

IBM Netfinity Fibre Channel Hub  
Type 3523

**Installation and User's Handbook**





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**Note**

Before using this information and the product it supports, be sure to read the general information under Appendix A, "Product Warranties and Notices" on page 39.

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# Safety and Welcome Information

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## Laser Compliance Statement

Some IBM Server products are equipped from the factory with a Gigabit Interface Converter (GBIC). GBICs are also sold separately as options. The GBIC is a laser product. The GBIC is certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products. Elsewhere, the GBIC is certified to conform to the requirements of the International Electrotechnical Commission (IEC) 825 and CENELEC EN 60 825 for Class 1 laser products.

When a GBIC is installed, note the following.



### CAUTION:

**Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

Removing the covers of the GBIC could result in exposure to hazardous laser radiation. There are no serviceable parts inside the GBIC. **Do not remove the GBIC covers.**

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



### DANGER

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

1



**DANGER**

**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.**

**To avoid shock hazard:**

- **The power cord must be connected to a properly wired and earthed receptacle.**
- **Any equipment to which this product will be attached must also be connected to properly wired receptacles.**

**When possible, use one hand to connect or disconnect signal cables to prevent a possible shock from touching two surfaces with different electrical potentials.**

**Electrical current from power, telephone, and communications cables is hazardous. To avoid shock hazard, connect and disconnect cables as described following when installing, moving, or opening covers of this product or attached devices.**



<b>To Connect</b>	<b>To Disconnect</b>
<ol style="list-style-type: none"><li>1. Turn Everything OFF.</li><li>2. First, attach all cables to devices.</li><li>3. Attach signal cables to receptacles.</li><li>4. Attach power cord(s) to outlet.</li><li>5. Turn device ON.</li></ol>	<ol style="list-style-type: none"><li>1. Turn Everything OFF.</li><li>2. First, remove power cord(s) from outlet.</li><li>3. Remove signal cables from receptacles.</li><li>4. Remove all cables from devices.</li></ol>

NOTE: In the UK, by law, the telephone cable must be connected after the power cord.	NOTE: In the UK, the power cord must be disconnected after the telephone cable.
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## Welcome and Thank You

# Welcome and Thank You

We appreciate your decision to purchase an IBM Netfinity Fibre Channel Hub with the Gigabit Interface Converters (GBICs).

The hub comes with a limited three-year on-site warranty. In addition, the Startup Support Program provides coverage to customers during the first 90 days after installation at no additional charge.\*

This comprehensive program enhances IBM's support for setup, installation, configuration, and problem determination. It provides assistance for popular network operating systems and network adapters from IBM and non-IBM vendors. In the U.S. and Puerto Rico, call IBM at 1-800-772-2227; in Canada, call 1-800-565-3344; or in the United Kingdom, call 01705-565000 or 0161-9056001 if you need assistance.

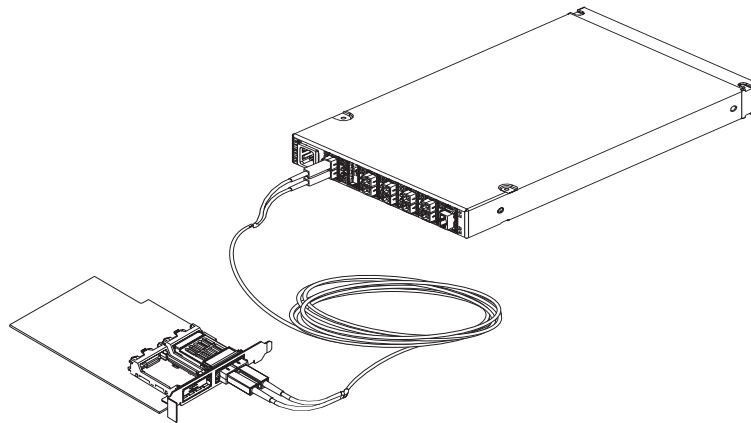
In all other countries, contact the IBM support organization that services your area, your IBM marketing representative, or your IBM reseller.

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\* Service availability will vary by country. Response time will vary depending on the number and nature of calls received.

## Chapter 1. Hub Description and Features

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The IBM Fibre Channel Hub is a 7-port central interconnection for Fibre Channel Arbitrated Loops that follow the ANSI FC-AL standard. Each Fibre Channel Hub port receives serial data from an attached node and retransmits the data out of the next hub port to the next node attached in the loop. Each reception includes data regeneration (both signal timing and amplitude) supporting full-distance optical links.

The Fibre Channel Hub detects any loop node that is missing or is inoperative and automatically routes the data to the next operational port and attached node in the loop. LED indicators provide status information to indicate whether the port is active or bypassed.

Each port requires a Gigabit Interface Converter (GBIC) to connect it to each attached node. The Fibre Channel Hub supports any combination of short-wave or long-wave optical GBICs. The GBICs are *hot-pluggable* into the Fibre Channel Hub, which means you can add host computers, servers, and storage modules to the arbitrated loop dynamically without powering off the Fibre Channel Hub or any connected devices. If you remove a GBIC from a Fibre Channel Hub port, that port is automatically bypassed. The remaining hub ports continue to operate normally with no degradation of system performance. Conversely, if you plug a GBIC into the Fibre Channel Hub, it will automatically be inserted and become a node on the loop if valid Fibre Channel data is received from the device.

Data transfer within the Fibre Channel Hub is implemented in serial differential Positive Emitter Coupled Logic (PECL) AC coupled logic. Each Fibre Channel Hub port monitors the serial data input stream as well as the GBIC connected to it.

The following conditions will cause the Fibre Channel Hub to bypass a port:

- TX\_FAULT: Detects a GBIC transmitter fault.
- RX\_LOS: Detects a loss of received signal amplitude from the device.
- MOD\_DEF: Detects the absence of a GBIC.

The Fibre Channel Hub circuitry detects off-frequency data, excessive jitter, or inadequate edge transition density on a per-port basis. The Fibre Channel Hub uses the standardized AMP SCA2 20-pin connector to implement hot plugging. Surge currents, caused by hot plugging, are minimized by slow-start circuitry and a pin-sequencing procedure on the GBIC. Electrostatic discharge (ESD) transients are minimized by means of sequenced connector contacts.

The Fibre Channel Hub includes a universal power supply that can operate from 95 to 250 Vac and from 50 to 60 Hz.

## **Fibre Channel-Arbitrated Loop**

The Fibre Channel-Arbitrated Loop (FC-AL) is an ANSI standard (X3T11) product designed to provide shared bandwidth over low-cost media. Early adapters primarily use the SCSI protocol transported over Fibre Channel for distributed server and storage-cluster applications. The Fibre Channel Hub is a central point of interconnection designed to maintain a fault-tolerant physical loop topology. The Fibre Channel Hub can also be used to implement configurations which extend the size of the FC-AL loop to its maximum size of 127 active loop ports (includes one optional Fabric-Loop port).

