

# **StorageWorks by Compaq**

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## **FCA2257C cPCI Host Bus Adapter for Sun Solaris Installation Guide**

Part Number: AA-RRAAA-TE

**First Edition (January 2002)**

This guide describes how to install and configure the *StorageWorks*<sup>™</sup>  
FCA2257C cPCI Host Bus Adapter for Sun Solaris by Compaq.

***COMPAQ***

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FCA2257C cPCI Host Bus Adapter for Sun Solaris Installation Guide  
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# About this Guide

This installation guide provides information for installing the FCA2257C cPCI to Fibre Channel Host Bus Adapter for Sun Solaris (cPCI adapter).

## Intended Audience

This book is intended for use by system administrators who are experienced with the following:

- Sun Solaris operating system
- Host bus adapters

## Related Documentation

In addition to this guide, Compaq provides release notes for late-breaking information.

## Document Conventions

The conventions included in Table 1 apply in most cases.

**Table 1: Document Conventions**

Element	Convention
Key names, menu items, buttons, and dialog box titles	<b>Bold</b>
File names and application names	<i>Italics</i>
User input, command names, system responses (output and messages)	Monospace font COMMAND NAMES are uppercase unless they are case sensitive
Variables	<i>Monospace, italic font</i>
Website addresses	Sans serif font ( <a href="http://www.compaq.com">http://www.compaq.com</a> )

## Symbols in Text

These symbols may be found in the text of this guide. They have the following meanings.



**WARNING:** Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or loss of life.

---



**CAUTION:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

---

**IMPORTANT:** Text set off in this manner presents clarifying information or specific instructions.

**NOTE:** Text set off in this manner presents commentary, sidelights, or interesting points of information.

## Symbols on Equipment



Any enclosed surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

**WARNING:** To reduce the risk of injury from electrical shock hazards, do not open this enclosure.

---



Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

**WARNING:** To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

---



Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. Contact with this surface could result in injury.

**WARNING:** To reduce the risk of injury from a hot component, allow the surface to cool before touching.

---



Power supplies or systems marked with these symbols indicate the presence of multiple sources of power.

**WARNING:** To reduce the risk of injury from electrical shock, remove all power cords to completely disconnect power from the power supplies and systems.

---



Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

**WARNING:** To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

---

## Getting Help

If you still have a question after reading this guide, contact service representatives or visit our website.

## Compaq Technical Support

In North America, call Compaq technical support at 1-800-OK-COMPAQ, available 24 hours a day, 7 days a week.

**NOTE:** For continuous quality improvement, calls may be recorded or monitored.

Outside North America, call Compaq technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the Compaq website: <http://www.compaq.com>.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions.

## Compaq Website

The Compaq website has the latest information on this product, as well as the latest drivers. Access the Compaq website at: <http://www.compaq.com/storage>. From this website, select the appropriate product or solution.

## Compaq Authorized Reseller

For the name of your nearest Compaq Authorized Reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- Elsewhere, see the Compaq website for locations and telephone numbers.

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# Adapter Features

The chapter describes the features of the FCA2257C cPCI to Fibre Channel Host Bus Adapter for Sun Solaris by Compaq (cPCI adapter).

