IBM Flex System EN2092 1Gb Ethernet Scalable Switch

User's Guide

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User's Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 31, the *Safety Information* and *Environmental Notices and User Guide* documents on the IBM *Notices for Network Devices* CD, and the *Warranty Information* document that comes with the product.

First Edition, February 2012

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information
(安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας
(safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się
z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Safety statements

Important:

Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document.

For example, if a caution statement is labeled "Statement 1," translations for that caution statement are in the *Safety Information* document under "Statement 1."

Be sure to read all caution and danger statements in this document before you perform the procedures. Read any additional safety information that comes with the server or optional device before you install the device.

This device is intended for use with UL Listed IBM devices.

Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	To Disconnect:
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

UL Regulatory Information

This device is for use only with Listed IBM Flex System Enterprise Chassis.

Chapter 1. The IBM Flex System EN2092 1Gb Ethernet Scalable Switch

The EN2092 1Gb Ethernet scalable switch provides support for L2/L3 switching and routing. This switch has passed IPv6 USGv6 certification, so it also can support IPv6 functions.

The base model of the EN2092 switch supports 24Gb full-duplex throughput with fourteen 1Gb ports down and ten RJ-45 1Gb ports up. With the optional upgrades, you easily and cost-effectively can scale this switch to support 48Gb full-duplex throughput with twenty eight 1Gb ports down and twenty RJ-45 1Gb ports up, or 88Gb full-duplex throughput with twenty eight 1Gb ports down, twenty RJ-45 1Gb ports up, and four 1Gb/10 Gb SFP+ uplink ports up.

This *User's Guide* contains information and instructions for installing the switch, updating the firmware, and solving problems.

For information about the types of compatible devices available for IBM products, contact your IBM marketing representative or authorized reseller. For a list of supported optional devices, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

You can obtain up-to-date information about the switch at http://www.ibm.com/supportportal/.

Notes:

1. The illustrations in this document might differ slightly from your hardware.
2. The screens that are described or referenced in this document might differ slightly from the screens that are displayed by your system. Screen content varies according to the type of IBM chassis and the firmware versions and options that are installed.

Related documentation

This *User's Guide* contains setup and installation instructions for the switch and general information about the switch, including how to configure, update, and troubleshoot the switch, and how to get help. The most recent version of this *User's Guide* and all other related documents are at http://publib.boulder.ibm.com/infocenter/flexsys/information/index.jsp

The following related documentation is available at http://www.ibm.com/supportportal/:

- *IBM Flex System EN2092 1Gb Ethernet Scalable Switch Application Guide*
- *IBM Flex System EN2092 1Gb Ethernet Scalable Switch Menu-Based CLI Command Reference*
- *IBM Flex System EN2092 1Gb Ethernet Scalable Switch ISCLI–Industry Standard CLI Command Reference*
- *IBM Flex System EN2092 1Gb Ethernet Scalable Switch BBI Quick Guide*
- *IBM Flex System Network Devices Basic Troubleshooting Information*

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is provided on the IBM *Notices for Network Device* CD. Each statement is numbered for reference to the corresponding statement in your language in the *Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

For detailed information about the switch hardware and firmware features, specifications, and standards, see the switch *Application Guide.*

Major components of the switch

The switch has the following components:

- The base model of the EN2092 1Gb Ethernet scalable switch supports 24Gb full-duplex throughput with fourteen 1Gb ports down and ten RJ-45 1Gb ports up.
- With the optional upgrades, you easily and cost-effectively can scale this switch to support 48Gb full-duplex throughput with twenty eight 1Gb ports down and twenty RJ-45 1Gb ports up, or 88Gb full-duplex throughput with twenty eight 1Gb ports down, twenty RJ-45 1Gb ports up, and four 1Gb/10Gb SFP+ uplink ports up. See “Acquiring feature licenses” on page 25 for information on how to upgrade the switch with optional licenses.

You can manage and configure the switch through the following interfaces:

- A SSHv2/Telnet connection to the embedded command-line interface (CLI)
- A terminal emulation program connection to the serial port interface
- A Web browser-based interface (https/http) connection to the switch

Record information about the switch in the following table. The product name and serial number are on the identification label on the sides of the switch. The media access control (MAC) address is on a separate label. You will need this information when you register the switch with IBM®. You can register the switch at http://www.ibm.com/support/mysupport/.

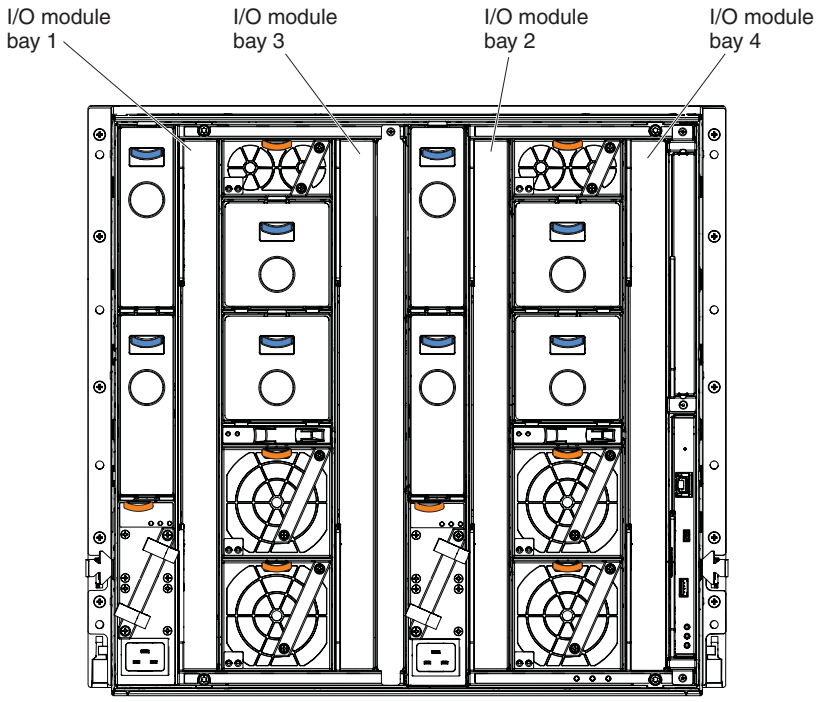
Product name	IBM Flex System EN2092 1Gb Ethernet Scalable Switch
Model number	_____
Serial number	_____
Part number	_____
Media access control (MAC) address for switch	_____
MAC addresses for other components	_____
	_____
	_____

Chapter 2. Installing the switch

This chapter provides instructions for installing a switch in the IBM Flex System chassis and for removing a switch from the IBM Flex System chassis. See the documentation for your IBM Flex System chassis for information about I/O bay locations and the components that can be installed in them that is specific to your IBM Flex System chassis type.