## Features at a Glance

The following list summarizes the features of the hub:

- Seven configurable media-interface optical ports provide a high performance and distance alternative.
- Plug and Play provides fault tolerance for online system configuration changes.
- Modular Gigabit Interface Converter (GBIC) transceiver design allows you to use ports when needed.
- Cascadable ports allows up to 127 connections (where one port is reserved for connection to fabric or switch active ports) or support of multiple loop implementations.
- Simplified cable management can be used for centralized storage management applications.
- Hot pluggable GBIC provides an optimal solution for entry storage interconnect needs.
- Half-rack width (1U = 1.75 in.) low profile hub packaging offers highest port density in single 1 unit height rack mount.
- Auto-sensing power-supply - supports 95 to 250 VAC and 50 to 60 Hz.

**Features at a Glance**

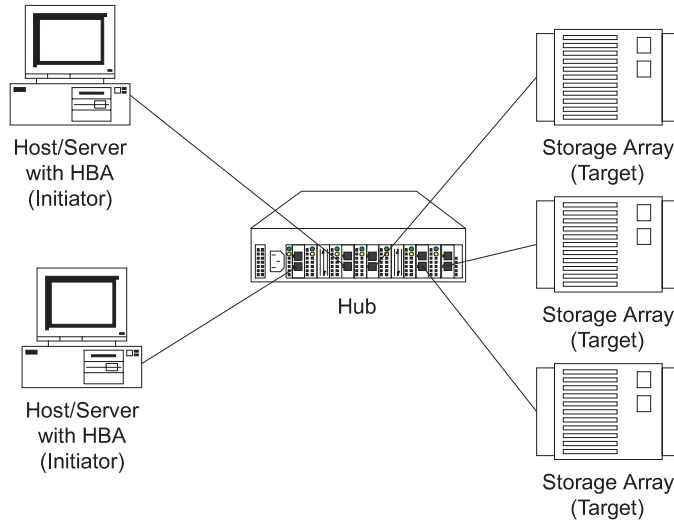
## Chapter 2. Introduction to Applications and Configurations

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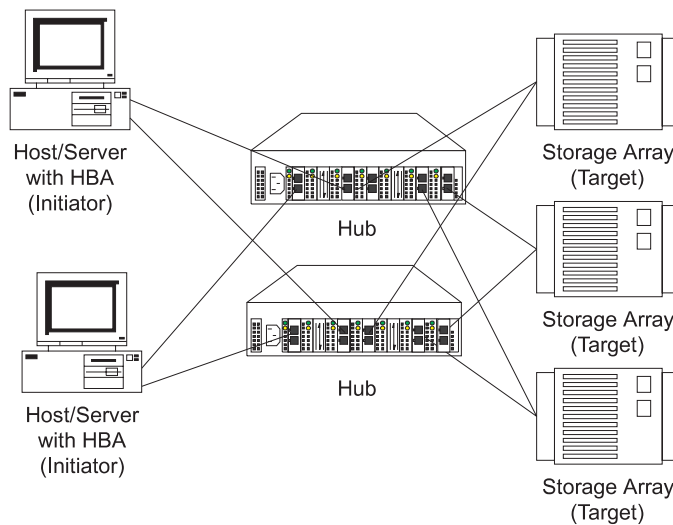
The Fibre Channel Hub is designed to provide a centralized point of connectivity, to provide loop fault tolerance, and to simplify configuration management. Specifically designed for FC-AL applications, the hub provides considerable flexibility in configuring loops and segmenting them for performance or high-profile availability applications.

### Applications and Configurations

The Fibre Channel Hub modular interface provides flexibility and is upgradable to available short-wave and long-wave optical Fibre Channel product port interfaces. Fibre Channel products that are commonly interconnected to the Fibre Channel Hub are Fibre Channel host bus adapters, FC-AL storage devices, and FC-AL storage arrays. SCSI initiators (workstations and servers) set up and initiate the transfer of data to or from the storage devices. The storage devices that receive the requests made by the SCSI initiators are the SCSI targets. Initiators and targets represent individual nodes that are linked by the shared FC-AL.



In some circumstances, redundancy for loop fail-over protection requires the implementation of dual loops, as represented in the following figure.



## Gigabit Interface Converter (GBIC) Choices

The Fibre Channel Hub is designed with seven modular user configurable interface ports. These seven ports comply with the GigaBit Interface Converter (GBIC) Specification. GBICs are currently available in two media types. You can select the appropriate media for a particular application or topology:

- Short-wave optical
- Long-wave optical



## Short-Wave Optical GBIC Features

Some features of the short-wave optical GBIC include:

- Compliant with Fibre Channel FC-PH-2 physical layer option 100-M5-SN-I
- Full-speed: 1.0625 Gbps
- Wavelength: 780 nm
- Non-OFC laser
- Supports multimode 50  $\mu\text{m}$  fiber (2 meters/minimum, 500 meters/maximum)
- Uses dual SC fiber optic connectors

## Long-wave Optical GBIC Features

Some features of the long-wave optical GBIC include:

- Full-speed: 1.0625 Gbps
- Uses single-mode 9  $\mu\text{m}$  fiber
- Wavelength: 1310 nm
- Non-OFC laser
- Uses dual SC fiber optic connectors
- Fiber lengths: 2 meters minimum, 10 kilometers maximum



## Chapter 3. Assembling a Fibre Channel Hub

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This chapter lists the contents of your Fibre Channel Hub package and includes assembly instructions. Be sure to review the contents of your package and compare it with the items listed. If you are missing any items, contact your IBM marketing representative or IBM reseller.

### Shipping Contents

The following items have been included in your Fibre Channel Hub package:

- 1 Seven-port Fibre Channel Hub
- 1 Power cord
- 4 Short wave GBICs
- 1 Tray bezel
- 1 19 in. rack tray
- 8 Nut clips, M6
- 8 Nut clips, 10-32
- 8 Screws, M6 x 16L black
- 8 Screws, 10-32 x 3/8 in. black
- 4 Screws, 6-32 x 1/4 in. Philips head 100 degree flat head
- 4 Self-adhesive pads for desktop installation

*Note:* The fiber optic cables do not come with the hub and must be ordered separately. To order, call your IBM reseller or IBM marketing representative.

If you are installing the Fibre Channel Hub in a rack, see “Installing the Fibre Channel Hub in a Rack” on page 10 for instructions. If you are installing the Fibre Channel Hub on a desktop, see “Installing the Fibre Channel Hub on a Desktop” on page 13 for instructions.

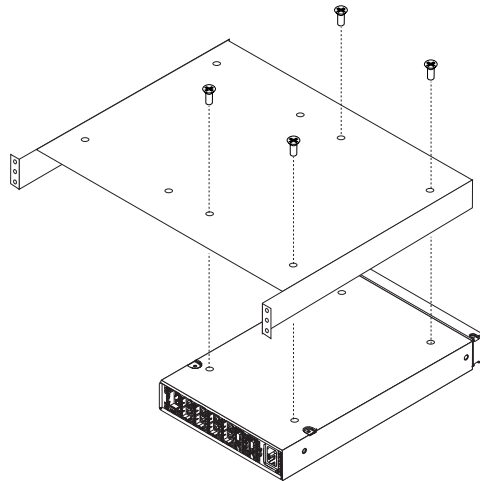
## Installing the Fibre Channel Hub in a Rack

The Fibre Channel Hub comes with a tray and bezel to enable you to install it in a rack.

*Note:* Two people might be needed for this procedure.

