

# **HP A6828A PCI Ultra160 SCSI Host Bus Adapter**

## **Service and User Guide**

**Edition 2**



**Manufacturing Part Number: A6828-96002  
E0503**

United States

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## About This Document

This document describes how to install, configure, and troubleshoot HP A6828A PCI Ultra160 SCSI host bus adapter (HBA) on HP-UX 11.x platforms.

The document printing date and part number indicate the document's current edition. The printing date will change when a new edition is printed. Minor changes may be made at reprint without changing the printing date. The document part number will change when extensive changes are made.

Document updates may be issued between editions to correct errors or document product changes. To ensure that you receive the updated or new editions, you should subscribe to the appropriate product support service. See your HP sales representative for details.

The latest version of this document can be found online at <http://docs.hp.com>.

## Intended Audience

This document is intended for system and network administrators responsible for installing, configuring, and managing HP A6828A PCI Ultra160 SCSI HBA.

## HP-UX Release Name and Release Identifier

Each HP-UX 11i release has an associated release name and release identifier. The *uname* (1) command with the -r option returns the release identifier. Table 1 shows the releases available for HP-UX 11i.

**Table 1** HP-UX 11i Releases

<b>Release Identifier</b>	<b>Release Name</b>	<b>Supported Processor Architecture</b>
B.11.11	HP-UX 11i v1	PA-RISC
B.11.20	HP-UX 11i v1.5	Intel® Itanium®
B.11.22	HP-UX 11i v1.6	Intel® Itanium®

**Table 1** HP-UX 11i Releases (Continued)

Release Identifier	Release Name	Supported Processor Architecture
B.11.23	HP-UX 11i v2.0	Intel® Itanium®

## Publishing History

The details of the document versions published for various HP-UX releases are mentioned in the following table:

**Table 2** Publishing History Details

Document Manufacturing Part Number	Operating Systems Supported	Supported Product Versions	Publication Date
A6828-96002	11.0 11i v1 11i v2	B.11.00 B.11.11 B.11.23	May 2003
A6828-96001	11.0 11i v1	B.11.00 B.11.11	March 2002

## What's in This Document

*HP A6828A PCI Ultra160 SCSI Host Bus Adapter Service and User Guide* is divided into several chapters, and each chapter contains information on installing or configuring the A6828A HBA. The appendixes area contains supplemental information.

Table 3 describes the content of the chapters in more detail.

**Table 3** Document Organization

Chapter	Description
HP A6828A Adapter Overview	Use this chapter to know about the A6828A HBA and its features.

**Table 3 Document Organization (Continued)**

<b>Chapter</b>	<b>Description</b>
Installing the A6828A Adapter	Use this chapter to install the A6828A HBA, connect external SCSI peripherals, specify SCSI parameters, install SCSI driver, configure LUN 0, add multi-initiator support, verify the installation, and use the EFI utility.
Troubleshooting	Use this chapter to learn about troubleshooting techniques, known problems, workarounds, and how to contact your Hewlett-Packard representative.

## **New and Changed Documentation in This Edition**

This edition includes the following changes:

- Information on the auto termination feature has been modified.
- Information on assigning and setting the SCSI IDs has been modified.
- Information on the Extended Firmware Interface Flash (EFI) utility has been added.

## **Typographical Conventions**

This document uses the following conventions:

<i>Book Title</i>	The title of a book. On the web and on the Instant Information CD, it may be a hot link to the book itself.
<i>Emphasis</i>	Text that is emphasized.
<b>Bold</b>	Text that is strongly emphasized.
ComputerOut	Text displayed by the computer.
...	The preceding element may be repeated an arbitrary number of times.

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<http://docs.hp.com/assistance/feedback.html>

Please include the following information along with your comments:

- The complete title of the manual and the part number. (The part number appears on the title page of printed and PDF versions of a manual.)
- The section numbers and page numbers of the information on which you are commenting.
- The version of HP-UX that you are using.



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# **1 HP A6828A Adapter Overview**

This chapter contains the following sections that describe the HP A6828A PCI Ultra160 SCSI host bus adapter (HBA):

- “About the A6828A Adapter” on page 3.
- “Features” on page 5.

## About the A6828A Adapter

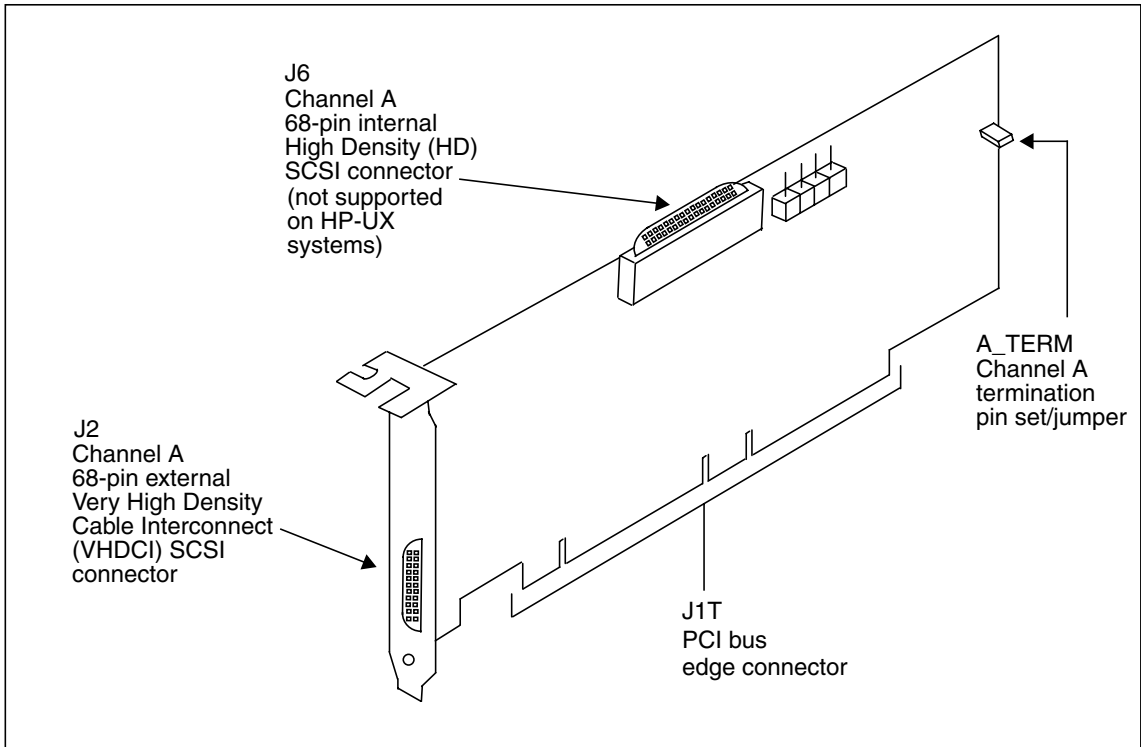
The A6828A PCI Ultra160 SCSI **host bus adapter (HBA)** provides one Ultra160 SCSI-3 interface to PCI computer systems. When you install this adapter in your PCI system, it allows connection of up to 15 SCSI devices on its single channel.

The A6828A provides 16-bit (Wide) **Low Voltage Differential (LVD)** or 16-bit (Wide) **Single-Ended (SE)** SCSI solutions for your system, using only one PCI slot. The A6828A also supports legacy Fast SCSI devices, Ultra SCSI devices, and Ultra2 SCSI devices.

Consult with your Hewlett-Packard representative for more information on specific system configurations.

Figure 1-1 below is a drawing (not to scale) of the A6828A adapter.

**Figure 1-1      The A6828A PCI Ultra160 SCSI Host Bus Adapter**



## Features

The A6828A adapter and its driver conform to the ANSI T10 SCSI Parallel Interface-3 (SPI-3) standard.

The A6828A adapter has the following features:

- PCI interface
  - Full 64-bit (66 MHz) Direct Memory Access (DMA) bus master.
  - Zero wait-state bus master data bursts.
  - PCI Universal 3.3 V/5 V bus support.
  - Compliance with *PCI Local Bus Specification, Revision 2.2*.
- SCSI interface
  - One SCSI channel.
  - 16-bit (Wide) Single Ended (SE)/Low Voltage Differential (LVD).
  - Enabling/disabling of on-board termination, with hardware override (using a jumper).
  - 68-pin **Very High Density Cable Interconnect (VHDCI)** connector on the external channel.
  - 68-pin High Density connector on the internal channel (not supported on HP-UX systems).
  - Maximum data transfer rate of 160 MBytes/s per channel, with a maximum cable length of 12 meters (with multiple SCSI devices) and a maximum 15 SCSI devices on the single channel (not including the A6828A adapter).
  - Fast, Ultra, Ultra2, and Ultra160 data transfer capability.
  - SCSI termination power (TERMPWR) source with auto-resetting circuit breaker.
  - Flash EEPROM configured with HP part number (allows easy identification through the `ioscan` command).
- HBA characteristics
  - PCI4X adapter (66MHz, 64-bit data transfers).

**Features**

- PCI board dimensions: approximately 8.95 inches x 4.25 inches.
- Universal 64-bit PCI card edge connector.
- Two SCSI connectors:
  - One external 68-pin Very High Density Cable Interconnect (VHDCI)—J2—for the single channel.
  - One internal 68-pin High Density (HD)—J6—for the single channel. Note that the internal HD connector is not supported on HP-UX systems.
- ISA/EISA bracket.

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## **2** **Installing the A6828A Adapter**

This chapter contains the following sections that describe how to install the A6828A adapter:

- “Overview of Installation Steps” on page 9

- “Performance Tuning” on page 11
- “Preparing for Installation” on page 12
- “Installing the A6828A Adapter” on page 13
- “Connecting External SCSI Peripherals” on page 19
- “Specifying SCSI Parameters” on page 21
- “Installing the SCSI Driver” on page 50
- “Configuring LUN 0” on page 52
- “Adding Multi-Initiator Support” on page 53
- “Verifying Installation” on page 55
- “Using the Extended Firmware Interface Flash Utility” on page 58

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**NOTE**

This manual provides installation instructions and technical information for qualified personnel who maintain or service HP-UX systems. Installing the adapter requires proficiency in both hardware configuration and software administration.

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## Overview of Installation Steps

Here is a high-level view of the steps for installing the A6828A HBA:

- Step 1.** Review the recommendations for performance (see “Performance Tuning” on page 11).
- Step 2.** Ensure that you have all the materials you will need (see “Preparing for Installation” on page 12).
- Step 3.** Determine what you need to do (if anything) to configure auto termination for the A6828A adapter (see “Auto Termination” on page 37).