You can install up to four I/O modules in the IBM Flex System chassis, including Ethernet switch modules, Fibre Channel switch modules, Infiniband, and pass-thru modules (optical and copper).

The following illustration shows an example of a IBM Flex System chassis with the I/O bays identified.



To enable the switch to communicate with a compute node, at least one switch must be installed in the IBM Flex System chassis. For details about network adapter installation, configuration, and use, see the documentation that comes with the network adapter.

Installing a second switch enables a redundant path and a separate connection from the compute node to the external Ethernet network.

The IBM Flex System chassis supports a maximum of four IBM Flex System EN2092 1Gb Ethernet Scalable Switch Modules. Depending on the type of IBM Flex System chassis that you are using, the IBM Flex System chassis supports a maximum of 10 or 14 network adapters.

Notes:

- I/O bays 1 and 2 support any standard Ethernet switch or pass-thru modules that connects to the two integrated Ethernet controllers in each of the compute nodes. When you install an adapter card in the first bay on the compute node, the I/O bays support any switch with the same type of network interface that is used in the corresponding compute node adapter bay.
- The I/O bays 3 and 4 support Ethernet switch modules, Fibre Channel switch modules, Infiniband, and pass-thru modules (optical and copper) if the serial pass-thru modules are not being used. If you install an additional I/O module in bay 3 or 4, a corresponding adapter card is required to be installed in each compute node to access the I/O bay.
- The compute nodes or IBM Flex System chassis that are described or shown in this document might be different from your compute nodes or IBM Flex System chassis. For additional information, see the documentation that comes with your compute node or IBM Flex System chassis.
- When the switch is installed in a IBM Flex System chassis, the internal ports operate at 10 Gbps or 1 Gbps. The external ports can operate at 10 Gbps or 1 Gbps, depending on the SFP module type.

Installation guidelines

Before you install the switch in the IBM Flex System chassis, read the following information:

- Read the safety information that begins on page v, "Handling static-sensitive devices" on page 7, and the safety statements in the IBM Flex System chassis documentation. This information provides a safe working environment.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the blade server or IBM Flex System chassis, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component on the switch, blade server, or IBM Flex System chassis indicates that the component can be hot-swapped, which means that if the IBM Flex System chassis and operating system support hot-swap capability, you can remove or install the component while the IBM Flex System chassis is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- You do not have to turn off the IBM Flex System chassis to install or replace any of the hot-swap modules on the front or rear of the IBM Flex System chassis.
- When you install a switch in the IBM Flex System chassis, you must also install a compatible I/O expansion card in the blade server to support the switch.
- When you are finished working on the blade server or IBM Flex System chassis, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported optional devices for the IBM Flex System chassis and other IBM products, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

System reliability guidelines

To help ensure proper cooling, performance, and system reliability, make sure that the following requirements are met:

- Each of the module bays on the rear of the IBM Flex System chassis contains either a module or a filler module.
- A removed hot-swap module is replaced with an identical module or filler module within 1 minute of removal.
- A removed hot-swap compute node is replaced with another compute node or filler node within 1 minute of removal.
- The ventilation areas on the sides of the compute node are not blocked.
- You have followed the reliability guidelines in the documentation that comes with the IBM Flex System chassis.

Cable requirements for the switch are described in the IBM *Configuration and Options Guide* at http://www.ibm.com/servers/eserver/xseries/cog/. See the documentation that comes with the IBM Flex System chassis for cable-routing information.

Handling static-sensitive devices

Attention: Static electricity can damage the IBM Flex System chassis and other electronic devices. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of electrostatic discharge, observe the following precautions:

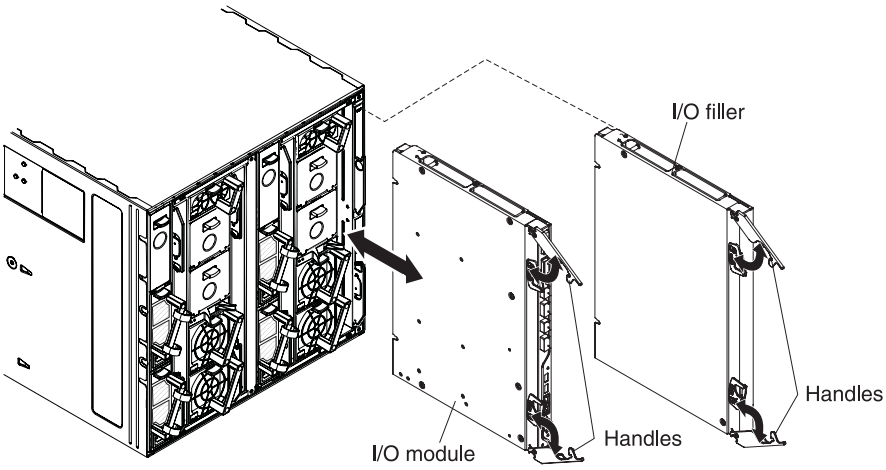
- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an *unpainted* metal surface of the IBM Flex System chassis or an *unpainted* metal surface on any other grounded rack component in the rack that you are installing the device in for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the IBM Flex System chassis without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the IBM Flex System chassis or on a metal surface.
- Take additional care when you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.
- Some types of IBM Flex System chassis come with electrostatic discharge (ESD) connectors. If your unit is equipped with an ESD connector, see the documentation that comes with the IBM Flex System chassis for using the ESD connector.

Installing a switch

Note: The following illustration shows how to install a switch in a IBM Flex System chassis. The appearance of your IBM Flex System chassis might be different; see the documentation for your IBM Flex System chassis for additional information.

Use the following instructions to install a switch in the IBM Flex System chassis. You can install a switch while the IBM Flex System chassis is powered on. For redundancy support, you must install I/O modules of the same type in I/O bays 1 and 2, and I/O modules of the same type in bays 3 and 4 of the chassis.