To install the Fibre Channel Hub in the rack, follow these instructions:

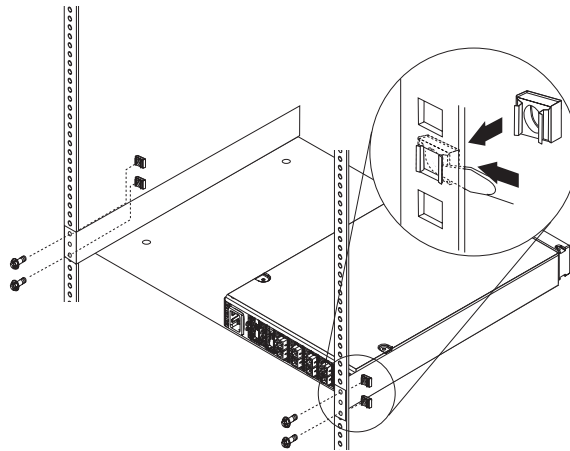
1. Turn the hub upside down and place it on a flat surface.
2. Turn the tray upside down and place it on the hub.
3. Align the four holes in the tray with the holes in the hub. Line up the back lip of the tray with the back side of the hub.
4. Using a Philips head screw driver, install the four smaller screws in the aligned holes.



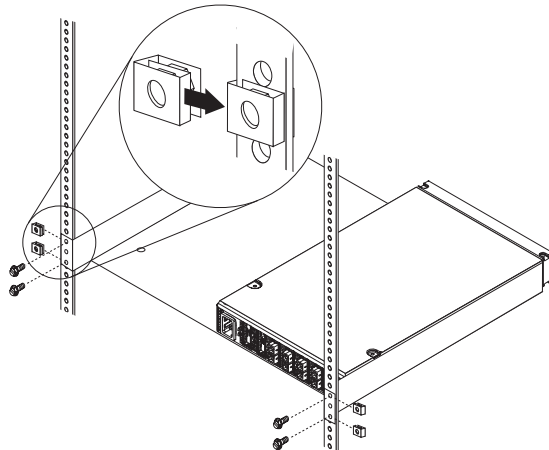
5. Turn the tray over so that the hub is on top of the tray.

6. Find the rack position into which you are installing the Fibre Channel Hub; then, take four clip nuts and install them in the rear of the rack. Make sure you have installed one in each screw hole you will be using for the tray installation.

If your rack has square holes, snap the M6 clip nuts into place on the rear of the rack.



If your rack has round holes, slide the 10-32 clip nuts into place on the rear of the rack.

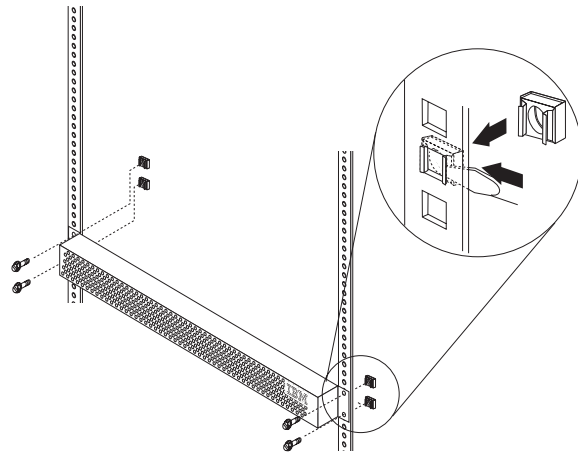


7. Pick up the tray and line up the top and bottom screw holes with the clip nuts on the rack. While holding the tray in place, install four of the larger screws.

If your rack has square holes and you used the M6 clip nuts, use the M6 hex washer headed screws.

If your rack has round holes and you used the 10-32 clip nuts, use the 10-32 hex washer headed screws.

8. Install the remaining four nut clips in the front of the rack. Be sure to line them up opposite the hub and tray.
9. Line up the top and bottom bezel screw holes with the clip nuts on the rack. While holding the bezel in place, install four of the larger screws.



If your rack has round holes, use the 10-32 clip nuts and hex washer headed screws.

10. See “Setting Up and Configuring the FC-AL” on page 14 to complete the installation.

## **Installing the Fibre Channel Hub on a Desktop**

The Fibre Channel Hub is shipped with four self-adhesive rubber pads. These rubber pads are designed to prevent damage to your desk surface.

To install the rubber pads:

1. Place the hub upside down so the case bottom is facing up.
2. Remove the wrapping and install one self-adhesive pad on each scribed area close to the corners of the hub.
3. Turn the hub over and place it on your desk.
4. Continue with “Setting Up and Configuring the FC-AL” on page 14 to complete the installation.

## Setting Up and Configuring the FC-AL

The following sections contain the information necessary to initially set up or make configuration changes to an FC-AL using the Fibre Channel Hub.

Installation tips:

- The GBIC housing has an integral guide key that is designed to prevent improper insertion.
- Use minimal pressure when inserting a GBIC into a port. Forcing a GBIC into a port might cause damage to the GBIC or the port.
- GBICs are hot pluggable. You can insert or remove a GBIC while the hub is powered on.
- The operational loop performance is not affected when you install or remove a GBIC.
- If you insert a GBIC without media attached, it will remain in the **bypassed** state. When you attach media to the GBIC and it detects a valid receive signal, the Fibre Channel Hub will allow the GBIC and the attached devices to join the loop.
- Unused ports, improperly seated GBICs, or GBICs that do not receive a valid input signal will remain in the bypass state and will not affect the operation of the FC-AL.
- For cable management information, go to <http://www.pc.ibm.com/support> on the World Wide Web.

**Attention:** To avoid damage to your fibre optic cables, follow these guidelines:

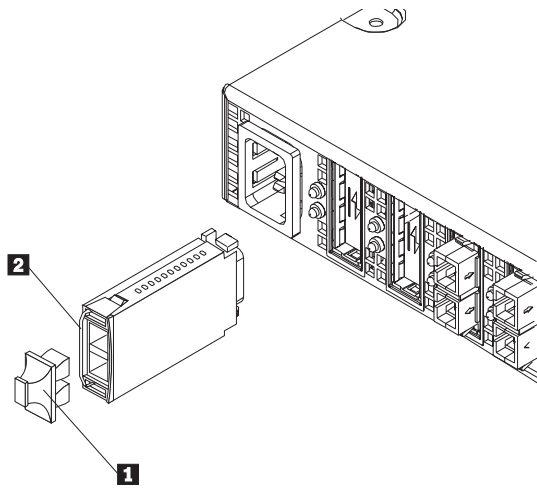
- Do not route the cable along a folding cable management arm.
- When attaching to a device on slides, leave enough slack in the cable so that it does not bend to a radius smaller than 3 inches when extended or become pinched when retracted.
- Route the cable away from places where it can be snagged by other devices in the rack.
- Do not over tighten the cable ties or bend the cables to a radius smaller than 3 inches.
- Do not put excess weight on the cable at the connection point and be sure it is well supported.



## Installing the GBIC

There are several different types of GBICs available. You can insert any type of GBIC into any available hub port.