## Descriptions

### cPCI Adapter Features

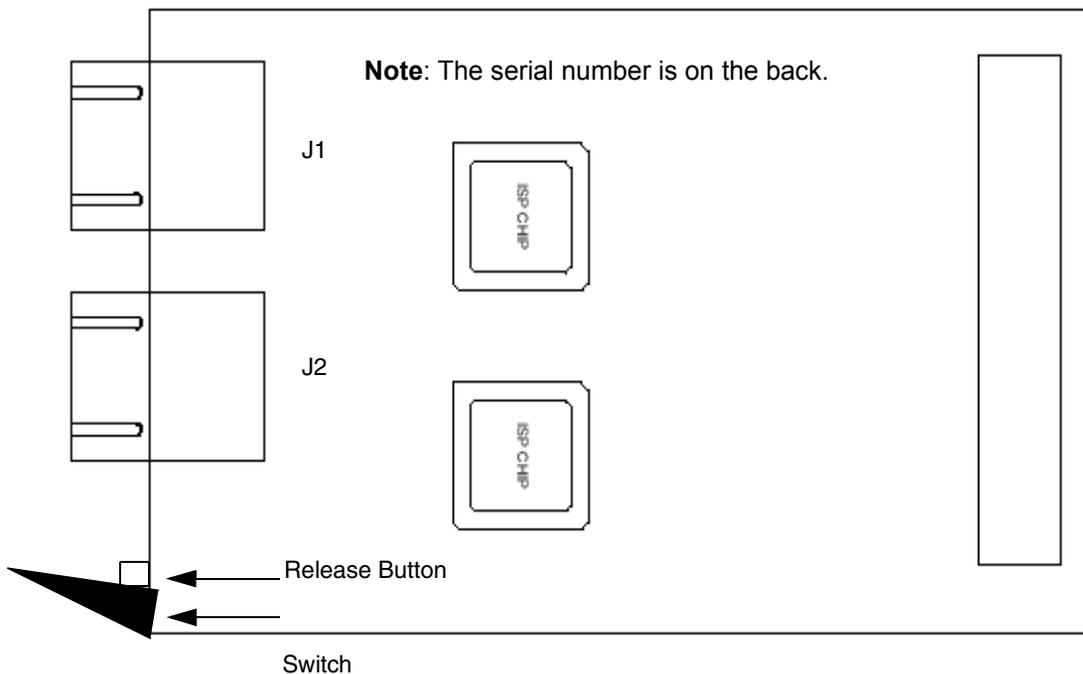
The cPCI adapter is a dual channel high-performance Host Bus Adapter (HBA) designed for high-end systems. This Fibre Channel (FC) adapter operates over a compact peripheral component interconnect (cPCI).

This adapter has the following features:

- Combines a powerful RISC processor and a fiber protocol module (FPM) with gigabit transceivers in a single-chip solution
- Supports Private Loop Disk Attach (PLDA) and Fabric Loop Attach (FLA) connections
- Supports Sun Solaris Version 8
- Supports bus master DMA
- Supports Fibre Channel Protocol SCSI (FCP-SCSI) protocol
- Supports point-to-point fabric connection (F-PORT FABRIC LOGIN)
- Complies with the following PCI standards:
  - PCI Local Bus Specification, Revision 2.1
  - PCI Hot Plug Specification, Revision 1.0
  - PCI Power Management Interface Specification, Revision 1.0
  - PICMG 2.0 Compact PCI Specification, Revision 2.1
  - Compact PCI Hot Swap Specification, Revision 2.1

- Complies with the following Fibre Channel standards:
  - Second Generation Fibre Channel Physical and Signaling Interface (FC-PH-2), Revision 7.4
  - Third Generation Fibre Channel Physical and Signaling Interface (FC-PH-3), Revision 9.2
  - Fibre Channel-Arbitrated Loop (FC-AL-2), Revision 5.4
  - Fibre Channel Fabric Loop Attachment (FC-FLA), Revision 2.7
  - Fibre Channel Generic Services 2 (FC-GS-2), Revision 5.3
  - Fibre Channel Switched Fabric (FC-SW), Revision 3.3
- Complies with U.S. and international safety and emissions standards

Figure 1-1 shows the cPCI adapter.



**Figure 1-1: cPCI Adapter**

---

## Installing the Adapters

This chapter describes:

- Installation Prerequisites
- Standard Installation
- Hot Installation
- Installing the Solaris Driver

**NOTE:** Refer to your Host documentation for installing the Host Bus Adapter (HBA).



**WARNING:** Disconnect the host from the power source before installing the adapter. To reduce the risk of personal injury from hot surfaces, allow the internal server or workstation components to cool before touching.

---



**CAUTION:** Electrostatic discharge (ESD) can damage electronic components. Be sure you are properly grounded before beginning this procedure. See Appendix D for related ESD information.