To install a switch, complete the following steps:



1. Read the safety information that begins on page v and "Installation guidelines" on page 6.
2. Verify that the switch is compatible with the chassis. For a list of supported optional devices for the IBM Flex System chassis and other IBM products, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.
3. Select I/O bay in which to install the switch.

   Note: For details about I/O bay requirements and bay locations, see the documentation for the IBM Flex System chassis and compute nodes.
4. Remove the filler module from the selected bay. Store the filler module for future use.
5. If you have not already done so, touch the static-protective package that contains the switch to an *unpainted* metal surface of the IBM Flex System chassis or an *unpainted* metal surface on any other grounded rack-component for at least 2 seconds.
6. If the removed filler module (from step 4) occupied two bays:
   - Remove the single-high filler module from its static-protective package.
   - Install the single-high filler module into the unused bay.
7. Remove the switch from its static-protective package.
8. Make sure that the release levers on the switch are in the open position (perpendicular to the switch).
9. Slide the switch into the applicable I/O-module bay until it stops.
10. Push the release levers on the front of the switch to the closed position. After you insert and lock the switch, it is turned on, and a power-on self-test (POST) occurs to verify that the switch is operating correctly.

    Notes:

    a. The switch takes approximately 60 seconds to complete the POST. When the switch is turned on, an LED test occurs. All LEDs are lit and remain lit during POST; then, all the LEDs except the OK LED turn off. This indicates normal POST results.

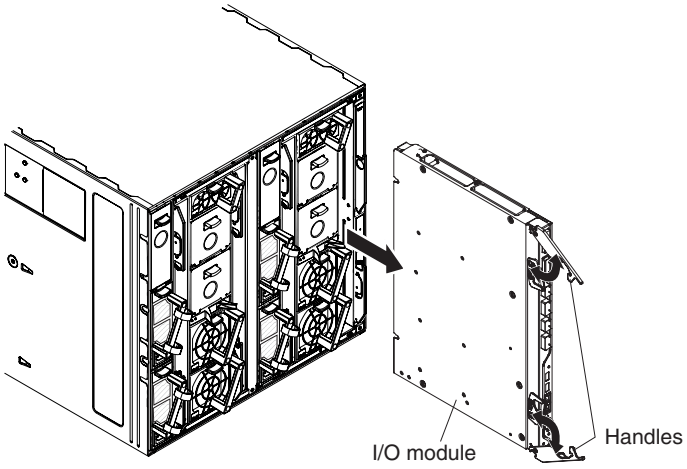
b. To maintain proper airflow, make sure that the ventilation holes on the front of the switch are not blocked.

11. Make sure that the LEDs on the switch indicate that it is operating correctly (see "Information LEDs" on page 16).
12. If you have another switch to install, repeat step 4 on page 8 through step 11; otherwise, go to the next step.
13. Install the SFP+ modules in the switch. For information and instructions, see "Installing and removing a 10 Gb SFP+ module" on page 12 and the documentation that comes with the SFP+ module.
14. Attach any cables that are required by the switch. For additional information about cabling the switch, see "Cabling the switch and the SFP+ module" on page 10, the documentation that comes with the cables, and the optional network devices to which the cables have been connected. For the locations of the connectors on the IBM Flex System chassis, see the documentation that comes with the IBM Flex System chassis. Then, continue with the next step.
15. Make sure that the external ports on the switch are enabled through one of the management-module interfaces, such as the Web-based interface or the CLI.

Removing or replacing a switch

Note: The following illustration shows how to remove and replace a switch from a IBM Flex System chassis. The appearance of your IBM Flex System chassis might be different; see the documentation for your IBM Flex System chassis for additional information.

To replace a switch, complete the following steps:



1. Read the safety information that begins on page v, and "Installation guidelines" on page 6.
2. Disconnect any cables from the switch that you are removing. Removing these cables (especially an Ethernet cable) disrupts the network connection from the external Ethernet port to any connected external Ethernet devices. If you plan to replace the switch with another switch, you can use the existing Ethernet cable, provided that it remains securely attached to the Ethernet network. For additional information about cabling the switch, see "Cabling the switch and the SFP+ module" on page 10, the documentation that comes with the cables, and the optional network devices to which the cables have been connected. For

the locations of the connectors on the IBM Flex System chassis, see the documentation that comes with the IBM Flex System chassis. Then, continue with step 3.

3. Pull the release latches out from the switch. The switch moves out of the bay approximately 0.6 cm (0.25 inch).
4. Slide the switch out of the bay and set it aside.
5. Place either another switch or a filler module in the bay.

   Important: Complete this step within 1 minute. (For more information, see steps 10 and 11 on page 9.)
6. If you placed a filler module in the bay, continue with "Installing and removing a 10 Gb SFP+ module" on page 12.
7. If you placed a switch in the bay, reconnect the other cables that you disconnected. Attach any additional cables that are required by the switch. For additional information about cabling the switch, see "Cabling the switch and the SFP+ module," the documentation that comes with the cables, and the optional network devices to which the cables have been connected. For the locations of the connectors on the IBM Flex System chassis, see the documentation that comes with the IBM Flex System chassis. Then, continue with "Installing and removing a 10 Gb SFP+ module" on page 12.

Cabling the switch and the SFP+ module

This section describes how to cable the switch and its optional devices.

The supported SFP+ modules and DAC cables for the switch are as follows:

- 10GBase-SR SFP+ (MMFiber) transceiver (part no. 44W4408)
- 10GBase-SR SFP+ (MMFiber) transceiver (part no. 46C3447)
- IBM BNT SFP+ LR transceiver (part no. 90Y9412)
- 1000Base-SX SFP (MMFiber) transceiver (part no. 81Y1622)
- 1000Base-T SFP transceiver 4 (part no. 81Y1618)
- 1000Base-LX SFP LX transceiver (part no. 90Y9424)
- 1m IBM Passive DAC SFP+ (part no. 90Y9427)
- 3m IBM Passive DAC SFP+ (part no. 90Y9430)
- 5m IBM Passive DAC SFP+ (part no. 90Y9433)

Note: The illustrations in this document might differ slightly from your hardware.

Connecting the serial console cable

To connect the serial console cable to the switch, connect the serial cable to the mini-USB serial console port of the switch and the other end of the cable to the console device.