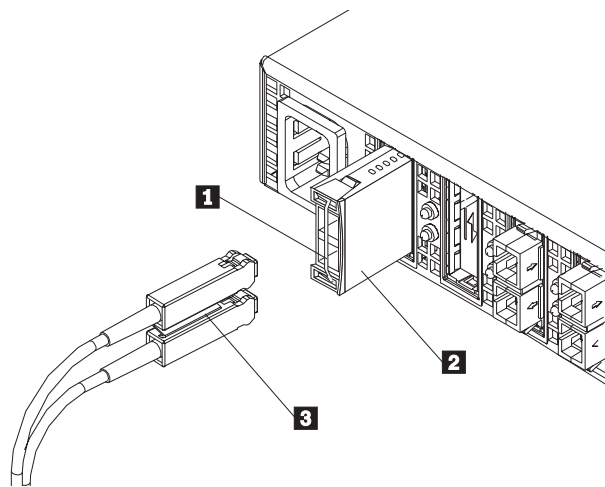
1. Remove the plastic cover **1** from the GBIC **2**.



2. Insert the cables into the GBIC.

If the GBIC you are installing has a metal latch, move the latch to the unlocked (center) position **1**. Slide the GBIC **2** into the port, then move the GBIC latch back to the locked position (flush with the rear of the GBIC). Connect the fibre optic cable **3** to the installed GBIC.

If the GBIC you are installing does not have a metal latch, slide the GBIC **2** into the port. Connect the fibre-optic cable **3** to the installed GBIC.



For cable management information, go to <http://www.pc.ibm.com/support/> on the World Wide Web.

## Removing a Gigabit Interface Converter (GBIC)

To remove a GBIC that does not have a metal latch from the hub port:

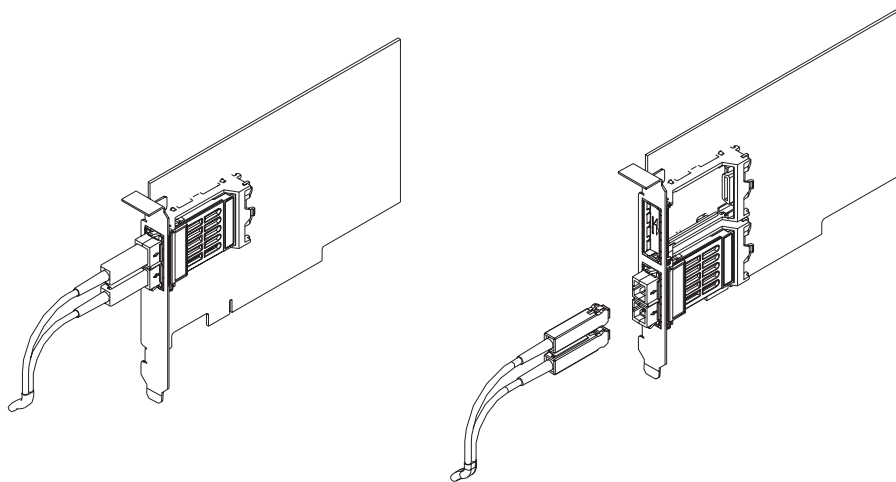
1. Press the opposing tabs on the GBIC toward each other while slowly removing the module from the hub (with the fiber optic cables still installed).
2. Remove the cable assembly from the GBIC.

To remove a GBIC that has a metal latch from the hub port: (If necessary, refer to the artwork shown “Installing the GBIC” on page 15.)

1. Remove the fiber optic cable assembly from the GBIC.
2. Move the latch to the unlocked (center) position.
3. Press the opposing tabs on the GBIC toward each other while slowly removing it from the port.

## Attaching a GBIC to Initiators and Targets

You must attach the cable assembly to the node or loop of nodes that the particular port supports. The following are examples of host bus adapters with a GBIC attached.

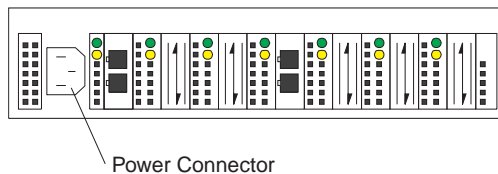


## Power Up Systems Check

Once you have installed all the appropriate cabling, the FC-AL is operational. Power on the storage modules first, then the controller and the Fibre Channel Hub, then everything else. Make sure you power on the host adapter after the hub has been powered on to insure proper loop initialization.

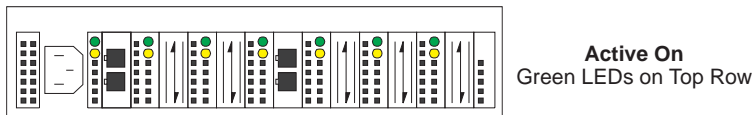
To insure proper operation:

1. Connect the power cord to the Fibre Channel Hub, then to the electrical outlet.



2. Turn on the attached FC-AL compatible nodes.

3. Check the Device Active (green) LEDs on the Fibre Channel Hub ports.

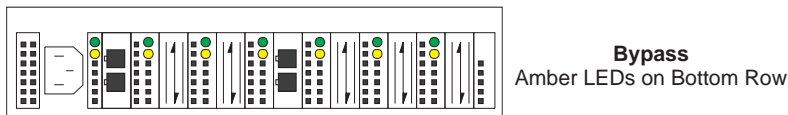


**LED On** This indicates that a GBIC is present and functioning properly.

**LED Off** This indicates a fault condition. Examples of a fault condition include: a GBIC transmitter fault, an improperly seated GBIC, an absent GBIC, or another failed device. The port will be in the bypass state, which precludes the port from participating in the FC-AL. This is the normal status of operation for Fibre Channel Hub ports in which GBICs are not installed.

*Note:* FC-AL compatible nodes must perform loop initialization procedures at power-up to function properly on the loop. The Fibre Channel driver software on FC-AL nodes performs the loop initialization or re-initialization depending on its prior state of operation.

4. Check the Port Bypass (amber) LEDs.



**LED On** If the Active (green) LED of the port is off, the port is nonoperational and the Bypass (amber) LED for the port is on. If a properly functioning port (the Active green LED is on) with a GBIC present also has the Bypass LED on, either the loss of signal or poor signal integrity has caused the port to go into the bypass state. When the port is in this state, it cannot participate in the FC-AL.

The bypass state is also the normal status condition when no GBIC is present in the port, a GBIC is present but not attached to a FC-AL node, or a GBIC

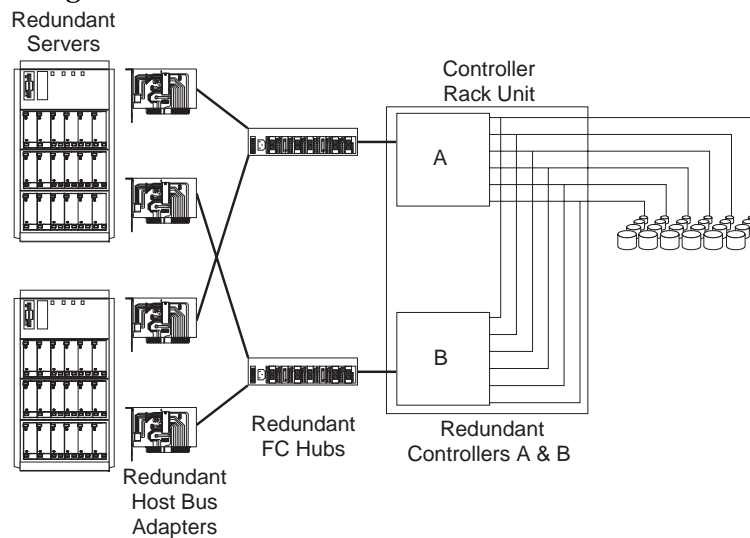
is attached to a cable assembly with nothing attached at the opposite end. Replacing such a port (or removing and reinserting the GBIC into the same port twice) is considered to be a loop configuration change which invokes the Loop Initialization Procedure.

