you install the three screws, ensure that the release lever is flush against the side of the socket. If it is not, the SRAM daughter card might not be seated properly.

If the SRAM daughter card appears misaligned, carefully remove it according to the removal procedure on page 41, and reseal it in the socket. Push the SRAM daughter card firmly back into the socket until the release lever is flush against the side of the socket.

**Step 8** Reinstall the GEIP in your system. (Follow the steps in the “Installing a GEIP” section on page 23.)

This completes the SRAM daughter card replacement procedure.

### Checking an SDRAM and SRAM Replacement

If the system fails to boot properly after an SDRAM or SRAM replacement, or if the console terminal displays a checksum or memory error, check the following:

- Ensure that all memory devices are installed correctly.  
If necessary, shut down the system and remove the GEIP.
- If a memory device appears to stick out or rest at an incorrect angle in the socket, remove it and reinsert it. Then replace the GEIP and reboot the system for another installation check.

See the “Using LEDs to Check GEIP Status” section on page 27, as required. If after several attempts the system fails to restart properly, contact a service representative for assistance. Before you call, make note of any error messages, unusual LED states, or any other indications that might help solve the problem.

## 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.

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, Inc. could void the FCC approval and negate your authority to operate the product.

## Cisco Connection Online

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](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](mailto:cco-help@cisco.com). For additional information, contact [cco-team@cisco.com](mailto:cco-team@cisco.com).

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**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](mailto: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](mailto:cs-rep@cisco.com).

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## 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>.

If you are reading Cisco product documentation on the World Wide Web, you can submit comments electronically. Click **Feedback** in the toolbar and select **Documentation**. After you complete the form, click **Submit** to send it to Cisco. We appreciate your comments.

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This document is to be used in conjunction with the installation and configuration guide that shipped with your router. (5350geip.fm, 78-5350-02, DOC-785350=)

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