Disconnecting the serial console cable

To disconnect the serial console cable, grasp the connector and gently pull the cable from the switch.

Connecting the SFP+ module cable

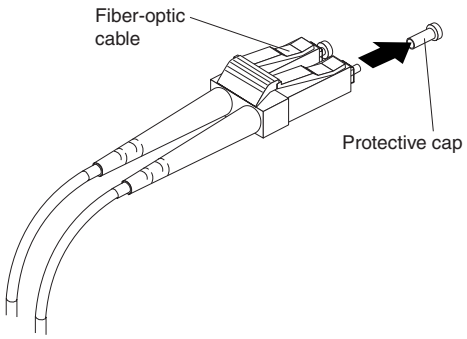
Attention: To avoid damage to the fiber optic cables, follow these guidelines:

- Do not route the cable along a folding cable-management arm.

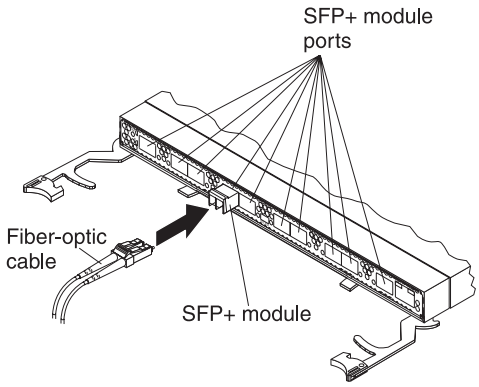
- When you attach the cable to a device on slide rails, leave enough slack in the cable so that it does not bend to a radius of less than 38 mm (1.5 in.) when the device is extended or become pinched when the device is retracted.
- Route the cable away from places where it can be snagged by other devices in the rack.
- Do not overtighten the cable straps or bend the cables to a radius of less than 38 mm (1.5 in.).
- Do not put excess weight on the cable at the connection point. Make sure that the cable is well supported.

To connect the SFP+ module cable, complete the following steps:

1. Remove the protective caps from the end of the fiber optic cable.



2. Gently slide the fiber optic cable into the SFP+ module until it clicks into place.



3. Check the LEDs on the switch. When the switch is operating correctly, the green link LED is lit. For information about the status of the switch LEDs, see "Locating the information panels, LEDs, and external ports" on page 14.

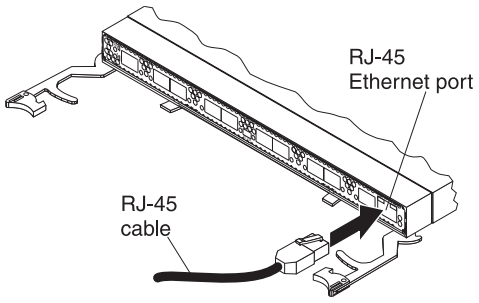
Disconnecting the SFP+ module cable

To disconnect the SFP+ module cable, complete the following steps:

1. Squeeze the release tabs and gently pull the fiber optic cable from the SFP+ module.
2. Replace the protective caps on the ends of the fiber optic cable.

Connecting the RJ-45 cable

To connect the RJ-45 connector to the switch, push the RJ-45 cable connector into the port connector until it clicks into place.



Disconnecting the RJ-45 cable

To disconnect the RJ-45 connector, squeeze the release tab and gently pull the cable connector out of the switch-module connector.

Installing and removing a 10 Gb SFP+ module

The switch supports the 10 Gb small-form-factor pluggable (SFP+) module and the 1 Gb small-form-factor pluggable (SFP) module. The SFP+ and SFP modules are laser products that convert electrical signals to optical signals.

For additional information about the location of the switch, the network interface requirements, and expansion options, see the documentation for your IBM Flex System chassis.

Notes:

1. The illustrations in this document might differ slightly from your hardware.
2. While the information in this section describes the 10 Gb small-form-factor pluggable (SFP+) module, it also applies to the 1 Gb small-form-factor pluggable (SFP) module.
3. The switch also supports MSA-compliant copper direct-attach cables (DAC), up to 7 m (23 ft) in length.

Handling an SFP+ module

Before you install an SFP+ module, read the following information:

- The module housing of the SFP+ has an integral guide key that is designed to prevent you from inserting the module incorrectly.
- Use minimal pressure when you insert the module into the port. Forcing the module into the port can cause damage to the module or the module port.
- You can insert or remove the module while the IBM Flex System chassis is turned on.
- You must first insert the module into the port before you can connect the cables.
- You must remove the cable from the SFP+ module before you remove the SFP+ module from the switch.

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

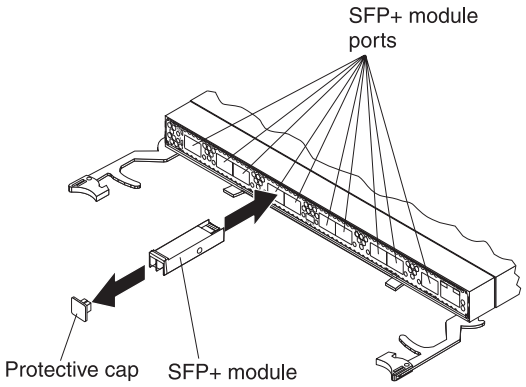
Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

Installing an SFP+ module

The SFP+ module provides two fiber-optic cable connectors for connecting to external ports. To install an SFP+ module, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 6.
2. If you have not already done so, touch the static-protective package that contains the SFP+ module to an *unpainted* metal surface of the IBM Flex System chassis or an *unpainted* metal surface on any other grounded rack component in the rack in which you are installing the switch for at least 2 seconds.
3. Read the information in "Handling an SFP+ module" on page 12.
4. Remove the SFP+ module from its static-protective package.
5. Remove the protective cap, if one is installed, from the SFP+ module port where you are installing the SFP+ module and store it in a safe place.
6. Remove the protective cap from the SFP+ module and store it in a safe place.

   Attention: To avoid damage to the cable or the SFP+ module, make sure that you do not connect the fiber optic cable *before* you install the SFP+ module.
7. Insert the SFP+ module into the SFP+ module port until it clicks into place.