**LED Off** This indicates that the Fibre Channel Hub port and device are fully operational and actively participating in the FC-AL.

5. The FC-AL should be fully operational at this point. However, it is a good idea to check that proper loop discovery has taken place and all required devices are participating in the loop. Some host bus adapters might provide this level of functionality or it might be resident in the application software on the host operating system.

## Redundant Fibre Channel-Arbitrated Loop Configurations

Use a dual loop configuration design for applications requiring loop redundancy for maximum uptime. A second, independent Fibre Channel Hub is required for the redundant loop. Many host bus adapters and storage modules have dual ports to support dual-loop configurations.







## Chapter 4. Troubleshooting

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Installation and operational problems in an arbitrated loop environment are typically caused by one of the following:

- Faulty cabling or cable connector
- Incorrect cable length
- Faulty GBIC
- Invalid Fibre Channel signaling from the host bus adapter (HBA) or disk array
- Device driver or microcode conflicts between the HBAs and other devices.

The following information will help you to isolate and correct the physical layer problems. For protocol-related problems, such as inoperability between devices, see the documentation that came with the individual devices.

### Port Status LEDs

The hub provides two status LEDs for each port. Use these LEDs to help you quickly diagnose and recover from problems.

The upper, green LED is lit when you install an operational GBIC. The lower, amber LED is lit when the port is in the bypass mode. In the bypass mode, a port is disabled, which prevents erratic signals or data from disrupting loop activity. The bypass mode could be triggered by the loss of valid signal or by a GBIC fault. The combination of green and amber LEDs indicate the four following states.

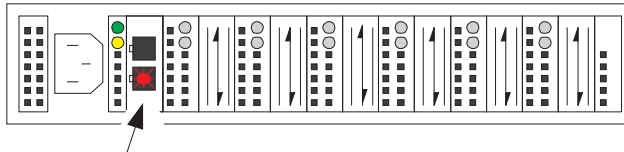
Green LED	Amber LED	Port State
Off	Off	No GBIC Installed
On	Off	Operational GBIC; Valid Signal
Off	On	Faulty GBIC; Port Bypassed
On	On	Operational GBIC; No Valid Signal; Port Bypassed

## Verifying GBIC and Cable Signal Presence

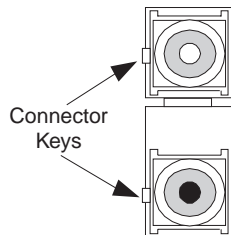
### CAUTION:

**Do not look directly at the GBIC transmitter or the fiber optic cable ends. A low intensity laser beam is emitted from the fiber optic cable ends.**

In addition to verifying port LED status, you can verify signal presence by using a mirror to look for a light at the fiber-optic cable ends and the GBIC transmitter. To verify signal presence at the hub end of a link, insert a GBIC into the hub and place a mirror at the bottom of the SC connector. If a signal is present, you will see a low intensity red light in the mirror reflecting from the GBIC transmitter.



To verify the integrity of the fiber optic cable at the node end of a link, make sure the cable is attached to the GBIC at the hub and the hub is turned on. Dual SC fiber-optic cable connectors are keyed and will insert into a GBIC in one direction only. Place a mirror at the node end of the link. A low intensity red light is visible in the mirror reflection of one of the SC leads, as shown in the following illustration.



If a fiber-optic cable has good transmitter throughput but a broken or degraded receiver lead, the end node might sense a *loop down* state. Because the transmitter is good, the hub responds to the end node valid Fibre Channel signal and adds the device to the loop.

But, because the end node is not receiving Fibre Channel signals, it will stream loop-down sequences onto the loop. This prevents all data communications among the devices on the loop and will continue to do so until the condition is corrected.

To verify the integrity of the fiber-optic cable at the hub end, make sure the fiber-optic cable is plugged into the host bus adapter at the host or into a disk-array controller and that the device is turned on. Using a mirror, examine the cable SC leads to verify that a low-intensity red light is visible on the receiver lead.

Some fiber optic cables are marked with an "A" on the receiver lead and a "B" on the transmitter lead. Some multimode cables plugged into a GBIC, HBA, or disk array controller are key-oriented with the "B" lead inserted into the device transmitter. Place a mirror on the opposite end of the cable to see the low-intensity red light on the "A" receiver lead.

## Troubleshooting Chart

Refer to the following chart to perform troubleshooting.

Problem	Action
GBICs installed in one or more ports but no LED is lit.	Verify that the power cord is firmly seated into the hub and is connected to a powered circuit.
GBIC is installed but only an amber light is lit.	Reseat the GBIC. If the same condition occurs, replace the GBIC.
GBIC is installed and both green and amber lights are lit.	<p>The hub is not receiving a valid Fibre Channel signal from the end node (HBA or disk array). Do the following:</p> <ol style="list-style-type: none"> <li>1. Unplug the fiber cable from the node and, using a mirror, verify that an optical signal is present on the cable receiver lead. If no red light is visible, replace the cable.</li> <li>2. Using a mirror, examine the SC connectors on the HBA or disk controller. If no red light is visible on the transmitter lead, do one of the following: <ul style="list-style-type: none"> <li>• Restart the device.</li> <li>• Reinstall the device drivers.</li> <li>• Have the HBA or disk controller serviced.</li> </ul> </li> <li>3. If a light is present on both the cable lead and the end node, have the HBA or the disk controller serviced.</li> </ol>
GBIC is installed, only the green LED is lit, but no communication occurs between the devices.	<p>The hub is receiving a valid Fibre Channel signal from the end device (HBA or disk), but no upper-level protocols are active.</p> <ul style="list-style-type: none"> <li>• Verify that the proper HBA device drivers are loaded for the appropriate operating system and that the host has been configured to recognize the attached disk devices.</li> <li>• Unplug the fiber cable from the end node and verify that an optical signal is present on the cable receiver lead. If no signal is present, the receiver lead of the cable might be defective and the device is streaming loop-down sequences to the hub. Replace the cable.</li> </ul>

## Chapter 5. Getting Help, Service, and Information

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If you need help, service, technical assistance, or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you.

For example, IBM maintains pages on the World Wide Web where you can get information about IBM products and services, find the latest technical information, and download device drivers and updates. Some of these pages are:

<a href="http://www.ibm.com">http://www.ibm.com</a>	Main IBM home page
<a href="http://www.pc.ibm.com">http://www.pc.ibm.com</a>	IBM Personal Computing
<a href="http://www.pc.ibm.com/support">http://www.pc.ibm.com/support</a>	IBM Personal Computing Support
<a href="http://www.pc.ibm.com/us/desktop/">http://www.pc.ibm.com/us/desktop/</a>	IBM Commercial Desktop (U.S.)
<a href="http://www.pc.ibm.com/us/intellistation/">http://www.pc.ibm.com/us/intellistation/</a>	IBM IntelliStation (U.S.)
<a href="http://www.pc.ibm.com/us/netfinity/">http://www.pc.ibm.com/us/netfinity/</a>	IBM Netfinity and PC Servers (U.S.)
<a href="http://www.pc.ibm.com/us/options/">http://www.pc.ibm.com/us/options/</a>	IBM Options (U.S.)