Change the jumper position (see “Using the Jumper for Controlling Auto Termination” on page 38), if needed, and then go to step 4.

If you do not need to change the position of the jumper, go to step 4.

- Step 4.** Install the adapter (see “Installing the A6828A Adapter” on page 13).
- Step 5.** Attach any external SCSI devices you want to connect to the adapter (see “Connecting External SCSI Peripherals” on page 19).
- Step 6.** If necessary, set any of the following SCSI parameters:
- SCSI ID (see “SCSI IDs” on page 25).
  - Maximum data transfer rate (see “Maximum Data Transfer Rate” on page 27).
  - Auto termination (see “Auto Termination” on page 37).
  - Bus width (see “Bus Width” on page 39).

Before setting the SCSI ID, Maximum data transfer rate, and Bus width parameters through Boot Control Handler (BCH) menus, ensure that the HP-UX system supports setting of these parameters in the BCH menus (see Table 2-2 on page 22).

- Step 7.** Install the `c8xx` SCSI driver from the latest HP-UX bundle or HP IT Resource Center (ITRC) at <http://itrc.hp.com>.

See “Installing the SCSI Driver” on page 50.

**Overview of Installation Steps**

- Step 8.** If you will be using a disk array in a multi-host environment, ensure that you have a LUN 0 configured (see “Configuring LUN 0” on page 52).
- Step 9.** Verify the installation (see “Verifying Installation” on page 55).

---

## Performance Tuning

To get the best performance from the A6828A adapter, HP **recommends** the following things:

- Increase the number specified for the `scsi_max_qdepth` kernel tunable parameter:
  - HP-UX 11.0: `scsi_max_qdepth` is a static tunable that you can change in SAM (“Kernel Configuration” screen → “Configurable Parameters” screen). Note that because this is a static tunable, you will need to reboot the system after changing its value.
  - HP-UX 11i: `scsi_max_qdepth` is a dynamic tunable; therefore, no system reboot is needed to change the parameter’s value. See “SCSI Queue Depth Management” in the *HP-UX 11i Release Notes* for more information about this tunable.

If you see “queue full” messages in the `/var/adm/syslog.log` file, you can avoid those messages by reducing the value for `scsi_max_qdepth`.

- Install the A6828A adapter in a PCI4X or PCI2X slot in the HP-UX system.
- Do not put any Single Ended (SE) SCSI devices on the same SCSI bus as Low Voltage Differential (LVD) SCSI devices. Doing this changes the entire bus to SE, which limits the bus to Ultra SCSI (40 MB/s).
- When you are assigning SCSI IDs to the SCSI devices on the bus, consider giving those devices the higher priorities on the bus (SCSI ID 7 is usually assigned to the HBA). See “SCSI IDs” on page 25 for more information.
- Ensure to set the adapter’s maximum data transfer rate to the correct rate (see “Maximum Data Transfer Rate” on page 27 for more information).
- Ensure to have the correct SCSI hardware configuration. Domain Validation can detect some configuration problems (see “Domain Validation” on page 98).

## Preparing for Installation

Installation of the A6828A adapter requires disassembly of some system components. Before beginning the installation, see the HP-UX system's manual for detailed instructions about installing host bus adapters in the PCI slots.

To install the HBA, you need the following:

- ✓ One HP A6828A SCSI HBA
- ✓ One grounding (ESD) kit (shipped with A6828A)
- ✓ Any other tools needed for installing components in the HP-UX system (for example, screwdrivers); see the system's documentation.

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### NOTE

The maximum number of SCSI HBAs you can install in any HP-UX system is equal to the maximum number of corresponding card slots in the system. For example, if a system has four PCI card slots, you can install four SCSI PCI HBAs in that system, assuming that all the PCI card slots are empty.

Check the latest SCSI support matrix for systems that support the A6828A adapter. The support matrix is available at <http://docs.hp.com> under the Networking and Communications section.

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## Installing the A6828A Adapter

This section contains information on installing the A6828A HBA in an HP-UX system (including Online Addition and Replacement [OLAR]).

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### WARNING

**The installation procedures in this section require opening the computer cabinet, which might expose you to high-energy (high-amperage) circuits and sharp edges in the equipment chassis. Ensure to remove all rings, watches, and other jewelry before opening the cabinet.**

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### CAUTION

The A6828A adapter contains electronic components that can easily be damaged by small amount of static electricity. To avoid damage, follow these guidelines:

- Store the adapter in its antistatic plastic bag until you are ready to install it.
  - Work in a static-free area, if possible.
  - Handle the adapter by the edges only. Do not touch electronic components or electrical traces.
  - If you must lay the adapter down, place it on a non-conductive mat or surface.
  - Use the ESD kit that is provided with the adapter. Follow the instructions included with the kit.
  - Use a suitable ground—any exposed metal surface on the system chassis.
- 

Before beginning the installation, and without removing the adapter from its antistatic bag, inspect the adapter for any signs of obvious damage, such as chipped or loose components. Contact Hewlett-Packard if the adapter is damaged.

Install the A6828A HBA in your HP-UX system according to the documentation for the system.

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**NOTE**

As stated earlier, although the A6828A HBA is supported on only 64-bit HP-UX 11.0 and 11i, you can install the adapter in either a 32-bit or 64-bit PCI slot. In addition, HP **recommends** using a PCI4X or PCI2X slot, to get maximum performance. However, you can install the adapter in a PCI2X, PCI1X, or shared PCI slot, if necessary.

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When you have finished installing the A6828A HBA, go to section “Connecting External SCSI Peripherals” on page 19.

## Online Addition and Replacement—HP-UX 11i Only

**Online Addition and Replacement (OLAR)** is the ability of a PCI host bus adapter to be replaced in or added to an HP-UX system designed to support this feature, without the need for completely shutting down and then rebooting the system or adversely affecting other system components. The system hardware uses the per-slot power control combined with OS support to enable this feature.

Check the latest SCSI support matrix that contains information on the HP-UX systems that support OLAR of the A6828A adapter. The support matrix is available at <http://docs.hp.com> under the Networking and Communications section.

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**IMPORTANT**

Certain “classes” of hardware are not intended for access by users. At this time, this includes superdome systems. HP **recommends** that these systems be opened by a qualified HP engineer only. Failure to observe this requirement can invalidate any support agreement or warranty to which the owner might otherwise be entitled.

---

You can add or replace an OLAR-compatible adapter in either of the following ways:

- Using the SAM utility.
- Issuing command-line commands, through `rad`, that refer to the `c8xx` OLAR script (`/usr/sbin/olard.d/c8xx`).

HP **recommends** that you use SAM instead of the `rad` command to perform OLAR procedures. This is because for the most part, SAM prevents you from performing OLAR procedures that would adversely affect other areas of the system. This is not true when you use the `rad` command.

For detailed information on using either of these two procedures, see *Configuring HP-UX For Peripherals*. You can order that document from Hewlett-Packard, or you can view, download, and print it from <http://www.docs.hp.com>.

Table 2-1 below explains some important OLAR-related terms.

**Table 2-1**      **Important OLAR Terms**

Term	Meaning
OLAR	All aspects of the OLAR feature, including Online Addition (OLA) and Online Replacement (OLR).
Power Domain	A grouping of one or more interface adapter slots that are powered on or off as a unit. ( <b>Note:</b> Currently, multi-slot power domains are not supported.)
target adapter / target adapter slot	The interface adapter that will be added or replaced using OLAR, and the adapter slot it is in.
affected adapter / affected adapter slot	Interface adapters and the adapter slots they are in, and which are in the same power domain as the target slot.

---

**IMPORTANT**

In many cases, other interface adapters and slots within the system are dependent on the target adapter. For example, if the target adapter is a multiple-channel adapter, suspending or deleting drivers for the target adapter slot also suspends individual drivers for the multiple hardware paths on that adapter.

---

During an adapter replacement operation, SAM performs a **Critical Resource Analysis (CRA)**, which checks all channels on the target adapter for critical resources that will be temporarily unavailable while the adapter is shut down.

### Planning and Preparation

As mentioned earlier, for the most part, SAM prevents you from performing OLAR procedures that would adversely affect other areas of the HP-UX system. See *Configuring HP-UX For Peripherals* for detailed information.

### Critical Resources

Replacing an adapter that is still operating can have adverse consequences. As power to the slot must be off when the old adapter is removed and the new adapter is inserted, you must consider the effects of shutting down the adapter's functions.

This is particularly important if no online failover or backup adapter to pick up those functions is installed. For example:

- Which mass storage devices will be temporarily disconnected when the adapter is shut down?
- Will a critical networking connection be lost?

A critical resource is one that would cause a system crash or prevent the operation from completing successfully if the resources were temporarily suspended or disconnected. For example, if the SCSI adapter to be replaced connects to the unmirrored root disk or swap space, the system will crash when the adapter is shut down.

During an OLAR procedure, it is essential to check the targeted adapter for critical resources, as well as the effects of existing disk mirrors and other situations where an adapter's functions can be taken over by another adapter that will not be affected.

As mentioned earlier, SAM performs a thorough CRA automatically, and presents options based on its findings. If you determine that critical resources will be affected by the procedure, you can replace the adapter when the system is offline. On the other hand, if you are required to take an action immediately, you can use the `rad` command to try an online addition of a backup adapter and deletion of the target adapter.



## Adapter Compatibility

This section explains adapter compatibility considerations for performing OLA and OLR.

**Online Addition (OLA)** You can add multiple adapters at the same time. While adding an adapter online, the first issue you must resolve is whether the new adapter is compatible with the system. Each OLAR-capable PCI slot provides a set amount of power. The replacement adapter cannot require more than the available power.

The adapter must also operate at the slot's bus frequency. A PCI adapter must run at any frequency lower than its maximum capability, but an adapter that could operate at only 33 MHz would not work on a bus running at 66 MHz. The SCSI A6828A HBA operates at 66MHz. The `rad` command provides information on the bus frequency and power available at a slot, as well as other slot-related data.

If your system has one or more slots that support OLAR, and you want to use OLA to install the A6828A in one of those slots, install the adapter in your HP-UX system according to the procedure described in the “Managing PCI Cards with OLAR” chapter of the *Configuring HP-UX Peripherals* manual.

After you add a new A6828A adapter, SAM tries to locate the SCSI `c8xx` driver. If SAM is unable to locate the driver, you cannot use the new adapter until you install the driver (remember that driver installation requires a system reboot). If SAM locates the driver, it determines whether the new adapter is functional. If the adapter is not functional, SAM displays an error message.