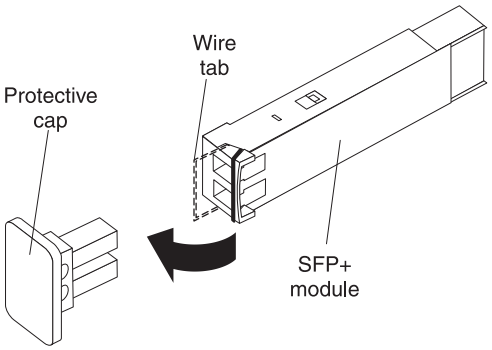
8. Connect the fiber optic cable (see "Connecting the SFP+ module cable" on page 10) and any cables that you disconnected earlier.

Removing an SFP+ module

To remove an SFP+ module, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 6.
2. Read the information in "Handling an SFP+ module" on page 12.
3. Remove the fiber optic cable from the SFP+ module that you want to replace. For more information about removing the cable, see "Disconnecting the SFP+ module cable" on page 11.

   Attention: To avoid damage to the cable or the SFP+ module, make sure that you disconnect the fiber-optic cable *before* you remove the SFP+ module.
4. Unlock the SFP+ module by pulling the wire tab straight out, as shown in the following illustration.



5. Grasp the wire tab on the SFP+ module and pull it out of the port.
6. Replace the protective cap on the SFP+ module and the SFP+ module port.
7. Place the SFP+ module into a static-protective package.

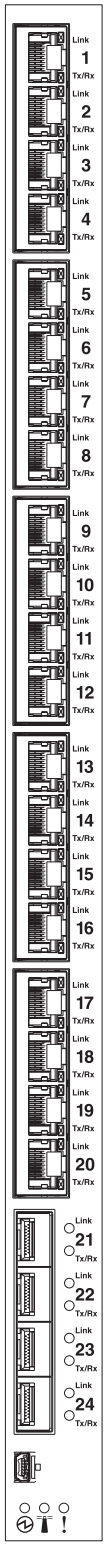
Locating the information panels, LEDs, and external ports

This section describes the information panels and LEDs on the switch and identifies the external ports on the information panels.

Note: The illustrations in this document might differ slightly from your hardware.

Information panel

The front panel of the switch contains information LEDs, four SFP+ module port connectors, one mini-USB serial port connector, and twenty RJ-45 ports.



The switch-module information panel contains the following components:

- LEDs that display the following information:
  - The status of the switch and its network connection
  - The status of the external connections to the switch

  For further details about LEDs, see "Information LEDs."
- Four SFP+ port connectors to attach SFP+ modules and twenty RJ-45 ports.
- One mini-USB serial port connector for console port use (management purposes) only. Do *not* attach any devices to this connector other than the serial cable that comes with the switch, as described in "Cabling the switch and the SFP+ module" on page 10.

Information LEDs

The front panel of the switch has two sets of LEDs. The OK and switch error LEDs in the first column at the bottom of the switch indicate the switch status. The link (LINK) and activity (TX/RX) LEDs indicate the status of the external ports. .

Notes:

- A yellow LED on the IBM Flex System chassis is lit when a system error or event has occurred. To identify the error or event, check the IBM Flex System management-module event log or the switch system log.
- An LED test occurs whenever the switch is turned on. All LEDs are lit and remain lit during POST, and then all the LEDs except the OK LED turn off.

Any errors that are detected during POST are written to the system log. For information about the command to read the system log, see the *IBM Command Reference* for the switch.

When POST errors are written to the system log, these errors are also written to the IBM Flex System management-module event log. If a hardware error, such as a current fault occurs, the management module displays it. If a firmware error occurs, the management module displays the `Module did not complete POST` message and a post error code that indicates the test that was running when the error was detected.

Note: You can also use the management module to make sure that the switch is operating correctly. For more information, see the documentation for the IBM Flex System chassis.

Switch status LEDs

The following table provides descriptions of the switch status LEDs on the front panel of the switch.

Table 1. Switch status LEDs

Status LED	Description
OK (⏻) LED	This green LED is at the bottom of the switch on the front panel. • When this LED is lit, it indicates that the switch is on. • When this LED is not lit and the yellow switch error LED is lit, it indicates a critical alert. If the yellow LED is also not lit, it indicates that the switch is off.

Table 1. Switch status LEDs (continued)

Status LED	Description
Switch error (!) LED	This yellow LED is at the bottom of the switch on the front panel. • When this LED is lit, it indicates a POST failure or critical alert. **Note:** When this LED is lit, the system-error LED on the IBM Flex System chassis is also lit. • When this LED is not lit and the green LED is lit, it indicates that the switch is working correctly. If the green LED is also not lit, it indicates that the switch is off.

Port status LEDs

The following table provides descriptions of the port status LEDs on the front panel of the switch.

Table 2. Port status LEDs

Status LED	Description
Link LED	This green LED indicates whether the port link is up or down. • When this LED is lit, there is an active connection (or link) between the corresponding port and the device that is using this connection. • When this LED is not lit, it indicates that there is no signal on the corresponding port, or the link is down.
Activity (TX/RX) LED	This yellow LED indicates the status of the link activity for the port. • When this LED is flashing or lit, the corresponding port is connected and online, and link activity is occurring on that port. • When this LED is not lit, it indicates that there is no signal or no link activity on the corresponding port.

Configuring the switch

The switch has an internal Ethernet path to the management module, 24 external Ethernet ports, and a serial console port. The switch supports two remote-access modes for management through Ethernet connections. You can select the mode that is best suited for your IBM Flex System environment.

- **Default mode:** The default mode uses the internal path to the management module only. In this mode, the remote-access link to the management console must be attached to the Ethernet connector on the management module. The Internet protocol (IP) addresses and SNMP parameters of the switches can be automatically assigned by the IBM Director Flex System Deployment wizard (when available), or you must assign them through the IBM Flex System Management and Configuration program. This mode enables you to provide a secure LAN for management of the IBM Flex Systems subsystems that is separate from the data network. See “Establishing a TCP/IP session through the management module” on page 19 for more information.
- **Remote management mode:** You can enable remote management of the switch through the external ports, instead of or in addition to access through the management module. This mode can be enabled only through the management-module configuration interface. When this mode is enabled, the twenty external RJ-45 ports and the four external SFP+ ports support both management traffic and IBM Flex System application data traffic.