You can select a country-specific Web site from these pages.

Help is also available from bulletin boards and online services, as well as by fax and telephone. This section provides information about these sources.

Services available and telephone numbers listed are subject to change without notice.

### Service Support

With the original purchase of an IBM hardware product, you have access to extensive support coverage. During the IBM hardware product warranty period, you may call the IBM Personal Computer HelpCenter (1-800-772-2227 in the U.S.) for hardware product assistance covered under the terms of the IBM Statement of Limited

Warranty. See “Getting Help by Telephone” on page 32 for HelpCenter telephone numbers in other countries.

The following services are available during the warranty period:

- Problem Determination - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- IBM Hardware Repair - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.
- Engineering Change Management - Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make Engineering Changes (ECs) available that apply to your hardware.

Be sure to retain your proof of purchase to obtain warranty service.

Please have the following information ready when you call:

- Machine Type and Model
- Serial numbers of your IBM hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

If possible, be at your computer when you call.

The following items are not covered:

- Replacement or use of non-IBM parts or nonwarranted IBM parts  
*Note:* All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of software problem sources
- Configuration of BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

Refer to the IBM Statement of Limited Warranty for a full explanation of IBM's warranty terms.

## **Before You Call for Service**

Many computer problems can be solved without outside assistance, by using the online help or by looking in the online or printed documentation that comes with your computer or software. Also, be sure to read the information in any README files that come with your software.

Most computers, operating systems, and application programs come with documentation that contains troubleshooting procedures and explanations of error messages. The documentation that comes with your computer also contains information about the diagnostic tests you can perform.

If you receive a POST error code when you turn on your computer, refer to the POST error-message charts in your hardware documentation. If you do not receive a POST error code, but suspect a hardware problem, refer to the troubleshooting information in your hardware documentation or run the diagnostic tests.

If you suspect a software problem, consult the documentation (including README files) for the operating system or application program.

## **Getting Customer Support and Service**

Purchasing an IBM PC hardware product entitles you to standard help and support during the warranty period. If you need additional support and services, a wide variety of extended services are available for purchase that address almost any need.

## **Using Electronic Support Services**

If you have a modem, you can get help from several popular services. Bulletin boards and online information services provide assistance through question-and-answer message areas, live chat rooms, searchable databases, and more.

Technical information is available on a wide range of topics, such as:

- Hardware setup and configuration
- Preinstalled software
- OS/2, DOS, and Windows
- Networking
- Communications
- Multimedia

In addition, the latest device driver updates are available.

The IBM Bulletin Board System (BBS) can be reached 24 hours a day, 7 days a week. Modem speeds of up to 14 400 baud are supported. Long distance telephone charges might apply. To access the IBM BBS:

- In the U.S., call 1-919-517-0001.
- In Canada:
  - In Montreal, call 514-938-3022.
  - In Toronto, call 905-316-4255 or 416-956-7877.
  - In Vancouver, call 604-664-6464.
- In the U.K., call 01256 336655.

Commercial online services that contain information about IBM products include:

- CompuServe  
Use the following GO words: APTIVA, IBMPS2, ThinkPad, PowerPC, ValuePoint, IBMSVR, or IBMObI.
- PRODIGY  
Use the Jump command; type **IBM** and select **PC Product Support**.
- America Online  
Use the “Go to” keyword **IBM Connect**.

## Using the World Wide Web

On the World Wide Web, the IBM Personal Computing Web site has up-to-date information about IBM Personal Computer products and



support. The address for the IBM Personal Computing home page is:

<http://www.pc.ibm.com>

You can find support information for your IBM products, including supported options, on the IBM Personal Computing Support page at:

<http://www.pc.ibm.com/support>

If you select Profile from the support page, you can create a customized support page that is specific to your hardware, complete with Frequently Asked Questions, Parts Information, Technical Hints and Tips, and Downloadable Files. You will have the information you need, all in one place. In addition, you can choose to receive e-mail notifications whenever new information becomes available about your registered products. You also can access online support forums, which are community sites monitored by IBM support staff.

For information about specific Personal Computer products, visit the following pages:

<http://www.pc.ibm.com/us/intellistation/>

<http://www.pc.ibm.com/us/desktop/>

<http://www.pc.ibm.com/us/netfinity/>

<http://www.pc.ibm.com/us/thinkpad/>

<http://www.pc.ibm.com/us/options/>

<http://www.pc.ibm.com/us/aptiva/>

You can select a country-specific Web site from these pages.

## Getting Information by Fax

If you have a touch-tone telephone and access to a fax machine, in the U.S. and Canada you can receive by fax marketing and technical information on many topics, including hardware, operating systems,

and local area networks (LANs). You can call the IBM Automated Fax System 24 hours a day, 7 days a week. Follow the recorded instructions, and the requested information will be sent to your fax machine.

To access the IBM Automated Fax System, do the following:

- In the U.S., call 1-800-426-3395.
- In Canada, call 1-800-465-3299.

## Getting Help Online

Online Housecall is a remote communication tool that allows an IBM technical-support representative to access your PC by modem. Many problems can be remotely diagnosed and corrected quickly and easily. In addition to a modem, a remote-access application program is required. This service is not available for servers. There might be a charge for this service, depending on the request.

For more information about configuring your PC for Online Housecall:

- In the U.S., call 1-800-772-2227.
- In Canada, call 1-800-565-3344.
- In all other countries, contact your IBM reseller or IBM marketing representative.

## Getting Help by Telephone

During the warranty period, you can get help and information by telephone through the IBM PC HelpCenter. Expert technical-support representatives are available to assist you with questions you might have on the following:

- Setting up your computer and IBM monitor
- Installing and setting up IBM options purchased from IBM or an IBM reseller
- 30-day, preinstalled-operating-system support
- Arranging for service (on-site or carry-in)
- Arranging for overnight shipment of customer-replaceable parts

In addition, if you purchased an IBM PC Server or IBM Netfinity Server, you are eligible for IBM Start Up Support for 90 days after installation. This service provides assistance for:

- Setting up your network operating system
- Installing and configuring interface cards
- Installing and configuring network adapters

Please have the following information ready when you call:

- Machine Type and Model
- Serial numbers of your computer, monitor, and other components, or your proof of purchase
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information for your system

If possible, be at your computer when you call.

In the U.S. and Canada, these services are available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9:00 a.m. to 6:00 p.m.<sup>1</sup>

Country		Telephone number
Austria	Österreich	1-546 585 075
Belgium - Dutch	Belgie	02-717-2504
Belgium - French	Belgique	02-717-2503
Canada	Canada	1-800-565-3344
Denmark	Danmark	03-525-6905
Finland	Suomi	9-22-931805
France	France	01-69-32-40-03

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<sup>1</sup> Response time will vary depending on the number and complexity of incoming calls.