**Online Replacement (OLR)** While replacing an interface adapter online, the replacement adapter must be identical to the adapter being replaced, or at least be able to operate using the same driver as the replaced adapter. This is referred to as **like-for-like** replacement and should be adhered to, because using a similar but not identical adapter can cause unpredictable results.

For example, a newer version of the target adapter that is identical to the older adapter in terms of hardware might contain an updated firmware version that could potentially conflict with the current driver. In addition, the old adapter and new adapter must have the same PCI identifiers (subsystem ID and device ID).

The PCI specification allows a single physical adapter to contain more than one channel. A single channel SCSI adapter cannot be replaced by a dual channel adapter, even if the additional channel(s) on the adapter are identical to the original SCSI adapter.

When the replacement adapter is added to the system, the appropriate driver for that adapter must be configured in the kernel before beginning the replacement operation. SAM ensures the correct driver is present. (In most cases, the replacement adapter will be of the same type as an adapter already in the system, and this requirement will be automatically met.) Keep the following things in mind:

- If the necessary driver is not present and the driver is a dynamically loadable kernel module (DLKM), you can load it manually. See the section “Dynamically Loadable Kernel Modules” in *Configuring HP-UX For Peripherals* for more information.
- If the driver is static and not configured in the kernel, then the adapter cannot be added online. The adapter could be physically inserted online, but no driver will claim it. Note that the SCSI `c8xx` driver is a static driver.

If you have any question about the driver’s presence, or if you are not certain that the replacement adapter is identical to the existing adapter, you can use the `ioscan` command together with the `rad` command to investigate.

SAM does not allow the A6828A HBA to be suspended in either of the following situations:

- If the adapter is being used (for example, if a file system is mounted).
- If the CRA shows that a critical resource (for example, swap space or the root file system) depends on the adapter.

After you replace an A6828A adapter online, SAM checks the replacement adapter to make sure it is permitted, according to the like-for-like rules. If the adapter is permitted, SAM automatically activates it. If it is not permitted, SAM displays an error message.

## Connecting External SCSI Peripherals

The A6828A adapter is capable of communicating with Low Voltage Differential (LVD) or Single Ended (SE) SCSI devices. LVD allows up to 12m cable lengths with multiple SCSI devices, or 25m point-to-point connections.

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### IMPORTANT

As stated earlier in this chapter, do not mix LVD SCSI devices with SE SCSI devices on the bus. If you do so, the entire SCSI bus will change to SE. This will limit the bus performance to Ultra SCSI (40 MB/s).

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Make all external SCSI bus connections to the A6828A adapter with shielded, 68-pin LVD cables. The connectors on the cable are always keyed to ensure proper mating.

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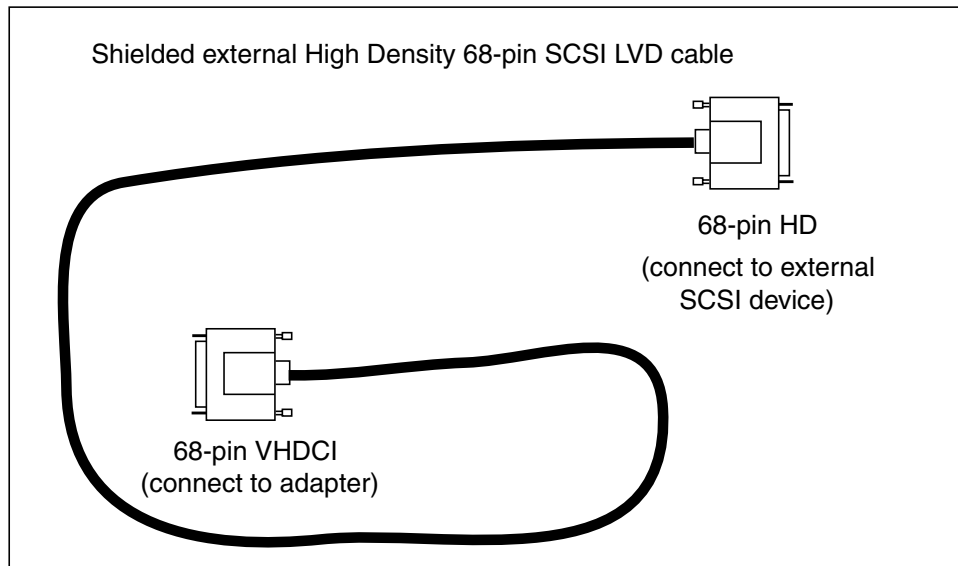
### NOTE

No cables or external terminators are shipped with the A6828A adapter. Cables are usually shipped with the external SCSI devices, and you can get external terminators for the A6828A HBA by ordering SCSI LVD/SE terminator (HP product number C2370A).

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Figure 2-1 below is a drawing (not to scale) of a typical SCSI shielded 68-pin LVD cable.

**Figure 2-1** SCSI Cable for External Connections



To connect external SCSI devices to the A6828A adapter, perform the following steps:

- Step 1.** Plug the 68-pin VHDCI connector on one end of a shielded external high density SCSI cable into the adapter's external connector (J2).
- Step 2.** Plug the 68-pin HD connector on the other end of the cable into the SCSI connector on the external SCSI device.
- Step 3.** If you need to connect more than one external SCSI device to the adapter, daisy chain them together with shielded external SCSI cables.

If auto termination is disabled and you want to terminate the external connector on the HBA, use SCSI LVD/SE terminator (HP product number C2370A). For more information on auto termination, see "Auto Termination" on page 37.

When you have finished connecting the external devices, go to the next section, "Specifying SCSI Parameters".

## Specifying SCSI Parameters

To ensure proper operation of the A6828A adapter, the following SCSI parameters that apply to the entire adapter must be configured correctly:

- SCSI ID (SCSI initiator ID)—see “SCSI IDs” on page 25.
- Maximum data transfer rate (SCSI rate)—see “Maximum Data Transfer Rate” on page 27.
- Auto termination state—see “Auto Termination” on page 37.
- Bus width—see “Bus Width” on page 39.

---

### NOTE

For some of these parameters, you can set the value through commands in the **Boot Console Handler (BCH)** menus (on some HP-UX systems); see Table 2-2 on page 22.

The BCH menus are displayed after the system has booted and before the OS is running.

---

If the adapter is new, the SCSI driver uses a default setting suggested by the system’s firmware, unless you specify a setting through the BCH menus (if possible). This also happens if the slot in which you install the adapter has no prior setting for a particular SCSI parameter

If the adapter is new and the slot does have a prior setting, the driver uses that setting unless you change it through the BCH menus (if possible).

If the adapter has been used in another slot or in a different system, you must set the SCSI parameters for the adapter back to their default values. This is because previously set values for the adapter cannot be migrated to the new slot or system. See “Setting SCSI Parameters to Default Values” on page 49 for the steps to follow.

Table 2-2 is a summary of the supported HP-UX systems and the SCSI parameters you can set on each one. This table assumes that you have correct version of PDC on the HP-UX system. To know about the correct

PDC version information, see the latest SCSI support matrix. The support matrix is available at <http://docs.hp.com> under the Networking and Communications section.

**Table 2-2 Ability to Set SCSI Parameters on HP-UX Systems**

HP-UX System	SCSI Parameter	Method for Setting Parameter		
		Firmware Suggested Default	BCH Commands	Jumper (for the Single Channel)
a400 and a500 servers	SCSI ID	✓	✓	
	Maximum data transfer rate	✓	✓	
	Auto term state			✓
	Bus width	✓		
l-class servers	SCSI ID	✓	✓	
	Maximum data transfer rate	✓	✓	
	Auto term state			✓
	Bus width	✓		
n-class servers	SCSI ID	✓	✓	
	Maximum data transfer rate	✓	✓	
	Auto term state			✓
	Bus width	✓		

**Table 2-2 Ability to Set SCSI Parameters on HP-UX Systems (Continued)**

HP-UX System	SCSI Parameter	Method for Setting Parameter		
		Firmware Suggested Default	BCH Commands	Jumper (for the Single Channel)
hp server rp24xx	SCSI ID	✓	✓	
	Maximum data transfer rate	✓	✓	
	Auto term state			✓
	Bus width	✓		
hp server rp54xx	SCSI ID	✓	✓	
	Maximum data transfer rate	✓	✓	
	Auto term state			✓
	Bus width	✓		
hp server rp74xx	SCSI ID	✓	✓	
	Maximum data transfer rate	✓	✓	
	Auto term state <sup>1</sup>			✓
	Bus width	✓	✓	

**Table 2-2 Ability to Set SCSI Parameters on HP-UX Systems (Continued)**

HP-UX System	SCSI Parameter	Method for Setting Parameter		
		Firmware Suggested Default	BCH Commands	Jumper (for the Single Channel)
hp server rp8400	SCSI ID	✓	✓	
	Maximum data transfer rate	✓	✓	
	Auto term state <sup>1</sup>			✓
	Bus width	✓	✓	
hp superdome servers	SCSI ID	✓	✓	
	Maximum data transfer rate	✓	✓	
	Auto term state <sup>1</sup>			✓
	Bus width	✓	✓	
<sup>1</sup> See “Summary of Auto Termination Configurations” on page 37 for information on systems where you can use the jumper to control auto termination.				

Information on configuring each of the SCSI parameters is given in the later sections.



## SCSI IDs

You must assign a separate SCSI ID (0 through 15 for a 16-bit SCSI bus) to the SCSI host bus adapter (HBA) and each SCSI device. The priority of the device on the SCSI bus is determined by the SCSI ID of the device. The order of SCSI ID priorities (from highest to lowest) is 7, 6, 5, 4, 3, 2, 1, 0, 15, 14, 13, 12, 11, 10, 9, and 8. A device with SCSI ID 7 has the highest priority, and one with SCSI ID 8 has the lowest.

When you are assigning SCSI IDs, HP recommends you to give the SCSI HBA higher priority than the other SCSI devices on the bus. SCSI ID 7 is the preset SCSI ID for the A6828A SCSI HBA, thereby giving it the highest priority on the SCSI bus. Set each of the other SCSI devices on the bus to one of the remaining SCSI IDs.

In a multi-initiator (High Availability [HA]) configuration, multiple SCSI HBAs are connected to the same SCSI bus. For such configuration, the SCSI HBA that carries most of the traffic must be assigned a SCSI ID of 7 (highest priority). Later, you must change the SCSI ID of each of the remaining SCSI HBAs on the bus from the preset setting (7) to the next highest priority remaining SCSI IDs (for example, 6, 5, 4, and so on).