  This mode enables the use of additional switch IP addresses on different IP subnets than the management modules. This is useful when the switches are to

be managed and controlled as part of the overall network infrastructure, while secure management of other IBM Flex System subsystems is maintained through the management module. See “Enabling management through external ports” on page 19 for additional instructions about configuring the switch for this mode of operation.

The mini-USB console port provides an alternative path to manage and configure the switch for local access.

Important:

- Before you configure the switch, make sure that the management modules in the IBM Flex System chassis are correctly configured. For more information about configuring the switch, see the following documents:
  - *IBM Flex System Advanced Management Module Installation Guide*
  - *IBM Flex System Advanced Management Module User's Guide*
- The default IP address of the switch is 192.168.70.120, 192.168.70.121, 192.168.70.122, or 192.168.70.123, depending on the switch bay where it is installed.
- If you change the IP address of the switch and restart the IBM Flex System chassis, the switch maintains this new IP address as its default value.
- The management module and the switch can communicate with each other only if they are on the same IP subnet.
- When you use the management-module Web interface to update the switch configuration, the management-module firmware saves the new configuration in its internal nonvolatile random-access memory (NVRAM). If the switch restarts, the management module applies the saved configuration to the switch.

  If the switch restarts and the management module cannot apply the saved configuration, the switch defaults to using the configuration that it had previously saved. If the IP subnet address of the switch does not match the IP subnet address of the management module, you can no longer manage the switch from the management module.
- For switch communication with a remote management station, such as an IBM Director management server, through the management-module external Ethernet port, the switch internal-network interface and the management-module external interface must be on the same IP subnet.

For specific details about configuring the switch and preparing for system installation, see the documentation listed in “Related documentation” on page 1.

Notes:

- Unless otherwise stated, references to the management module apply only to the IBM Flex System Advanced Management Module, which is the only type of management module that supports the switch.
- Throughout this document, the management-module Web-based user interface is also known as the IBM Flex System management-module Web interface.
- Throughout this document, the user name is also known as the login name or user ID for logging on to interfaces or programs.
- The screens that are described or referenced in this document might differ slightly from the screens that are displayed by your system. Screen content varies according to the type of IBM Flex System chassis and the firmware versions and options that are installed.

Establishing a TCP/IP session through the management module

To establish a TCP/IP session for the switch through the management module, complete the following steps:

1. Log on to the management module as described in the *User's Guide* or *Command Line Interface Reference Guide* for your advanced management module. If necessary, obtain the IP address of the management module from your system administrator. The management-module window opens.

   Note: The **User ID** and **Password** fields are case-sensitive. Type your information in uppercase letters only. To maintain system security, change your password after you log on for the first time. The default User ID is `USERID`, and the default password is `PASSW0RD` (where the sixth character is the number zero, not the letter O).
2. From the **I/O Module Tasks** menu, click **Configuration**.
3. In the **I/O Module Configuration** area, click the bay number that corresponds to the location of the switch that you installed.
4. In the **IP address** field in the **New Static IP Configuration** area, type the new TCP/IP address of the switch; then, click **Save**.

   Note: The management module does not check for invalid IP addresses.
5. Click **Advanced Configuration**. You can now start a Web session or a Telnet session.

The Web interface and the Telnet program provide different ways to access the same internal-switching firmware and configure it.

- If your system application requires that you use the Web interface program, see "Configuring the switch through the switch browser-based interface" on page 21 for additional information.
- If your system application requires that you use the Telnet program, see "Configuring the switch through the Telnet interface" on page 20 for additional information.

Enabling management through external ports

To access and manage the switch through external interfaces, you must enable the external ports and the ability to manage the switch through them. Use the information in the following table to configure your ports.

External management	External ports	Description
Disabled	Disabled	The switch must be managed through the management module. No traffic is allowed on external ports.
Disabled	Enabled	The switch must be managed through the management module. Data traffic is allowed on external ports.
Enabled	Disabled	The switch can be managed through the management module or a blade server. No traffic is allowed on external ports.

External management	External ports	Description
Enabled	Enabled	The switch can be managed through the management module, a blade server, or a management station that is connected through an external port. Data traffic is allowed on external ports.

To enable management through external ports, complete the following steps:

1. Log on to the management module as described in the *User's Guide* or *Command Line Interface Reference Guide* for your advanced management module. If necessary, obtain the IP address of the management module from your system administrator. The management-module window opens.
2. Click **I/O Module Tasks → Configuration** and click the bay number that corresponds to the location of the switch that you installed.
3. Click **Advanced Configuration** and make sure that external management is enabled.
4. Click **I/O Module Tasks → Admin/Power/Restart** and make sure that the external ports are enabled for the switch that you installed.

Configuring the switch through the Telnet interface

Note: Telnet is disabled by default.

The switch supports a command-line interface (CLI) that you can use to configure and control the switch over the network through the Telnet program. You can use the CLI to perform many basic network-management functions. In addition, you can configure the switch for management through an SNMP-based network-management system. The following sections describe how to use the Telnet interface to access the switch, change its settings, and monitor its operation.

Connecting to the switch

If you know the IP address for the switch and you have an existing network connection, you can use the Telnet program from an external management station or the management module to access and control the switch. The management station and the switch must be on the same IP subnet. If you have to obtain the IP address for the switch or establish a network connection, contact your system or network administrator. Be sure to use the correct IP address in the required command, as specified in "Accessing the main menu."

Accessing the main menu

To connect to the switch through the Telnet interface, complete the following steps:

1. From a DOS command-line prompt, type `telnet x` and press Enter.

   where *x* is the IP address for the switch.
2. If you do not have an assigned initial password, in the **Password** field, type the default password (`PASSw0RD`, spelled with a zero) and press Enter.

Important: The **apply** command changes the currently active configuration. If you want your change to persist beyond the next reboot of the switch, you must enter the **save** command. This command stores the current switch configuration and all changes in nonvolatile memory.

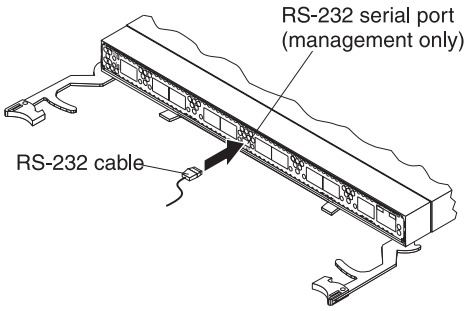
For more information about configuring through the CLI, see the *IBM Application Guide* for the switch.