---

### Installation Prerequisites

Before you begin, make sure you have the following:

- A screwdriver (usually a Phillips #1)
- An optical, multimode cable with an SC-style duplex connector
- The unique serial number, located on the back of the adapter. Check the adapter and record its serial number, in the unlikely event that the NVRAM is corrupted.

## Standard Installation

To install a cPCI adapter:

1. Shut down the system.
2. Choose any available cPCI slot. (Check the indicator lights next to or above the available slots. The top two lights should be off; the bottom light should be is amber.)
3. Place the adapter into the slot. Carefully press the adapter into the slot until the adapter seats firmly (The switch clicks into a locked position when the adapter is seated).
4. Connect the appropriate cables from the FC devices to the J2 and J3 connectors.
5. Start the system and make sure that the cPCI adapter appears as part of the system.
  - a. Power up all external FC devices.
  - b. Power up the system.
  - c. Observe the BIOS power-on display. The adapter does not appear as part of the system components unless the driver has been installed. In this case, the adapter and corresponding driver are listed.
6. Check the hot swap LED; it should be off, indicating that the adapter is active. The bottom indicator light next to the slot should be blue.

**NOTE:** In some systems, the lights are above the slots.

If you are unable to successfully install the adapter, refer to Chapter 3 for troubleshooting information.

## Hot Installation

Perform the following steps to install the adapter without shutting down the system (hot installation).

To hot install the cPCI adapter:

1. Log on to the system as a superuser.
2. At the system prompt (`#`), enter the following command to find an available slot for the adapter:

```
cfgadm
```

A list of the system's processors, memory, and I/O slots appears, as shown in the following example. In this example, the shaded rows indicate that CPCI slots 0, 1, 3, and 4 are available.

Ap_Id	Type	Receptacle	Occupant	Condition
N0.IB6	CPCI_I/O_bo	connected	configured	ok
N0.IB8	unknown	empty	unconfigured	unknown
N0.SB0	CPU_Board	connected	configured	ok
N0.SB2	CPU_Board	connected	configured	ok
c0	scsi-bus	connected	configured	unknown
pcisch0:sg6slot2	stpcipci/fhs	connected	configured	ok
pcisch0:sg6slot3	unknown	empty	unconfigured	unknown
pcisc1:sg6slot0	unknown	empty	unconfigured	unknown
pcisch2:sg6slot4	unknown	empty	unconfigured	unknown
pcisch2:sg6slot5	unknown	connected	unconfigured	unknown
pcisch3:sg6slot1	unknown	empty	unconfigured	unknown

3. Check the indicator lights next to the available slots (in some systems, the lights are above the slots). The top two lights should be off; the bottom light should be amber. This is another way to verify an available slot.

4. Place the adapter into the slot. Carefully press the adapter into the slot until the adapter seats firmly (the switch clicks into a locked position when the adapter is seated). The indicator lights change as follows:
  - The bottom indicator light next to (or above) the slot changes from amber to off.
  - The top indicator light changes to green.
  - The hot swap LED on the adapter turns blue while the adapter is inserted.
5. Perform one of the following:
  - If the LED turns off, the adapter is inserted and has been configured; continue with step 7.
  - If the LED stays blue after the adapter is inserted, continue with step 8.
6. Enter the `cfgadm` command to verify that the system recognizes the adapter and that the adapter is not configured.

In the following example, the shaded row indicates that the adapter has been installed in slot 4. “Disconnected” in the Receptacle column indicates the adapter is not configured.

<b>Ap_Id</b>	<b>Type</b>	<b>Receptacle</b>	<b>Occupant</b>	<b>Condition</b>
N0.IB6	CPCI_I/O_bo	connected	configured	ok
N0.IB8	unknown	empty	unconfigured	unknown
N0.SB0	CPU_Board	connected	configured	ok
N0.SB2	CPU_Board	connected	configured	ok
c0	scsi-bus	connected	configured	unknown
pcisch0:sg6slot2	stpcipci/fhs	connected	configured	ok
pcisch0:sg6slot3	unknown	empty	unconfigured	unknown
pcisc1:sg6slot0	unknown	empty	unconfigured	unknown
pcisch2:sg6slot4	unknown	disconnected	unconfigured	unknown
pcisch2:sg6slot5	unknown	connected	unconfigured	unknown
pcisch3:sg6slot1	unknown	empty	unconfigured	unknown