If you plan to boot your system from a hard disk drive on the SCSI bus, you must assign that drive the next highest priority unassigned SCSI ID. If there is only one SCSI HBA (SCSI ID = 7), the hard disk drive will be assigned a SCSI ID of 6. If there are multiple SCSI HBAs, the hard disk drive will be assigned the next highest priority SCSI ID available after all of the SCSI HBAs have been assigned higher priority SCSI IDs.

### Setting SCSI IDs

To set the SCSI ID of the A6828A HBA, see “Setting and Confirming SCSI Parameters” on page 88.

The peripheral device SCSI IDs are usually set with jumpers or a switch on the peripheral. Refer to the peripheral manufacturer’s instructions to determine the ID of each device and how to change it.

---

#### IMPORTANT

---

You must not have duplicate SCSI IDs on a SCSI bus; the system may hang or crash if you have duplicate SCSI IDs on the bus.

Make necessary changes, if any, to the SCSI IDs and record the SCSI IDs for future reference. To keep a record of the SCSI IDs, you can use Table 2-3.

**Table 2-3**      **Record of SCSI IDs—A6828A Host Bus Adapter**

SCSI ID	SCSI Device
15	
14	
13	
12	
11	
10	
9	
8	
7	
6	
5	
4	
3	
2	
1	
0	

## Maximum Data Transfer Rate

The firmware suggested default for the A6828A adapter's maximum data transfer rate is the adapter's maximum speed (160 MB/s). The A6828A can communicate with all LVD or SE devices that have speeds up to 160 MB/s. This includes the following speeds (synchronous communication over a Wide bus):

- Fast (20 MB/s)
- Ultra (40 MB/s)
- Ultra2 (80 MB/s)
- Ultra160 (160 MB/s)

The actual transfer rate between the adapter and a SCSI device depends on the transfer rate that was negotiated between the adapter and the SCSI device. However, the actual rate will never be greater than the maximum data transfer rate set for the adapter.

For example, if you set the A6828A's maximum data transfer rate to `NOLIMIT` (which is same as 160 MB/s, in this case), and then connect a disk drive that has a maximum data transfer rate of Ultra2 (80 MB/s), the *actual* transfer rate will be 80 MB/s.

---

### TIP

HP **recommends** that you always set the A6828A's maximum data transfer rate to `MAX` or `NOLIMIT` (whichever is applicable to the system), unless you are trying to debug a communication problem between the adapter and a specific SCSI device. Using `MAX` or `NOLIMIT` allows the adapter's maximum transfer rate (160 MB/s) to be used.

---

You can set the A6828A's maximum data transfer rate in two ways, as shown in Table 2-2 on page 22.

To set the maximum data transfer rate for A6828A HBA installed in PA-RISC based system, see "Setting Maximum Data Transfer Rate for A6828A Host Bus Adapter Installed in PA-RISC Based System" on page 28.

To set the maximum data transfer rate for A6828A HBA installed in Itanium®-based system, see "Setting Maximum Data Transfer Rate for A6828A Host Bus Adapter Installed in Itanium,-Based System" on page 32.

### Setting Maximum Data Transfer Rate for A6828A Host Bus Adapter Installed in PA-RISC Based System

If the HP A6828A HBA is installed in a supported PA-RISC based system, use the BCH menu to set the maximum data transfer rate.

The steps for setting the maximum data transfer rate through the BCH menus (if you do not want to use the default suggested by the system's firmware) are mentioned later in this section.

---

#### NOTE

The following steps and examples are specific to an hp server rp7410. Menus, command syntax, and responses might be slightly different on other systems (for example, a maximum data transfer rate of Ultra2 is not allowed on some HP-UX systems).

For command syntax and valid maximum data transfer rate values, HP **recommends** you to use the online help for the `scsi` command (type **help scsi** when you are in the BCH "Service Menu").

---

To display and optionally change the A6828A adapter's maximum data transfer rate in the BCH menus, perform the following steps:

- Step 1.** At the "Information Menu," type **fv** (to display the PDC version). The output is as follows:

```
FIRMWARE INFORMATION
```

```
    Firmware Version:          15.3
```

To know about the correct PDC version information, see the latest SCSI support matrix available at <http://docs.hp.com> under the Networking and Communications section.

If you do not have a correct PDC version on your system, contact your HP support representative.

- Step 2.** Determine the HBA's path by performing the following steps:
- a.** If you are already at the "Main Menu," type **in** (for "Information Menu"), and then go to step b.

If you are not at the "Main Menu," type **main** (to return to the "Main Menu"), type **in** (for "Information Menu"), and then go to step b.

- b. At the “Information Menu,” type **io** (to display I/O interface information). The output is as follows:

## Installing the A6828A Adapter Specifying SCSI Parameters

### PCI DEVICE INFORMATION

Description	Path (dec)	Bus #	Slot #	Vendor Id	Device Id
.					
.					
SCSI bus cntlr	<b>0/0/10/0/0</b>	80	2	0x1000	0x0021
.					
.					

In this example, the HBA's path is 0/0/10/0/0 (shown in **bold** in the listing above, for highlighting purposes). Note that the last (farthest right) digit is the channel number—0 for channel A.

**Step 3.** Display (and optionally change) the HBA's maximum data transfer rate by performing the following steps:

- a. If you are already at the "Main Menu," type **ser** (for "Service Menu"); go to step b.

If you are not at the "Main Menu," type **main** (to return to the "Main Menu"), type **ser** (for "Service Menu"), and then go to step b.

- b. In the "Service Menu," type the following command:

#### **scsi path rate**

where *path* is the HBA's path (from step 1).

Therefore, using the information for the HBA in the example in step 1, type the following:

#### **scsi 0/0/10/0/0 rate**

This displays the HBA's maximum data transfer rate. The output is as follows:

Path (dec)	Initiator ID	SCSI Rate	Auto Term	Bus Width
0/0/10/0/0	7	<b>MAX</b>	ON	MAX

In this example, the HBA's maximum data transfer rate is **MAX** (shown in **bold** in the previous listing, for highlighting purposes). As mentioned earlier, this is the firmware suggested default setting, and it allows the A6828A's maximum data rate (160 MB/s) to be used.

If you want to retain the maximum data transfer rate, type **main** to go back to the “Main Menu”.

If you want to change the data transfer rate (for example, to troubleshoot communications between the adapter and an Ultra-capable SCSI disk), go to step c.

- c. If you are still in the “Service Menu,” type the following command:

```
scsi path rate new_data_rate
```

where, *path* is the HBA’s path and *new\_data\_rate* is what you want to change the HBA’s maximum data transfer rate to (ULTRA, for this example).

Therefore, using the information for the HBA in step b, type the following:

```
scsi 0/0/10/0/0 rate ultra
```

This changes the HBA’s maximum data transfer rate to ULTRA (40 MB/s).

To ensure that the data transfer rate has changed, you can repeat step b to display the HBA’s transfer rate.

When your troubleshooting is complete, and you want to change the adapter’s transfer rate back to MAX, go to step d.

- d. If you are still in “Service Menu”, type the following command:

```
scsi path rate new_data_rate
```

where, *path* is the HBA’s path and *new\_data\_rate* is what you want to change the HBA’s maximum data transfer rate to (MAX, for this example).

Therefore, using the information for the HBA in step c, type the following:

```
scsi 0/0/10/0/0 rate nolimit
```

This changes the HBA’s maximum data transfer rate back to MAX (160 MB/s).

To ensure that the data transfer rate has changed, you can repeat step b to display the HBA’s transfer rate.

When you are satisfied that the maximum data transfer rate is set correctly, type **main** to go back to the “Main Menu.”

## Setting Maximum Data Transfer Rate for A6828A Host Bus Adapter Installed in Itanium®-Based System

If the HP A6828A HBA is installed in a supported Itanium®-based system, use the following procedure to set maximum data transfer rate:

- Step 1.** At the EFI Shell prompt, issue the `drivers` command as illustrated in the following example:

```
Shell> drivers

          T   D
D         Y C I
R         P F A
V  VERSION  E G G #D #C DRIVER NAME                               IMAGE NAME
== ===== = = = == == =====
14 00000010 B - - 8 18 PCI Bus Driver                               PciBus
20 01010201 D X X 5 - LSI Logic Ultra160 SCSI Driver              PciRomSeg=00000000
21 01010201 D X X 1 - LSI Logic Ultra160 SCSI Driver              PciRomSeg=00000000
24 00000200 D X X 3 - LSI Logic Ultra SCSI Driver                  PciRomSeg=00000000
25 00000200 D X X 1 - LSI Logic Ultra SCSI Driver                  PciRomSeg=00000000
28 01010201 D X X 1 - LSI Logic Ultra160 SCSI Driver              PciRomSeg=00000000
2D 00000105 D X X 1 - HP Tachyon XL2 Fibre Channel Mass S        PciRomSeg=00000000
2E 00000105 D X X 2 - HP Tachyon XL2 Fibre Channel Mass S        PciRomSeg=00000000
31 00000020 ? - - - - USB Keyboard Driver                          UsbKeyBoard
32 00000010 ? - - - - UGA Console Driver                            GraphicsConsole
33 00000000 ? - - - - PCI VGA Mini Port Driver                    PciVgaMiniPort
34 00000010 ? - - - - VGA Class Driver                            VgaClassDriver
35 00000010 B - - 1 1 Serial 16550 UART Driver                      Serial16550
36 00000010 B - - 1 1 Serial Terminal Driver                       Terminal
37 00000010 D - - 1 - Platform Console Management Driver          ConPlatform
38 00000010 D - - 1 - Platform Console Management Driver          ConPlatform
39 00000010 B - - 1 1 Console Splitter Driver                      ConSplitter
```

- Step 2.** Find the driver handle designation `<drv_handle>`.

For the A6828A HBA, the `<drv_handle>` designation will be in the `DRV` column that corresponds to the LSI Logic Ultra160 SCSI Driver listing in the `DRIVER NAME` column.

In the preceding example, there are two versions of the LSI Logic Ultra160 SCSI Driver. The `<drv_handle>` designations that correspond to the two LSI Logic Ultra SCSI Drivers are 20 and 21.

- Step 3.** Find the controller handle designation, `<cntrl_handle>`.