Configuring the switch through the serial-port interface

The mini-USB serial port provides basic communication through a terminal emulation program (such as Hyperterminal). Because messages from the power-on self-test (POST) and all initialization information are transmitted through the serial port, you can use the serial port to log in to the switch and access and configure the internal switching firmware.

To log in to the switch, complete the following steps:

1. Connect one end of the specifically designed serial cable that comes with your device into the mini-USB port and connect the other end to the management station.



   For additional information, see "Connecting the serial console cable" on page 10.
2. On the management station, open a console window and make sure that the serial port is configured with the following settings:
   - 9600 baud
   - 8 data bits
   - No parity
   - 1 stop bit
   - No flow control
3. Type the user name and password. The default user name is `USERID`. The default password is `PASSW0RD`. The password is spelled with a zero, not the letter O.

The serial port is compatible with the standard 16550 Universal Asynchronous Receiver/Transmitter (UART) protocol. The mini-USB serial port is enabled by default.

Configuring the switch through the switch browser-based interface

Note: HTTP is disabled by default. HTTPS is not disabled by default.

Before you can access and start the browser-based interface, make sure that you have completed the following procedures:

- Install the switch in the IBM Flex System chassis.
- Make sure that the switch firmware is installed on the switch.
- Configure at least one IP interface on the switch.

- Enable frames and the JavaScript program in your Web browser.

The following hardware and software are required for the Web interface:

- A frame-capable Web-browser program, such as Internet Explorer (version 6.0 or later), Mozilla Firefox (version 1.0.4 or later), or Netscape Navigator (version 4.7 or later)
- A computer or workstation with network access to the switch

To start the browser-based interface, complete the following steps:

1. Start a Web browser. The Web-browser window opens.
2. In the **URL** field, enter the IP address of the switch, in the following format: http://*xxx.xxx.xxx.xxx*. The login window opens.
3. Enter the switch user ID and password and click **OK**. The default user ID is `USERID`. The default password is `PASSW0RD`. The password is spelled with a zero, not the letter O.

Note: The passwords that are used to access the switch are case-sensitive. To increase system security, change the password after you log on for the first time.

Initial configuration

The operating firmware on the switch contains default configuration files that are installed during the firmware installation. These initial configuration settings are not in a separate configuration file but are components of the firmware. When you restore the management module to factory defaults, the original configuration is restored. For more information about configuring and managing the switch through the management module, see the *Command Reference* for the switch.

Logging in to the switch

The switch supports user-based security that enables you to prevent unauthorized users from accessing the switch or changing its settings.

To log in to the switch, complete the following steps:

1. At the prompt, type your user ID and press Enter. The default user ID is `USERID`.
2. Type your password and press Enter. The default password is `PASSW0RD`. The password is spelled with a zero, not the letter O. The main-menu window opens.

After you log on to the switch, you must set the date and time. See the *Command Reference* for the switch to perform this task and others as needed.

Chapter 3. Updating the firmware and licensing

This chapter describes how to determine the level of the firmware that is installed on the switch, how to obtain the latest level of switch firmware, how to upgrade the firmware, how to acquire additional feature licensing, and how to reset the switch to activate the firmware upgrade.

Determining the level of switch firmware

After you install the switch in the IBM Flex System chassis, make sure that the latest firmware is installed on the switch. To determine the level of the firmware that is installed, complete the following steps:

1. Log on to the management module CLI as described in the switch's *User's Guide* or *CLI Reference Guide*. If necessary, obtain the IP address of the management module from your system administrator.
2. Set the environment to the bay where you installed the switch. For example:

   ```
   system> env -T system:switch[1]
   ```

3. Issue the **info** command to display switch firmware information:

   ```
   system:switch[1]> info
     ...
     Boot ROM
             Rel date:       01/17/2012
             Version:        6.9.1.0
             Status: Active
     Main application
             Rel date:       01/17/2012
             Version:        6.9.1.0
             Status: Active
     Main application
             Rel date:       11/18/2011
             Version:        6.9.0.11
             Status: Inactive
   ```

Obtaining the latest level of switch firmware

The latest firmware update for the IBM Flex System EN2092 1Gb Ethernet Scalable Switch is available at the following site: http://www.ibm.com/supportportal/

Note: Changes are made periodically to the IBM Web site. The procedure for locating firmware and documentation might change from what is described in this document.

Upgrading the switch firmware

You can upgrade the switch firmware by using a TFTP server application. Typically, this firmware runs as an application under your operating system. Make sure that this firmware is installed on your server; then, download the firmware images from http://www.ibm.com/systems/support/ into a directory on your TFTP server. Enable the TFTP server and set its default directory to the one where the image is.

To transfer the firmware image files from the TFTP server to the switch, you can establish a Telnet session through the management module. Ping the TFTP server to make sure that you have a connection. The Telnet session performs optimally if

all three network entities (TFTP server, management module, and switch IP addresses) are on the same subnet. Otherwise, you must use a router and configure a gateway address on the switch. Use the management-module interface to configure the IP addresses of the management module external interface (eth0) and the switch so that they are both on the same subnet as the TFTP server.

Examples of IP addresses and masks are described in the following table.

Network entity	IP address	Mask
TFTP server	192.168.2.178	255.255.255.0
Management module (eth0)	192.168.2.237	255.255.255.0
Switch-module current IP configuration (IF 128)	192.168.2.51	255.255.255.0

Note: With this configuration, you can ping the switch from the TFTP server.

Access the switch command line interface (CLI). Refer to "Configuring the switch through the Telnet interface" on page 20 for more information.

To upgrade the switch firmware, complete the following steps:

1. Log in to the switch.
2. At the CLI prompt, type the following command and press Enter.

   ```
   /boot/gtimg imageX TADDR zzzzz
   ```

   where *imagex* is the image to install and *zzzzz* is the operating-system image file name.
3. At the CLI prompt, type the following command and press Enter.

   ```
   /boot/gtimg boot TADDR yyyy
   ```

   Where *yyyy* is the boot image file name.
4. Press Enter for user name.
5. Enter data path (either *mgt* or *data*).
6. Reset and restart the switch as described in "Resetting and restarting the switch."