<b>Country</b>		<b>Telephone number</b>
Germany	Deutschland	069-6654-9003
Ireland	Ireland	01-815-9207
Italy	Italia	02-4827-5003
Luxembourg	Luxembourg	298-977-5060
Netherlands	Nederland	020-504-0531
Norway	Norge	2-305-3203
Portugal	Portugal	01-791-5147
Spain	España	091-662-4270
Sweden	Sverige	08-632-0063
Switzerland - German	Schweiz	01-212-1810
Switzerland - French	Suisse	022-310-0418
Switzerland - Italian	Svizzera	091-971-0523
United Kingdom	United Kingdom	01475-555555
U.S.A. and Puerto Rico	U.S.A. and Puerto Rico	1-800-772-2227

In all other countries, contact your IBM reseller or IBM marketing representative.

## Getting Help Around the World

If you travel with your computer or need to move it to another country, you can register for International Warranty Service. When you register with the International Warranty Service Office, you will receive an International Warranty Service Certificate that is honored virtually worldwide, wherever IBM or IBM resellers sell and service IBM PC products.

For more information or to register for International Warranty Service:

- In the U.S. or Canada, call 1-800-497-7426.
- In Europe, call 44-1475-893638 (Greenock, U.K.).
- In Australia and New Zealand, call 61-2-9354-4171.

In all other countries, contact your IBM reseller or IBM marketing representative.

## **Purchasing Additional Services**

During and after the warranty period, you can purchase additional services, such as support for IBM and non-IBM hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and name might vary by country.

### **Enhanced PC Support Line**

Enhanced PC Support is available for desktop and mobile IBM computers that are not connected to a network. Technical support is provided for IBM computers and IBM or non-IBM options, operating systems, and application programs on the Supported Products list.

This service includes technical support for:

- Installing and configuring your out-of-warranty IBM computer
- Installing and configuring non-IBM options in IBM computers
- Using IBM operating systems in IBM and non-IBM computers
- Using application programs and games
- Tuning performance
- Installing device drivers remotely
- Setting up and using multimedia devices
- Identifying system problems
- Interpreting documentation

You can purchase this service on a per-call basis, as a multiple-incident package, or as an annual contract with a

10-incident limit. For more information about purchasing Enhanced PC Support, see “Ordering Support Line Services” on page 36.

## 900-Number Operating System and Hardware Support Line

In the U.S., if you prefer to obtain technical support on a pay-as-you-go basis, you can use the 900-number support line. The 900-number support line provides support for IBM PC products that are out of the warranty period.

To access this support, call 1-900-555-CLUB (2582). You will be notified of the charge per minute.

## Network and Server Support Line

Network and Server Support is available for simple or complex networks made up of IBM servers and workstations using major network operating systems. In addition, many popular non-IBM adapters and network interface cards are supported.

This service includes all of the features of the Enhanced PC Support Line, plus:

- Installing and configuring client workstations and servers
- Identifying system problems and correcting problems on the client or the server
- Using IBM and non-IBM network operating systems
- Interpreting documentation

You can purchase this service on a per-call basis, as a multiple-incident package, or as an annual contract with a 10-incident limit. For more information about purchasing Network and Server Support, see “Ordering Support Line Services.”

## Ordering Support Line Services

Enhanced PC Support Line and Network and Server Support Line services are available for products on the Supported Products list. To receive a Supported Products list:

- In the U.S.:

1. Call 1-800-426-3395.
  2. Select document number 11683 for Network and Server support.
  3. Select document number 11682 for Enhanced PC support.
- In Canada, contact IBM Direct at 1-800-465-7999, or:
    1. Call 1-800-465-3299.
    2. Select the HelpWare catalog.
  - In all other countries, contact your IBM reseller or IBM marketing representative.

For more information or to purchase these services:

- In the U.S., call 1-800-772-2227.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your HelpCenter.

## Warranty and Repair Services

You can upgrade your standard hardware warranty service or extend the service beyond the warranty period.

Warranty upgrades in the U.S. include:

- Carry-in service to on-site service  
If your warranty provides carry-in repair service, you can upgrade to on-site repair service, either standard or premium. The standard upgrade provides a trained servicer within the next business day (9 a.m. to 5 p.m., local time, Monday through Friday). The premium upgrade provides 4-hour average response, 24 hours a day, 7 days a week.
- On-site service to premium on-site service  
If your warranty provides for on-site service, you can upgrade to premium on-site service (4-hour average on-site response, 24 hours a day, 7 days a week).

You also can extend your warranty. Warranty and Repair Services offers a variety of post-warranty maintenance options, including ThinkPad EasyServ Maintenance Agreements. Availability of the services varies by product.

For more information about warranty upgrades and extensions:

- In the U.S., call 1-800-426-4968.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your IBM reseller or IBM marketing representative.

## **Ordering Publications**

Additional publications are available for purchase from IBM. For a list of publications available in your country:

- In the U.S., Canada, and Puerto Rico, call 1-800-879-2755.
- In other countries, contact your IBM reseller or IBM marketing representative.



## Appendix A. Product Warranties and Notices

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This appendix contains warranty and emission notices for the United States, Puerto Rico, Canada, and the United Kingdom. In addition, this appendix contains trademarks and general-information notices.

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## Product Warranties and Notices

### Warranty Statements

The following warranty statements are for the United States, Canada, Puerto Rico, and the United Kingdom.

#### United States, Canada and Puerto Rico

The following is the statement of limited warranty for the United States, Canada, and Puerto Rico.

International Business Machines Corporation

Armonk, New York, 10504

#### Statement of Limited Warranty

*The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you originally purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. If you have any questions, contact IBM or your reseller.*

**Machine:** IBM Netfinity Fibre Channel Hub

**Warranty Period\*:** Limited Three-Year On-Site Service

*\*Contact your place of purchase for warranty service information.*

#### Production Status

Each Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's warranty terms apply.

#### The IBM Warranty for Machines

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications. The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your receipt is the Date of Installation, unless IBM or your reseller informs you otherwise.

During the warranty period IBM or your reseller, if authorized by IBM, will provide warranty service under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

For IBM or your reseller to provide warranty service for a feature, conversion, or upgrade, IBM or your reseller may require that the Machine on which it is installed be 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many of these transactions involve the removal of parts and their return to IBM. You

## Product Warranties and Notices

represent that all removed parts are genuine and unaltered. A part that replaces a removed part will assume the warranty service status of the replaced part.

If a Machine does not function as warranted during the warranty period, IBM or your reseller will repair it or replace it with one that is at least functionally equivalent, without charge. The replacement may not be new, but will be in good working order. If IBM or your reseller is unable to repair or replace the Machine, you may return it to your place of purchase and your money will be refunded.

If you transfer a Machine to another user, warranty service is available to that user for the remainder of the warranty period. You should give your proof of purchase and this Statement to that user. However, for Machines which have a life-time warranty, this warranty is not transferable.

### Warranty Service

To obtain warranty service for the Machine, you should contact your reseller or call IBM. In the United States, call IBM at **1-800-772-2227**. In Canada, call IBM at **1-800-565-3344**. You may be required to present proof of purchase.