7. Enter the `cfgadm -c configure slot path` command to configure the adapter. In the following example, the adapter is configured for slot 4:

```
cfgadm -c configure pcisch2:sg6slot4
```

System configuration information appears, The following example shows that the Receptacle column for the shaded row changes to **connected**:

Ap_Id	Type	Receptacle	Occupant	Condition
N0.IB6	CPCI_I/O_b o	connected	configured	ok
N0.IB8	unknown	empty	unconfigured	unknown
N0.SB0	CPU_Board	connected	configured	ok
N0.SB2	CPU_Board	connected	configured	ok
c0	scsi-bus	connected	configured	unknown
pcisch0:sg6slot2	stpcipci/fhs	connected	configured	ok
pcisch0:sg6slot3	unknown	empty	unconfigured	unknown
pcisc1:sg6slot0	unknown	empty	unconfigured	unknown
pcisch2:sg6slot4	stpcipci/fhs	connected	configured	ok
pcisch2:sg6slot5	unknown	connected	unconfigured	unknown
pcisch3:sg6slot1	unknown	empty	unconfigured	unknown

8. Connect the appropriate cables from the FC devices to the J2 and J3 connectors.
9. Check the adapter hot swap LED; it should be off, indicating that the adapter is active.

If you are unable to successfully install the adapter, refer to Chapter 3 for troubleshooting information.

## Installing the Solaris Driver

This section provides instructions for installing the Solaris driver in an already installed Solaris operating system.

To install the driver, you must be familiar with the operating system under which the HBA is to operate, and have access to standard system documentation.

The software kit that is included with the HBA contains the latest version of the HBA software files at the time of shipment. Software files are updated periodically and can be obtained from the Compaq website:

<http://www.compaq.com/products/storageworks/adapters.html>

To install the Solaris driver to your system:

1. Log on to the system as superuser.
2. Create a temporary directory to which you can copy the driver.
3. Change the directory (`cd`) to the CD-ROM mount point (usually `/cdrom`, but the location varies. Ask your system administrator for the specific directory).
4. Change the directory (`cd`) to the Solaris directory.
5. Copy (`cp`) the `qla2200.Z` file from the CD-ROM to the temporary directory created in step 2.
6. Change the directory (`cd`) to the temporary directory created in step 2.
7. At the command prompt, enter:  

```
uncompress ./qla2200.Z
```

This step creates a file in the same directory called `qla2200`.
8. At the command prompt, enter:  

```
pkgadd -d ./qla2200
```

You are prompted to select a driver package, as shown in the following example in which **3** was entered:

The following packages are available:

- 1 QLA2200-1QLogic QLA2200 driver  
Solaris 2.6, Rev=X.XX
- 2 QLA2200-2QLogic QLA2200 driver  
Solaris 2.7, Rev=X.XX
- 3 QLA2200-3QLogic QLA2200 driver  
Solaris 2.8, Rev=X.XX

Select package(s) you wish to process (or 'all'  
to process all packages). (default: all)  
[?,??,q]: 3

**NOTE:** The revision number, X.XX, indicates the most recent version of the driver.

9. Enter the number associated with the Solaris version on your system.

You are prompted to select the directory where the driver will be installed, as shown in the following example:

Processing package instance <QLA2200-3> from  
</qla2200>

QLogic QLA2320 driver  
Solaris 2.8, Rev=X.XX

Where do you want the driver object installed (default=/kernel/drv):

10. Press **ENTER** to accept the default.

The pkgadd program performs a series of checks, then posts a script warning and asks whether to continue the installation, as shown in the following example:

```
##Executing checkinstll script.
Using </> as the package base directory.
## Processing package information.
## Processing system information.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.
```

This package contains scripts which will be executed with super-user permission during the process of installing this package.