Resetting and restarting the switch

To activate the new image or images, you must reset the switch. To reset the switch, complete the following steps:

1. Log on to the management module CLI as described in the switch's *User's Guide* or *CLI Reference Guide*. If necessary, obtain the IP address of the management module from your system administrator.
2. Set the environment to the bay where you installed the switch. For example:

   ```
   system> env -T system:switch[1]
   ```
3. Issue the **reset** command to restart the switch:

   ```
   system:mm[1]> env -T system:switch[1]
   system:switch[1]> reset
   ```
4. Wait approximately 100 seconds for POST to complete.
5. Issue the **info** command for the switch that was just restarted and note the corresponding level of the firmware for the switch. Confirm that the firmware build number reflects the correct firmware release:

```
system:switch[1]> info
 ...
 Boot ROM
         Rel date:       11/18/2011
         Version:        6.9.0.11
         Status: Active
 Main application
         Rel date:       11/18/2011
         Version:        6.9.0.11
         Status: Active
 Main application
         Rel date:       10/21/2011
         Version:        6.8.0.72
         Status: Inactive
```

Acquiring feature licenses

Licenses are available that enable the use of additional ports on the switch:

- Base product: Supports 24Gb full duplex throughput arranged as 14 1Gb ports down and 10 RJ-451Gb ports up
- Upgrade 1: Supports 48Gb full duplex throughput arranged as 28 1Gb ports down and 20 RJ-451Gb ports up
- 10Gb uplinks: Supports 88Gb full duplex throughput arranged as 28 1Gb ports down and 20 RJ-451Gb ports up and four (4) 1Gb/10Gb SFP+ uplink ports up.

The upgrade licenses can be acquired using the IBM System x Features on Demand website http://www.ibm.com/systems/x/fod/.

You can use the website to perform the following tasks:

- Request a new activation key
- Check an authorization code to see what feature it enables and how many remaining times it can be used to create a key
- Retrieve the history of feature activation on a selected device
- Retrieve the history of feature activation on a selected authorization code
- Retrieve a lost authorization code
- Manage your IBM customer number
- Find help for the Features on Demand feature activation process
- Provide feedback to IBM about the Features on Demand process

Note: Your IBM ID and password are required to log into the Features on Demand website. If you are not registered with IBM, go to http://www.ibm.com/systems/x/fod/ and click My IBM registration in the left navigation pane.

Chapter 4. Solving problems

This section provides basic troubleshooting information to help you solve some problems that might occur while you are setting up the switch. The *Application Guide* for the switch provides more details about troubleshooting the switch.

If you cannot locate and correct a problem by using the information in this section, see Appendix A, "Getting help and technical assistance," on page 29.

Running POST

To ensure that it is fully operational, the switch processes a series of tests during power-up or a restart (power-on self-test, or POST). These tests take approximately 1 minute to complete. The management module reads the test results and displays them for you. During normal operation, these tests are completed without error, and the green OK LED is lit. However, if the switch fails POST, the yellow switch error LED and the system-error LED on the IBM Flex System chassis are lit. An event is stored in the event log in the system status panel of the management module. The specific failure is displayed on the system status I/O module panel of the management module.

Note: For the locations and descriptions of the switch LEDs, see "Locating the information panels, LEDs, and external ports" on page 14.

POST errors

There are two types of errors: noncritical and critical. A noncritical error applies to one port, and the switch is operational. You can continue to operate the switch; however, you must replace it as soon as possible. When critical errors occur, the switch does not operate. To view POST results, complete the following steps:

1. Log on to the management module as described in the *IBM Flex System Chassis Management Module Command-Line Interface Reference Guide*. If necessary, obtain the IP address of the management module from your system administrator. The login window opens.
2. Turn off the power to the switch; then, turn it on again.
3. After POST is completed, the management module displays the results. Refresh the window to view the POST results. If a critical error occurs, replace the switch. If a noncritical error occurs, see the switch error log for additional details.

The following table describes the basic critical and noncritical failures. This abbreviated list is representative; it is not an exhaustive list. An error code is associated with each failure. Error codes are displayed on the Management Module Switch Information window. Be sure to note the applicable error code and corresponding failure. You might have to provide this information when you call for service. For details, see Appendix A, "Getting help and technical assistance," on page 29.

Diagnostic indicator (in hex)	Failing functional area	Failure criticality
00 - 7F	Base internal functions	Critical
80 - 9F	Internal interface failures	Noncritical

Diagnostic indicator (in hex)	Failing functional area	Failure criticality
A0 - AF	External interface errors	Noncritical
B0 - FE	Reserved	Noncritical
FF	Switch “good” indicator	Operation

Parts listing

Replaceable components are of three types:

- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Tier 2 customer replaceable unit (CRU):** You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designated for your server.
- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.

For information about the terms of the warranty, see the *Warranty Information* document.

The replaceable components in the following table are Tier 1 CRUs. If other IBM Flex System components require replacement, see the following documentation that comes with these devices:

- *Problem Determination and Service Guide* or *Hardware Maintenance Manual and Troubleshooting Guide*
- *Installation and User's Guide* or *Installation Guide*

Part	CRU number (Tier 1)
IBM Flex System EN2092 1Gb Ethernet Scalable Switch	49Y4296

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system.
- Go to the IBM support website at http://www.ibm.com/supportportal/ to check for technical information, hints, tips, and new device drivers or to submit a request for information.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/supportportal/ and follow the instructions.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM website has up-to-date information about IBM systems, optional devices, services, and support. You can find service information for IBM systems and optional devices at http://www.ibm.com/supportportal/.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems. For information about which products are supported by Support Line in your country or region, see http://www.ibm.com/services/supline/products/.

For more information about Support Line and other IBM services, see http://www.ibm.com/services/, or see http://www.ibm.com/planetwide/ for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to http://www.ibm.com/partnerworld/ and click **Find Business Partners** on the right side of the page. For IBM support telephone numbers, see http://www.ibm.com/planetwide/. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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電話：0800-016-888

IBM Taiwan product service contact information:
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914-499-1900

European Community contact:
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IBM-Allee 1, 71137 Ehningen, Germany
Telephone: +49 7032 15-2937
E-mail: tjahn@de.ibm.com

Germany Class A statement

Deutschsprachiger EU Hinweis:

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International Business Machines Corp.
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Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

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Generelle Informationen:

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中华人民共和国“A类”警告声明

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Index

R

S

T

U

W

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