At the EFI Shell prompt, issue the `drvcfg` command as illustrated in the following example:



```
Shell> drvcfg
Configurable Components
  Drv[20]  Ctrl [1A] Lang [eng]
  Drv[20]  Ctrl [1B] Lang [eng]
  Drv[20]  Ctrl [1D] Lang [eng]
  Drv[20]  Ctrl [1E] Lang [eng]
  Drv[20]  Ctrl [23] Lang [eng]
  Drv[21]  Ctrl [22] Lang [eng]
  Drv[24]  Ctrl [27] Lang [eng]
  Drv[24]  Ctrl [2B] Lang [eng]
  Drv[24]  Ctrl [2C] Lang [eng]
  Drv[25]  Ctrl [26] Lang [eng]
  Drv[28]  Ctrl [29] Lang [eng]
  Drv[2D]  Ctrl [30] Lang [eng]
  Drv[2E]  Ctrl [2A] Lang [eng]
  Drv[2E]  Ctrl [2F] Lang [eng]
  Drv[48]  Ctrl [1F] Lang [eng]
```

From the output of the **drvcfg** command, look for the line(s) where the NN in Drv[NN] is same as the <drv\_handle> for the driver(s) you are using.

The 2nd column, Ctrl [NN], contains the corresponding <cntrl\_handle>, where NN is the controller handle. For example, controller handle 1A, 1B, 1D, 1E, and 23 correspond to driver handle 20, and controller handle 22 corresponds to driver handle 21.

- Step 4.** Once the driver handle and the controller handle are identified, the SCSI parameters can be displayed and set for any driver and corresponding controller (HBA) on the SCSI bus.

Enter the **drvcfg -s <drv\_handle> <cntrl\_handle>** command at EFI shell prompt. The Global Properties screen containing a list of the controller (HBA) to which the controller handle corresponds is displayed; refer to the following example:

```
LSI Logic Host Bus Adapters
Adapter      PCI  PCI  PCI      IRQ  NVM  LSI Logic
              Bus Device Function
<53C875      60  01  01>       0   Yes  Enabled
```

Press the [Enter] key. This displays the Adapter Properties screen containing the controller (HBA) settings; refer to the following example:

**Adapter Properties**

<b>Adapter</b>	<b>PCI</b>	<b>PCI</b>	<b>PCI</b>
	<b>Bus</b>	<b>Device</b>	<b>Function</b>
53C875	60	01	01

**<Device Properties>**

<b>Boot Support</b>	<b>[Enabled]</b>
<b>SCSI Parity</b>	<b>[Yes]</b>
<b>Host SCSI ID</b>	<b>[ 5]</b>
<b>SCSI Bus Scan Order</b>	<b>[Low to High (0..Max)]</b>
<b>Spinup Delay (Secs)</b>	<b>[ 2]</b>
<b>Secondary Cluster Server</b>	<b>[Yes]</b>
<b>Termination Control</b>	<b>[Auto]</b>
<b>&lt;Restore Defaults&gt;</b>	

**Step 5.** Use the arrow keys to highlight the Device Properties option, and press the [Enter] key. This displays the Device Properties screen; refer to the following example:

**Device Properties**

SCSI ID	Device Identifier		MB/Sec	MT/Sec	Data Width	Scan ID	Scan LUNs > 0
0	-		160	[80]	[16]	[Yes]	[Yes]
1	HP 18.2GST318406LC	HP05	160	[80]	[16]	[Yes]	[Yes]
2	HP 18.2GST318406LC	HP05	160	[80]	[16]	[Yes]	[Yes]
3	HP 18.2GST318406LC	HP05	160	[80]	[16]	[Yes]	[Yes]
4	-		160	[80]	[16]	[Yes]	[Yes]
5	-		160	[80]	[16]	[Yes]	[Yes]
6	53C1010-66		160	[80]	[16]	[Yes]	[Yes]
7	-		160	[80]	[16]	[Yes]	[Yes]
8	-		160	[80]	[16]	[Yes]	[Yes]
9	-		160	[80]	[16]	[Yes]	[Yes]
10	-		160	[80]	[16]	[Yes]	[Yes]
11	HP 18.2GST318406LC	HP05	160	[80]	[16]	[Yes]	[Yes]
12	HP 18.2GST318406LC	HP05	160	[80]	[16]	[Yes]	[Yes]
13	-		160	[80]	[16]	[Yes]	[Yes]
14	-		160	[80]	[16]	[Yes]	[Yes]
15	HP A6491A	HP16	160	[80]	[16]	[Yes]	[Yes]

To change the maximum data transfer rate of the required device, use the arrow keys to highlight the corresponding option under the MT/Sec column, and then use the plus (+) or minus (-) keys to change the values.

---

**NOTE**

If you set a particular maximum data transfer rate to the SCSI controller (in this example, 53C1010-66), then the same maximum data transfer rate is set to all the devices.

This happens because all the devices are connected to the same SCSI bus, which is controlled by the SCSI controller.

---

**Step 6.** After making the necessary changes, press the [ESC] key to exit the Device Properties screen. This takes you back to the Adapter Properties screen.

**Step 7.** Press the [ESC] key to exit the Adapter Properties screen.

If you did not modify any of the SCSI parameters, then the Global Properties screen appears.

However, if you modified any of the SCSI parameters, then the following screen appears:

```
Adapter and/or device property changes have been made.  
<Cancel Exit>  
<Save changes then exit this menu>  
<Discard changes then exit this menu>  
Exit the Configuration Utility
```

Use the arrow keys to highlight your selection from the listed choices, and then press the [ENTER] key to return to the Global Properties screen.

**Step 8.** Press the [ESC] key. This displays the following screen:

```
Are you sure you want to exit?  
<Cancel Exit>  
Save changes then exit this menu  
Discard changes then exit this menu  
<Exit the Configuration Utility>
```

Use the arrow keys to highlight your selection from the listed choices, and then press the [ENTER] key to return to the EFI shell prompt.

**Step 9.** At the EFI shell prompt, issue the following command to reboot the system:

```
reset
```

---

**NOTE** The system reboot is required for the new setting to take effect.

---

## Auto Termination

When you configure the A6828A adapter's auto termination parameter, you specify the adapter's role in the SCSI bus termination, because the adapter might be a point of termination.

For more information on SCSI bus termination, including a tutorial, you can visit HP IT Resource Center (ITRC) at <http://itrc.hp.com>.

### Controlling Auto Termination

You can control auto termination in the A6828A adapter (see "Using the Jumper for Controlling Auto Termination" on page 38) depending upon the HP-UX system in which the adapter is installed (see Table 2-2 on page 22).

### Summary of Auto Termination Configurations

Table 2-4 summarizes the possible A6828A auto termination configurations.

Table 2-4

**Summary of A6828A Auto Termination Configurations**

Jumper Position	Auto Termination Feature	Termination Applied on Adapter
Open/ON/ON	Enabled	Yes
Open/ON/ON	Enabled	Yes
Open/OFF/ON	Disabled	No <sup>1</sup>
Open/OFF/ON	Disabled	No <sup>1</sup>
Shorted/ON/ON	Disabled	No <sup>1</sup>
Shorted/ON/ON	Disabled	No <sup>1</sup>
Shorted/OFF/ON	Disabled	No <sup>1</sup>
Shorted/OFF/ON	Disabled	No <sup>1</sup>

**Table 2-4 Summary of A6828A Auto Termination Configurations**

Jumper Position	Auto Termination Feature	Termination Applied on Adapter
<p><sup>1</sup>An external terminator might be required on the adapter, depending on the SCSI bus configuration. If you need an external terminator for the A6828A, use SCSI LVD/SE terminator (HP product number C2370A).</p>		

**Using the Jumper for Controlling Auto Termination**

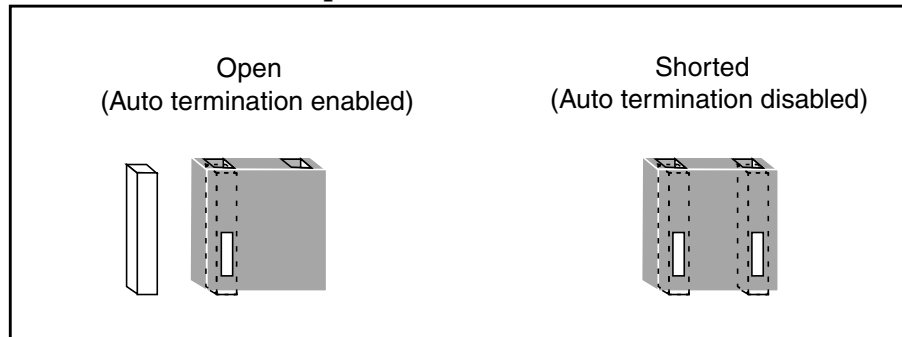
The A6828A adapter has one set of pins that control enabling and disabling of the auto termination feature. The pins—labeled A\_TERM—are at the end of the HBA that is opposite to the bulkhead connectors. Figure 1-1 on page 20 shows where the pin set is located on the adapter.

The default setting of the pin set on the A6828A HBA is the **open** position (the jumper is on only one pin of its pin set). This is the **auto termination enabled** state. In this state, the A6828A automatically senses whether a cable from a powered SCSI device is attached and provides the proper termination (depending on whether a powered device is present).

To disable auto termination on the adapter, change the jumper from the default open position to the **shorted** position (the jumper is on both pins of the pin set). This is the **auto termination disabled** state.

The following Figure 2-2 shows the two jumper positions.

**Figure 2-2 Auto Termination Jumper Positions**



## Bus Width

The firmware suggested default for the A6828A adapter's bus width is **MAX** (use the adapter's maximum bus width [16 bits]). However, either of these rates can be used for the A6828A:

- 8 bits (Narrow)
- 16 bits (Wide)

---

**TIP**

HP **recommends** you to always use the A6828A's maximum bus width (16 bits), unless you have Narrow (8-bit) devices on the bus and you are experiencing problems with the connection.

---

You can set the A6828A's bus width in one or two ways, depending on the HP-UX system the adapter is installed in (refer to Table 2-2 on page 22).

To set the bus width for A6828A HBA installed in PA-RISC based system, see "Setting Bus Width for A6828A Host Bus Adapter Installed in PA-RISC Based System" on page 40.

To set the bus width for A6828A HBA installed in Itanium®-based system, see "Setting Bus Width for A6828A Host Bus Adapter Installed in Itanium,-Based System" on page 44.

### Setting Bus Width for A6828A Host Bus Adapter Installed in PA-RISC Based System

If the HP A6828A HBA is installed in a supported PA-RISC based system, use the BCH menu to set the bus width.

The steps for setting the bus width through the BCH menus (if you do not want to use the default suggested by the system's firmware) are given below.

---

#### NOTE

The following steps and examples are specific to HP server rp7410. Menus, command syntax, and responses might be slightly different on other systems.

For command syntax and valid bus width values, HP **recommends** you to use the online help for the `scsi` command (type **help scsi** when you are in the BCH "Service Menu").