IBM or your reseller will provide certain types of repair and exchange service, either at your location or at IBM's or your reseller's service center, to restore a Machine to good working order.

When a type of service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item. Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service. You also agree to ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange.

You agree to:

1. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
2. where applicable, before service is provided —
  - a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provide,
  - b. secure all programs, data, and funds contained in a Machine, and
  - c. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

### Extent of Warranty

IBM does not warrant uninterrupted or error-free operation of a Machine.

## Product Warranties and Notices

The warranties may be voided by misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, removal or alteration of Machine or parts identification labels, or failure caused by a product for which IBM is not responsible.

THESE WARRANTIES REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD.

### **Limitation of Liability**

Circumstances may arise where, because of a default on IBM's part or other liability you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), IBM is liable only for:

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages or loss, up to the greater of U.S. \$100,000 or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR LOSSES OR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS OR SAVINGS), EVEN IF IBM OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU.

## Product Warranties and Notices

### United Kingdom

IBM warrants this IBM product to be in good working order and conforms to its officially published IBM specifications for a period of three years from the date of first purchase by an end-user customer.

*Note:* Batteries for Mobile products are limited to 1 year warranty.

Your sales receipt or authorised dated and stamped warranty service certificate is proof of your entitlement to warranty service.

If this product is not in good working order, IBM will, at its option, repair or replace this product at no additional charge except as set forth below. Repair parts and replacement products will be provided on an exchange basis and will be either new, equivalent to new or reconditioned. All replaced parts and products become the property of IBM. This warranty does not cover the repair of damage to the product resulting from:

- Accident, disaster, misuse and abuse
- Use of parts not manufactured or sold by IBM
- Modification of the product
- Service provided by anyone other than IBM or an authorised IBM service provider.

IBM does not warrant that the functions in any preloaded program will meet your requirements or that the operations of the preloaded program will be uninterrupted or error free.

There is no other warranty whether express or implied. In case the exclusion of certain warranties would be precluded by applicable law, such warranties would be limited in duration to the warranty period stated above.

### *Warranty Performance*

Warranty service may be obtained by returning the product during warranty period to an authorised IBM service provider and by providing proof of your warranty service entitlement. You are responsible for any associated transportation charges and insurance during shipment and return.

## Product Warranties and Notices

For a product purchased in a group A country (as defined), warranty service may be obtained from any authorised IBM service provider in any group A country; similarly for a product purchased in a group B country, warranty service may be obtained from any authorised IBM service provider in any group B country.

### *Group A Countries*

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland Italy, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

### *Group B Countries*

Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Czechia, Russia, Armenia, Bellarus, Georgia, Kirghizia, Hungary, Kazakhstan, Macedonia, Moldova, Poland, Romania, Slovakia, Serbia-Montenegro, Slovenia, Ukraine.

### *On-Site Service*

Some IBM products are sold with a service entitlement which is delivered on the customers premises (on-site). If the product you have purchased carries with it an entitlement to IBM on-site service, this service is provided during the warranty period subject to the following terms and conditions:

- The product must have been announced as qualifying for On-Site Service in the country in which Warranty Service is being claimed.
- You must contact a local authorised IBM service provider and be prepared to supply proof of warranty entitlement. The authorised IBM service provider will attempt to resolve your problem over the telephone. If this is not possible, a trained service engineer will be dispatched to your location to repair the IBM product.
- The service representative must be provided with full access to the equipment reported as faulty.
- The equipment must be located within 50 kilometers (or more depending on country) of the authorised IBM service provider.

## Product Warranties and Notices

### *Liability*

IBM shall have no liability for lost profits or other consequential damages, even if advised of the possibility of such damages, or for any claim by any third party. IBM's total liability for a breach or breaches of this warranty by IBM is limited to 100,000 US Dollars of direct damages. This financial limitation of liability will not apply to claims for death or personal injury or damage to real or personal property caused by IBM negligence.

### *General*

No statements contained herein shall affect the statutory rights of consumers.

### *International Warranty Service*

IBM International hardware warranty service is available for those customers, travelling to countries in which their PC products are announced and sold by IBM or IBM resellers, upon registering with IBM International Warranty Service Office. IBM International Warranty Service is provided subject to the terms and conditions of the IBM Warranty Statement provided with the product in the country of purchase. Service outside the country of purchase will be provided under local service procedures. Customers who wish to relocate their machine to another country and wish to obtain warranty service must first register with the International Warranty Service Office based in Greenock. The I.W.S.O. will offer advice on the warranty service available in the country or countries where the customer wishes to relocate and will issue an International Warranty Service Certificate upon proof of warranty status of the customers machine. Contact the I.W.S.O. on

Tel + 44 1475 893638

Fax + 44 1475 893732

Alternatively customers may register for International Warranty Service via their local IBM Office.

## Product Warranties and Notices

*Notes:*

1. International Warranty Service is not available on IBM Options unless they are installed in or connected to an IBM System Unit which is registered for International Warranty Service.
2. Customers are not required to register their machine for International Warranty Service if relocation is within the countries of Group A or Group B.



## Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Subject to IBM's valid intellectual property or other legally protectable rights, any functionally equivalent product, program, or service may be used instead of the IBM product, program, or service. The evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the responsibility of the user.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing  
IBM Corporation  
North Castle Drive  
Armonk, NY 10504-1785  
U.S.A.

## Year 2000 Readiness and Instructions

A product is Year 2000 Ready if the product, when used in accordance with its associated documentation, is capable of correctly processing, providing and/or receiving date data within and between the 20th and 21st centuries, provided all other products (for example, software, hardware, and firmware) used with the product properly exchange date data with it.

This IBM PC hardware product has been designed to process four-digit date information correctly within and between the 20th and 21st centuries. If your IBM computer is on when the century changes, you should turn it off and then back on again once, or restart the operating system, to ensure that the internal clock resets itself for the new century.

## Product Warranties and Notices

This IBM PC product cannot prevent errors that might occur if software you use or exchange data with is not ready for the Year 2000. IBM software that comes with this product is Year 2000 Ready. However, software from other companies might come with this IBM PC product. IBM cannot take responsibility for the readiness of that software. You should contact the software developers directly if you wish to verify readiness, understand limitations, or look for any software updates.

To learn more about IBM PC products and the Year 2000, visit our Web site at <http://www.pc.ibm.com/year2000>. The information and tools there can help you with your Year 2000 transition plan, especially if you have multiple IBM PCs. IBM encourages you to check periodically for updated information.

## Trademarks

### Trademarks

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## Federal Communications Commission (FCC) Statement

**Note:** 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 the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## Industry Canada Class A Emission Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

### **Avis de conformité à la réglementation d'Industrie Canada**

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

## United Kingdom Telecommunications Safety Requirements

### Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

## European Community Directive Conformance Statement

This product is in conformity with the protection requirements of EC Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electro-magnetic compatibility.

A declaration of Conformity with the requirements of the Directive has been signed by IBM United Kingdom Limited, PO BOX 30 Spango Valley Greenock Scotland PA160AH.

**Attention:** This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## Australia and New Zealand Class A Statement

**Attention:** This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## Taiwanese Electromagnetic Interference (EMI) Statement

警告使用者：  
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情形下，使用者會被要求採取某些適當的對策。







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