Do you want to continue with the installation of <QLA2200-3> [y,n,?]

11. Enter **Y** to continue the driver installation. The `pkgadd` program notifies you when the driver installation is complete, as shown in the following example:

```
Installing QLogic QLA2200 driver as <QLA2200-3>
```

```
## Installing part 1 of 1.  
/kernel/drv/qla2200  
/kernel/drv/qla2200.conf  
[ verifying class <none> ]  
## Executing postinstall script
```

```
Installation of <QLA2200-3> was successful.
```

12. If you are not installing the adapter with a Compaq storage platform kit, edit the `qla2200.conf` file that resides in the `/kernel/drv/` directory.

**NOTE:** When you install a Compaq Storage platform kit, these values are automatically changed. If you are using a Compaq Storage platform kit, skip this step and go to step 13.

Compaq has tested with and recommends that you change the values in the `qla2200.conf` file as follows:

```
hba0-max-frame-length=2048;
```

```
hba0-max-iocb-allocation=64;
```

```
hba0-execution-throttle=16;
```

```
hba0-login-timeout=8;
```

```
hba0-login-retry-count=8;
```

```
hba0-fabric-retry-count=90;
```

```
hba0-port-down-retry-count=90;
```

```
hba0-connection-options=1;
```

```
hba0-device-configuration-mode=1;
```

```
hba0-command-completion-option=0;
```

```
hba0-persistent-binding-configuration=1; (You can keep the existing value of 0  
for this parameter if you want to bind to all devices in the SAN.)
```

13. Reboot the system to implement your changes, as shown in the following example:

```
reboot -- -r
```

---

## Troubleshooting Information

There are two basic types of installation problems that can cause your Host Bus Adapter (HBA) to function incorrectly: hardware problems and Fibre Channel problems. This chapter provides itemized checklists to help you determine why your HBA is not functioning.

### Hardware Problem Checklist

- Are all of the circuit cards installed securely in the system?
- Are all of the cables securely connected to the correct connectors? Be sure that the FC cables that attach from the HBA connectors to the FC device are connected correctly. For example, the optical transmit connector on the HBA should be connected to the optical receive connector on the device.
- Are all connectors pushed firmly to ensure proper seating? An easy way to check is to switch the connectors on either the HBA or the device, then reboot your system.
- Is the HBA installed correctly in the slot? Is it seated firmly in the slot?
- Are all external peripherals properly powered up?

### Fibre Channel Problem Checklist

- Were all of the FC devices powered up before you powered up the system?
- Are all cables are properly connected?



---

## Using FCode

This appendix describes how to install and set up FCode. It includes:

- FCode File Contents
- Supported Features
- Flashing the Adapter with Fcode

### FCode File Contents

The following files are included with the Fcode binary file:

- *fp2200.prom*—Fcode binary file
- *readme.txt*—Fcode readme file
- *qla2x00flash*—qla2x00 flash utility
- *Readme*—Readme for qla2x00flash

### Supported Features

This driver supports the following features:

- 256 IDs
- 256 LUNs
- Fabric boot
- Local loop boot
- HBA diagnostics

This driver has been tested with Sun Solaris Version 8.

## Flashing the Adapter with Fcode

To update the your adapter's Fcode, use the `qla2x00flash` utility.

Use the following procedure to flash the adapter with Fcode.

1. Copy the `qla2x00flash` file and `ifp2200.prom` file to the desired directory.



**CAUTION:** Make sure you want to change the Flash contents. Incorrect data in the Flash contents can render the adapter unusable, and disrupt the operating system function.

---

2. Enter the **`qla2x00flash`** command with the appropriate path, as shown in the following example:

```
qla2x00flash -l /devices/pci@1f,0/pci@1/QLGC,qla@4:devctl  
ifp2200.prom
```

---

## Specifications

### Specifications

This appendix provides the specifications for the FCA2257C cPCI to Fibre Channel Host Bus Adapter (cPCI Adapter) for Sun Solaris.

### Environmental Specifications

Table B-1 lists the HBA environmental specifications.