---

To display and optionally change the A6828A adapter's bus width in the BCH menus, perform the following steps:

- Step 1.** Check the PDC (system firmware) version by performing the following steps:
  - a.** If you are already at the "Main Menu," type **in** (for "Information Menu"); go to step b.

If you are not at the "Main Menu," type **main** (to return to the "Main Menu"), type **in** (for "Information Menu"), and then go to step b.
  - b.** At the "Information Menu," type **fv** (to display the PDC version). The output is as follows:

```
FIRMWARE INFORMATION
```

```
    Firmware Version:                15.3
```

To know about the correct PDC version information, see the latest SCSI support matrix available at <http://docs.hp.com> under the Networking and Communications section.

If you do not have a correct PDC version on your system, contact your HP support representative.



**Step 2.** Determine the HBA's path by doing the following:

- a. If you are already at the “Main Menu,” type **in** (for “Information Menu”); go to step b.

If you are not at the “Main Menu,” type **main** (to return to the “Main Menu”), type **in** (for “Information Menu”), and then go to step b.

- b. At the “Information Menu,” type **io** (to display I/O interface information). The output is as follows:

PCI DEVICE INFORMATION

Description	Path (dec)	Bus #	Slot #	Vendor Id	Device Id
-----	-----	---	-----	-----	-----
.					
.					
SCSI bus cntlr	<b>0/0/10/0/0</b>	80	2	0x1000	0x0021
.					
.					

In this example, the HBA's path is 0/0/10/0/0 (shown in **bold** in the listing above, for highlighting purposes). Note that the last (farthest right) digit is the channel number—0 for channel A.

**Step 3.** Display (and optionally change) the HBA's bus width by performing the following steps:

- a. If you are already at the “Main Menu,” type **ser** (for “Service Menu”); go to step b.

If you are not at the “Main Menu,” type **main** (to return to the “Main Menu”), type **ser** (for “Service Menu”), and then go to step b.

- b. In the “Service Menu,” type the following command:

**scsi path width**

where, *path* is the HBA's path (from step 1).

Therefore, using the information for the HBA in the example in step 1, type the following:

**scsi 0/0/10/0/0 width**

This displays the HBA's bus width. The output is as follows:

## Installing the A6828A Adapter

### Specifying SCSI Parameters

Path (dec)	Initiator ID	SCSI Rate	Auto Term	Bus Width
0/0/10/0/0	7	MAX	ON	<b>MAX</b>

In this example, the HBA's bus width is **MAX** (shown in **bold** in the previous listing). As mentioned earlier, this is the firmware suggested default setting.

If you want to retain the bus width, type **main** to go back to the "Main Menu".

If you want to change the bus width (for example, because you have Narrow devices on the SCSI bus and you are having problems with the connection), go to step c.

- c.** If you are still in the "Service Menu," type the following command:

```
scsi path width new_bus_width
```

where, *path* is the HBA's path and *new\_bus\_width* is what you want to set the HBA's bus width to (8, for this example).

Therefore, using the information for the HBA in step b, type the following:

```
scsi 6/0/4/0/0 width 8
```

This changes the HBA's bus width to 8.

To ensure that the bus width has changed, you can repeat step b to display the HBA's bus width.

When you have fixed the problem with the connection, and you want to change the adapter's bus width back to **MAX**, go to step d.

- d.** If you are still in "Service Menu", type the following command:

```
scsi path width new_bus_width
```

where, *path* is the HBA's path and *new\_bus\_width* is what you want to change the HBA's bus width to (**MAX**, for this example).

Therefore, using the information for the HBA in step c above, type the following:

```
scsi 0/0/10/0/0 width 0
```

This changes the HBA's bus width back to **MAX**.

To ensure that the bus width has changed, you can repeat step b to display the HBA's bus width.

When you are satisfied that the bus width is set correctly, type **main** to get back to the “Main Menu.”

## Setting Bus Width for A6828A Host Bus Adapter Installed in Itanium®-Based System

If the HP A6828A HBA is installed in a supported Itanium®-based system, use the following procedure to set the bus width:

- Step 1.** At the EFI Shell prompt, issue the `drivers` command as illustrated in the following example:

```
Shell> drivers

          T   D
D         Y C I
R         P F A
V  VERSION  E G G #D #C DRIVER NAME                               IMAGE NAME
== ===== = = = == == =====
14 00000010 B - - 8 18 PCI Bus Driver                               PciBus
20 01010201 D X X 5 - LSI Logic Ultra160 SCSI Driver             PciRomSeg=00000000
21 01010201 D X X 1 - LSI Logic Ultra160 SCSI Driver             PciRomSeg=00000000
24 00000200 D X X 3 - LSI Logic Ultra SCSI Driver                 PciRomSeg=00000000
25 00000200 D X X 1 - LSI Logic Ultra SCSI Driver                 PciRomSeg=00000000
28 01010201 D X X 1 - LSI Logic Ultra160 SCSI Driver             PciRomSeg=00000000
2D 00000105 D X X 1 - HP Tachyon XL2 Fibre Channel Mass S        PciRomSeg=00000000
2E 00000105 D X X 2 - HP Tachyon XL2 Fibre Channel Mass S        PciRomSeg=00000000
31 00000020 ? - - - - USB Keyboard Driver                          UsbKeyBoard
32 00000010 ? - - - - UGA Console Driver                            GraphicsConsole
33 00000000 ? - - - - PCI VGA Mini Port Driver                   PciVgaMiniPort
34 00000010 ? - - - - VGA Class Driver                            VgaClassDriver
35 00000010 B - - 1 1 Serial 16550 UART Driver                     Serial16550
36 00000010 B - - 1 1 Serial Terminal Driver                       Terminal
37 00000010 D - - 1 - Platform Console Management Driver          ConPlatform
38 00000010 D - - 1 - Platform Console Management Driver          ConPlatform
39 00000010 B - - 1 1 Console Splitter Driver                      ConSplitter
```

- Step 2.** Find the driver handle designation `<drv_handle>`.

For the A6828A HBA, the `<drv_handle>` designation will be in the `DRV` column that corresponds to the LSI Logic Ultra160 SCSI Driver listing in the `DRIVER NAME` column.

In the preceding example, there are two versions of the LSI Logic Ultra160 SCSI Driver. The `<drv_handle>` designations that correspond to the two LSI Logic Ultra SCSI Drivers are 20 and 21.

- Step 3.** Find the controller handle designation, `<cntrl_handle>`.

At the EFI Shell prompt, issue the `drvcfg` command as illustrated in the following example:

```
Shell> drvcfg
Configurable Components
  Drv[20]  Ctrl [1A] Lang [eng]
  Drv[20]  Ctrl [1B] Lang [eng]
  Drv[20]  Ctrl [1D] Lang [eng]
  Drv[20]  Ctrl [1E] Lang [eng]
  Drv[20]  Ctrl [23] Lang [eng]
  Drv[21]  Ctrl [22] Lang [eng]
  Drv[24]  Ctrl [27] Lang [eng]
  Drv[24]  Ctrl [2B] Lang [eng]
  Drv[24]  Ctrl [2C] Lang [eng]
  Drv[25]  Ctrl [26] Lang [eng]
  Drv[28]  Ctrl [29] Lang [eng]
  Drv[2D]  Ctrl [30] Lang [eng]
  Drv[2E]  Ctrl [2A] Lang [eng]
  Drv[2E]  Ctrl [2F] Lang [eng]
  Drv[48]  Ctrl [1F] Lang [eng]
```

From the output of the **drvcfg** command, look for the line(s) where the NN in Drv[NN] is same as the <drv\_handle> for the driver(s) you are using.

The 2nd column, Ctrl [NN], contains the corresponding <cntrl\_handle>, where NN is the controller handle. For example, controller handle 1A, 1B, 1D, 1E, and 23 correspond to driver handle 20, and controller handle 22 corresponds to driver handle 21.

- Step 4.** Once the driver handle and the controller handle are identified, the SCSI parameters can be displayed and set for any driver and corresponding controller (HBA) on the SCSI bus.

Enter the **drvcfg -s <drv\_handle> <cntrl\_handle>** command at EFI shell prompt. The Global Properties screen containing a list of the controller (HBA) to which the controller handle corresponds is displayed; refer to the following example:

```
LSI Logic Host Bus Adapters
Adapter      PCI   PCI   PCI      IRQ  NVM  LSI Logic
              Bus  Device Function
<53C875      60   01   01>      0   Yes  Enabled
```

Press the [Enter] key. This displays the Adapter Properties screen containing the controller (HBA) settings; refer to the following example:

Installing the A6828A Adapter  
**Specifying SCSI Parameters**

**Adapter Properties**

```

Adapter      PCI   PCI   PCI
              Bus  Device Function
53C875      60   01   01
  
```

<Device Properties>

```

Boot Support           [Enabled]
SCSI Parity            [Yes]
Host SCSI ID          [ 5]
SCSI Bus Scan Order   [Low to High (0..Max)]
Spinup Delay (Secs)   [ 2]
Secondary Cluster Server [Yes]
Termination Control   [Auto]
<Restore Defaults>
  
```

**Step 5.** Use the arrow keys to highlight the Device Properties option, and press the [Enter] key. This displays the Device Properties screen; refer to the following example:

**Device Properties**

SCSI ID	Device Identifier		MB/Sec	MT/Sec	Data Width	Scan ID	Scan LUNs > 0
0	-		160	[80]	[16]	[Yes]	[Yes]
1	HP 18.2GST318406LC	HP05	160	[80]	[16]	[Yes]	[Yes]
2	HP 18.2GST318406LC	HP05	160	[80]	[16]	[Yes]	[Yes]
3	HP 18.2GST318406LC	HP05	160	[80]	[16]	[Yes]	[Yes]
4	-		160	[80]	[16]	[Yes]	[Yes]
5	-		160	[80]	[16]	[Yes]	[Yes]
6	53C1010-66		160	[80]	[16]	[Yes]	[Yes]
7	-		160	[80]	[16]	[Yes]	[Yes]
8	-		160	[80]	[16]	[Yes]	[Yes]
9	-		160	[80]	[16]	[Yes]	[Yes]
10	-		160	[80]	[16]	[Yes]	[Yes]
11	HP 18.2GST318406LC	HP05	160	[80]	[16]	[Yes]	[Yes]
12	HP 18.2GST318406LC	HP05	160	[80]	[16]	[Yes]	[Yes]
13	-		160	[80]	[16]	[Yes]	[Yes]
14	-		160	[80]	[16]	[Yes]	[Yes]
15	HP A6491A	HP16	160	[80]	[16]	[Yes]	[Yes]

To change the bus width of the required device, use the arrow keys to highlight the corresponding option under the Data Width column, and then use the plus (+) or minus (-) keys to change the values.

---

**NOTE**

---

As stated earlier, HP **recommends** you to always use the A6828A's maximum bus width (16 bits), unless you have Narrow (8-bit) devices on the bus and you are experiencing problems with the connection.

If you decrease the maximum bus width value (16 bits) when the transfer rate (MT/sec) is set to 80 or 160, the following message is displayed:

```
Data Width cannot be set to narrow when MT/Sec is set to 80 or 160.  
Press any key to continue.
```

If you want to decrease the maximum bus width value of a particular device, first set the transfer rate (MT/sec) to a lower value, and then decrease the corresponding bus width value.

**Step 6.** After making the necessary changes, press the [ESC] key to exit the Device Properties screen. This takes you back to the Adapter Properties screen.

**Step 7.** Press the [ESC] key to exit the Adapter Properties screen.

If you did not modify any of the SCSI parameters, then the Global Properties screen appears.

However, if you modified any of the SCSI parameters, then the following screen appears:

```
Adapter and/or device property changes have been made.  
<Cancel Exit>  
<Save changes then exit this menu>  
<Discard changes then exit this menu>  
Exit the Configuration Utility
```

Use the arrow keys to highlight your selection from the listed choices, and then press the [ENTER] key to return to the Global Properties screen.

**Step 8.** Press the [ESC] key. This displays the following screen:

```
Are you sure you want to exit?  
<Cancel Exit>  
Save changes then exit this menu  
Discard changes then exit this menu  
<Exit the Configuration Utility>
```

Use the arrow keys to highlight your selection from the listed choices, and then press the [ENTER] key to return to the EFI shell prompt.

- Step 9.** At the EFI shell prompt, issue the following command to reboot the system:

```
reset
```

---

**NOTE**

---

The system reboot is required for the new setting to take effect.



## Setting SCSI Parameters to Default Values

You can set the SCSI parameters, except Auto Termination, for the adapter to their default values through the BCH menus. The steps you follow depend on the type of HP-UX system in which the adapter is installed.

### hp servers rp7410, rp8400, and superdome

On hp servers rp7410, rp8400, and superdome, set the SCSI parameters to the default values by performing the following steps:

- Step 1.** If you are already at the “Main Menu,” type **ser** (for “Service Menu”); go to step 2.

If you are not at the “Main Menu,” type **main** (to return to the “Main Menu”), type **ser** (for “Service Menu”), and then go to step 2.

- Step 2.** In the “Service Menu,” type the following command:

```
scsi path default
```

where, *path* is the HBA’s path. This sets all of the SCSI parameters for the *path* to their default values.

- Step 3.** Type **main** to get back to the “Main Menu.”

### All Other Servers

On all servers other than hp servers rp7410, rp8400, and superdome, set the SCSI parameters to the default values by following the steps for specifying each SCSI parameter (described earlier in this section).

You will need to know the default value—and how to specify it—for each SCSI parameter. To know the valid SCSI parameter values, HP **recommends** you to use the online help for the `scsi` command (type **help scsi** when you are in the BCH “Service Menu”).

## Installing the SCSI Driver

On most of the supported HP-UX PA-RISC systems, the SCSI `c720` driver is used with some of the SCSI interfaces. This driver is automatically installed as part of the HP-UX 11.0 core OS and the HP-UX 11i base Operating Environment (OE). Therefore, you do not have to install it separately.

However, you must separately install the SCSI `c8xx` driver, which is used by the A6828A HBA in all the supported HP-UX systems. This driver is available in the latest HP-UX bundle or at <http://itrc.hp.com>.

---

### TIP

You should keep in mind that although the installation process installs the `c8xx` driver, it does not load the `c8xx` driver into the HP-UX kernel unless it detects one or more SCSI Ultra160 devices installed in the HP-UX system. This is done to prevent the kernel from becoming unnecessarily large.

Therefore, if Ultra160 devices (for example, a SCSI Ultra160 “add-in” adapter [like the A6828A] or core I/O card) are already installed in the HP-UX system, or if you will be installing an Ultra160 add-in adapter later through OLA, you should install the `c8xx` driver now. If no SCSI Ultra160 devices are in the system, and you do not want to install any Ultra160 add-in adapters later, do not install the `c8xx` driver at this time.

---

### NOTE

You must install all patches before you install the bundle containing the `c8xx` driver.

The following is an overview of the steps you need to perform:

- Step 1.** Issue the `swlist` command to see which patches are already installed on the system. You can get any patches you need to install from the HP IT Resource Center (ITRC) at <http://itrc.hp.com>.

If you do not need to install any patches (other than the `c8xx` bundle), go to step 3.

If you need to install one or more patches, go to step 2.

- Step 2.** Install any necessary patches.
- Step 3.** Follow the normal procedure to install the appropriate software bundle for your HP-UX system's OS or OE.
- Step 4.** Issue the `swlist` command to ensure that the necessary patches and the `c8xx` driver are present.
- Step 5.** Check to see if the `c8xx` driver is loaded in the kernel by doing *one* of the following two things:

- Use SAM, as follows:
  1. Select the “Kernel Configuration” icon.
  2. Select the “Drivers” icon.
  3. In the “Kernel Configuration” screen, check to see if the `c8xx` driver is in the kernel.

- Issue the following command:

```
what /stand/vmunix | grep scsi_c8xx.c
```

Check to see if the `c8xx` driver is listed.

If the driver is in the kernel, go to the section, “Configuring LUN 0” on page 52.

If the driver is not in the kernel, go to step 6.

- Step 6.** Load the `c8xx` driver into the kernel through SAM:
- a. Select the “Kernel Configuration” icon.
  - b. Select the “Drivers” icon.
  - c. In the “Kernel Configuration” screen, follow the normal steps for loading the driver into the kernel (and building a new kernel).

---

**NOTE**

You need to reboot the system after completing these steps.

---

Once you have confirmed that the `c8xx` driver is in the kernel, go to section, “Configuring LUN 0” on page 52.

## Configuring LUN 0

For a disk array that is in a multi-host environment, the SCSI standard **requires** a LUN 0 in certain scenarios:

- If the disk array is connected to the A6828A adapter, and you plan to boot from that array, the disk array must be configured as LUN 0. Do not configure the LUN with any LUN security (that is, do not restrict access).
- If the disk array is connected to an A6828A adapter installed in an HP-UX system that is running from a separate boot disk, the disk array must be configured with LUN 0; otherwise, the `ioscan` command will not detect all of the LUNs present in the disk array.

Once you have determined that LUN 0—if it is required—is configured correctly, go to the section, “Verifying Installation” on page 55.

## Adding Multi-Initiator Support

In a multi-initiator configuration, multiple SCSI host bus adapters (HBA) are connected to the same SCSI bus. Multi-initiator is supported for A6828A HBAs having part number A6828A-60101 or higher.

---

**NOTE**

Multi-initiator is not supported for HP A6828A SCSI HBA with part number A6828A-60001.

---

If you need multi-initiator support for an Itanium®-based system, follow the steps mentioned in the section, “Multi-Initiator Support for Itanium,-Based System” on page 54.

If you need multi-initiator support for a PA-RISC based system, follow the steps mentioned in the section, “Multi-Initiator Support for PA-RISC Based System” on page 54.

### Multi-Initiator Support for Itanium®-Based System

If you need multi-initiator support for HP A6828A SCSI HBA installed in an Itanium®-based system, perform the following steps:

- Step 1.** Ensure that the part number of the HBA is A6828A-60101.
- Step 2.** Install the driver patch, **PHKL\_28566**.

### Multi-Initiator Support for PA-RISC Based System

If you need multi-initiator support for HP A6828A SCSI HBA installed in a PA-RISC based system, perform the following steps:

- Step 1.** Ensure that the part number of the HBA is A6828A-60101.
- Step 2.** Install the appropriate driver patch. Refer to Table 2-5 for information on the patch you need to install on your system.

**Table 2-5** Mapping of System Version to Driver Patch

System Version	Driver Patch
HP-UX 11.0	PHKL_27555
HP-UX 11i	PHKL_27556

---

## Verifying Installation

After installing the adapter and the `c8xx` driver and attaching the peripheral devices, verify that all the components are working by performing the following steps:

- Step 1.** To verify that the adapter is correctly installed, issue the following command:

```
ioscan -fnk
```

The applicable line in the `ioscan` output can have the following form:

```
ext_bus 0 0/0/10/0/0 c8xx CLAIMED INTERFACE SCSI C1010 Ultra160 Wide LVD A6828-60101
```

The third column shows the hardware path of the PCI device/function (shown in **bold** in the above example, for highlighting purposes). The A6828A supports one PCI device/function (because it has only one channel). In addition, since this is a single channel HBA, one line is listed for channel A of the adapter (denoted by a 0 as the last digit in the hardware path).

- Step 2.** In the same line of the `ioscan` output, verify that the adapter is claimed by the SCSI `c8xx` driver by looking at the fifth column of information (shown in **bold** in the example below, for highlighting purposes).

```
ext_bus 0 0/0/10/0/0 c8xx CLAIMED INTERFACE SCSI C1010 Ultra160 Wide LVD A6828-60101
```

If the adapter is not claimed, see “If the A6828A Adapter is Not Claimed” on page 86.

- Step 3.** In the same line of the `ioscan` output, verify that the SCSI driver and adapter information are displayed (shown in **bold** in the example below, for highlighting purposes).

```
ext_bus 0 0/0/10/0/0 c8xx CLAIMED INTERFACE SCSI C1010 Ultra160 Wide LVD A6828-60101
```

In this example, the SCSI driver information is `c8xx` (name of the driver), and the adapter information is as follows:

- SCSI C1010—The type of HBA (SCSI) and the type of Ultra160 controller (C1010).

- Ultra160—The HBA’s maximum data transfer rate. This can be Ultra160, Ultra2, Ultra, Fast, or Async. You should keep the following in mind:
  - This is not the actual transfer rate, but the maximum transfer rate set for the HBA.
  - This is either the firmware default or the rate set through the BCH menus, unless you attach an SE device, which causes the entire bus to change to a transfer rate of Ultra (see “Performance Tuning” on page 11).
- Wide—The HBA’s bus width. This can be Wide or Narrow.
- LVD—The HBA’s bus type. This can be LVD or Single-Ended. If no bus type is shown, then the SCSI channel is disabled.
- A6828-60101—The HBA’s HP part number.