**Table B-1: cPCI Adapter Environmental Specifications**

<b>Environment</b>	<b>Minimum</b>	<b>Maximum</b>
Operating temperature	0°C/32°F	55°C/131°F
Storage temperature	-20°C/-4°F	70°C/158°F
Relative humidity (noncondensing)	10%	90%
Storage humidity (noncondensing)	5%	95%

## Adapter Specifications

Table B–2 lists the cPCI adapter specifications.

**Table B–2: cPCI Adapter Specifications**

Type	Specification
Host bus	Conforms to <i>PCI Local Bus Specification</i> , Revision 2.1
Fibre Channel specifications	Bus type: fiber optic media Bus transfer rate: 100 MBps maximum at half duplex 200 MBps maximum at full duplex Interface chip: SP2200A/33 (two)
Central processing unit (CPU)	Single-chip design that includes a RISC processor, Fibre Channel protocol manager, DMA controller, and 1-Gb transceivers
RAM	128K bytes of SRAM for each ISP2200A/33
NVRAM	256 bytes for each ISP2200A/33, field programmable
Flash	512K bytes of flash ROM, field programmable
Onboard DMA	Three independent DMA channels: two data and one command. Integrated frame buffer FIFOs (4K-byte receive and 4K-byte transmit) for each data channel.
Connectors	SC-style connector that supports non-OFC, multimode fiber optic cabling using 1 fiber optic transceiver module.
Form factor	16.0 cm x 10.0 cm (6.3" x 3.9")
Operating power	Less than 15 watts

---

# Regulatory Compliance Notices

## Federal Communications Commission Notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (for example, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device and additional operating instructions for the user.

The rating label on the device shows the classification (A or B) of the equipment. Class B devices have an FCC logo or FCC ID on the label. Class A devices do not have an FCC logo or ID on the label. After the class of the device is determined, refer to the corresponding statement in the sections below.

### Class A Equipment

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 instructions, 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 personal expense.

## **Declaration of Conformity for Products Marked with the FCC Logo—United States Only**

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.

For questions regarding your product, contact:

Compaq Computer Corporation  
P. O. Box 692000, Mail Stop 530113  
Houston, Texas 77269-2000

Or call 1-800-652-6672 (1-800-OK COMPAQ). (For continuous quality improvement, calls may be recorded or monitored.)

To identify the device, refer to the part, series or model number found on the product.

## **Modifications**

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Compaq Computer Corporation may void the user's authority to operate the equipment.

## **Network and Serial Cables**

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

## **Canadian Notice (Avis Canadien)**

### **Class A Equipment**

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## Japanese Notice

### Japanese Class A Notice

### Laser Devices

に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

All Compaq systems equipped with a laser device comply with safety standards, including International Electrotechnical Commission (IEC) 825. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. The product does not emit hazardous light; the beam is totally enclosed during all modes of customer operation and maintenance.

### Laser Safety Warnings



**WARNING: To reduce the risk of exposure to hazardous radiation:**

**Do not try to open the laser device enclosure. There are no user-serviceable components inside.**

**Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.**

**Allow only Compaq authorized service technicians to repair the laser device.**

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## Compliance with CDRH Regulations

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States.

## Compliance with International Regulations

All Compaq systems equipped with laser devices comply with appropriate safety standards including IEC 825.

## Label

The transceiver on the adapter is a Class I laser product. It complies with IEC 825-1 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated under recommended operating conditions.

**CLASS I LASER PRODUCT**

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## Electrostatic Discharge

To prevent damaging the system, you must take precautions when setting up the system or when handling parts. A discharge of static electricity from a finger or other conductor may damage system adapters or other static-sensitive devices. This type of damage can reduce the life expectancy of the device.

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always make sure you are properly grounded when touching a static-sensitive component or assembly.

### Grounding Methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm  $\pm$  10 percent resistance in the ground cords. To provide proper grounding, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have a Compaq authorized reseller install the part.

**NOTE:** For more information on static electricity, or for assistance with product installation, contact your Compaq authorized reseller.



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