**Step 4.** In addition, in the `ioscan` output, the `ctl` line shows the adapter’s SCSI ID in its hardware path (shown in **bold** in the example below, for highlighting purposes).

```
ctl      0 0/0/10/0/0.7.0  sctl CLAIMED  DEVICE
                /dev/rscsi/c0t7d0
```

**Step 5.** Verify that the devices you attached to the adapter are present in the `ioscan` output. For example, a partial list may look like this:

```
disk    10 0/0/1/0/1.0.0  sdisk CLAIMED  DEVICE      SEAGATE ST39103LC
                /dev/dsk/c1t0d0  /dev/rdisk/c1t0d0
disk    11 0/0/1/0/1.2.0  sdisk CLAIMED  DEVICE      SEAGATE ST39103LC
                /dev/dsk/c1t2d0  /dev/rdisk/c1t2d0
disk    45 0/2/1/0/1.8.0  sdisk CLAIMED  DEVICE      HP 18.2GST318404LC
                /dev/dsk/c9t8d0  /dev/rdisk/c9t8d0
disk    46 0/2/1/0/1.10.0  sdisk CLAIMED  DEVICE      HP 18.2GST318404LC
                /dev/dsk/c9t10d0 /dev/rdisk/c9t10d0
```

The second line under each `disk` line shows the disk’s device files (`/dev/...` [shown in **bold** in the example above, for highlighting purposes]).



---

**TIP**

When the system boots after installation, the `insf` command creates the proper device files for the “ctl” interfaces (which are usually adapters) and the SCSI devices attached to the A6828A adapter. Sometimes, though, it does not create all of the needed device files.

One situation when this happens is when you attach SCSI disks to the adapter after the system boots and the adapter is already installed in the system.

In the `ioscan` output, if you see a SCSI device listed without the second line, that means you are missing that device’s device files. To fix the problem, issue the `insf -e` command, which creates all of the device files.

---

For more information on the `ioscan` command, see the `ioscan(1M)` man page.

Refer to your system documentation for information on verifying system operation.

## Using the Extended Firmware Interface Flash Utility

If you are installing the A6829A SCSI HBA in an Itanium®-based system, use the Extended Firmware Interface (EFI) flash utility to verify the firmware version, or to flash and save firmware images onto the A6829A HBA.

The EFI flash utility is supported on HP A6829A SCSI HBA, which is based on the 53C1010 LSI Logic SCSI chip.

### Features

The features of the EFI flash utility are as follows:

- Supports HBA selection for updating the SCSI parameters.
- Displays the firmware version on an HBA or in a firmware image file.
- Supports a menu driven mode.
- Allows you to flash the EFI option ROM images.

### Description

This utility allows you to update the HBA flash memory with the LSI Logic EFI driver. New versions of these images are released periodically. Your HBA must have a flash memory to use this utility.

---

#### WARNING

**Do not attempt to use this utility to flash any binaries other than the EFI option ROM images.**

---

The executable file name of the EFI utility is `EFI8XXFL.EFI`. This file, and any firmware image files you need, must be stored on a diskette or CD-ROM. These files must not be stored on a hard disk, because if the flash fails, there is no way to recover these files. Moreover, the hard disk may not be accessible.

The EFI utility should be executed from a diskette or CD-ROM. For EFI based systems without a floppy diskette drive, burning the EFI utility and other firmware images onto a CD-ROM allows proper execution, but with reduced functionality. In such a situation, you will not be able to save an image of the flash memory to the CD-ROM.

## Preparation

While booting the EFI enabled systems, the diskette or CD-ROM containing the EFI utility needs to be in the drive to allow device mapping. The EFI utility and firmware image files are located in the root directory or in a subdirectory on the diskette or CD-ROM.

Boot the system to the EFI shell prompt. The floppy diskette drive or CD-ROM drive should appear in the list of mapped devices as `fs0`.

In systems with a floppy drive, type `fs0` at the EFI shell prompt to change to this device.

## Menu Driven Mode

If the EFI utility and firmware image files are located in the root directory, enter the `efi8xxfl` command at the prompt as illustrated below; otherwise, move to the directory in which these files are located and continue.

```
fs0:\> efi8xxfl
```

The following main window screen appears:

Choice	Vendor ID	Device ID	Seg	Bus	Dev	Func	Flash Part
1	0x1000	0x021	0x00	0x15	0x01	0x00	M29F010B
	LSI Logic, Inc. SYMC1010 Ultra160 66Mhz SCSI						
2	0x1000	0x021	0x00	0x15	0x01	0x01	M29F010B
	LSI Logic, Inc. SYMC1010 Ultra160 66Mhz SCSI						
3	0x1000	0x021	0x00	0x3F	0x01	0x00	Am29F010
	LSI Logic, Inc. SYMC1010 Ultra160 66Mhz SCSI						
4	0x1000	0x021	0x00	0x3F	0x01	0x01	Am29F010
	LSI Logic, Inc. SYMC1010 Ultra160 66Mhz SCSI						

## Using the Extended Firmware Interface Flash Utility

```
5      0x1000      0x021      0x01      0x16      0x01      0x00      Am29F010
      LSI Logic, Inc. SYMC1010 Ultra160 66Mhz SCSI
6 - Refresh

Which chip/adapter (0 to quit)?
```

The main window allows you to choose the SCSI chip corresponding to the path where you want to perform the selected tasks. Dual channel cards display two entries (one for each SCSI chip) on this screen.

In the aforementioned example, the system has three HBAs - one each on the 0x15, 0x3F, and 0x16 buses. The HBA on bus 0x3F is a dual-channel HBA (func 0x00 and func 0x01) with flash memory part number Am29F010. Since both the channels of a dual channel board share the same flash memory, only one of the paths needs to be chosen. If separate updates are performed through both the paths, the flash memory is not affected.

---

### NOTE

---

Each update overwrites the existing contents of the flash memory.

The segment value of the HBA corresponding to Choice number 5 is 0x01. This indicates that the HBA resides on PCI segment 1. The other HBAs reside on PCI segment 0, as the segment value for other HBAs is 0x00.

The SYMC1010 following LSI Logic, Inc. indicates that the HBAs use the 53C1010 LSI SCSI chip, which is supported by this EFI utility.

If a device does not contain an LSI Logic SCSI chip supported by the EFI utility, the lines listing the chip numbers do not appear in the display. The HP A6829A SCSI HBA is based on the LSI Logic 53C1010 SCSI chip.

At the Which chip/adapter (0 to quit)? prompt, enter the number under Choice that corresponds to the SCSI chip associated with the flash memory you want to update. Refer to the following example where chip 1 is selected:

```
Which chip/adapter (0 to quit)? 1
```

The following menu is displayed:

```
LSI Logic Corporation EFI 53C8xx/53C1010 FLASH Utility.  
EFI8XXFL-1.00.00.00 (05.05.2003)  
Copyright (c) 2003 LSI Logic Corporation. All rights reserved.  
*****  
FLASH  
    a - Identify Flash Image  
    b - Download New Flash Image  
    c - Upload Current Flash Image to a File  
    d - Erase Entire Flash Part  
  
MISC  
    z - Change Current PCI chip/adapter  
    q - Quit  
  
Selection:
```

In the preceding menu, the banner at the top of the option menu displays the version of the EFI update utility and the release date.

The details on each of the menu choices are as follows:

**a Identify Flash Image:** Displays the version number of the image in the flash memory associated with the currently selected chip or the image contained in the firmware image file.

**b Download New Flash Image:** Overwrites the flash memory associated with the currently selected chip with a new firmware image file. This menu choice prompts you for a file name.

---

**NOTE**

The EFI utility does not flash an image that exceeds the capacity of the flash memory on the selected HBA. Instead, a warning message is displayed.

**c Upload Current Flash Image to a File:** Saves the image from the flash memory associated with the currently selected chip to a file. This menu choice prompts you for a file name.

**d Erase Entire Flash Part:** Erases the entire flash memory associated with the currently selected chip. Once the flash memory is erased, you must download a new Flash image (select option [b]) before the HBA is able to function in the boot sequence.

When the EFI utility flashes an adapter, the following message is displayed:

## Installing the A6828A Adapter

### Using the Extended Firmware Interface Flash Utility

```
Updating the adapter at: PCI seg 0x00, bus 0x3F, dev 0x01, func 0x00
Updating VPD of NVM with new image version.....
Begin erase cycle...
Erase complete.
```

---

## **3 Troubleshooting**

The A6828A adapter is a single field-replaceable unit (FRU) and does not contain any field-serviceable parts. Troubleshooting procedures described in this chapter are limited to verifying that the adapter is operational and a valid connection is established.

This chapter contains the following sections that describe how to troubleshoot the A6828A adapter:

- “General Procedure” on page 65.
- “NVRAM SCSI Parameters Do Not Match” on page 66.
- “Creating Missing Device Files” on page 67.
- “If the A6828A Adapter is Not Claimed” on page 68.
- “Setting and Confirming SCSI Parameters” on page 70.
- “Domain Validation” on page 80.
- “Using Support Tools Manager (STM)” on page 85.
- “Contacting Your Hewlett-Packard Representative” on page 86.



## General Procedure

In general, perform the following steps to troubleshoot the A6828A adapter:

**Step 1.** Check the connection.

Ensure that the correct cable is used, connected, and operating properly. In addition, ensure that none of the connectors have any bent pins. If you do not find any problems with the connection, go to step 2.

**Step 2.** Check SCSI bus compatibility.

Use the commands in the BCH menus to ensure that the data transfer rates of the A6828A adapter and the attached devices are compatible (see “Setting and Confirming SCSI Parameters” on page 70). If the transfer rates of the adapter and attached devices are compatible, go to step 3.

**Step 3.** Check the adapter.

Inspect the adapter to ensure that it is seated properly in the PCI slot. If necessary, power down the system, reseal the adapter, and restart the system.

If a visual inspection of the adapter and cable does not reveal any problems, or if an action taken as a result of the inspection does not produce a working adapter, go to step 4.

**Step 4.** Run the Support Tools Manager (STM) diagnostics application (see “Using Support Tools Manager (STM)” on page 85).

If diagnostics determine that the adapter is defective, you must replace it. Contact your local Hewlett-Packard customer representative or call the Hewlett-Packard Response Center.

---

## NVRAM SCSI Parameters Do Not Match

On hp servers rp7410, rp8400, and superdome *only*, you might see the following message after you have installed the A6828A adapter (it would be displayed at the BCH “Main Menu”):

```
ERROR: PDH NVRAM and I/O card NVRAM SCSI parameters
do not match for path hw_path
Search aborted. The SCSI parameters for this card
must be corrected from the BCH Service menu.
```

To correct this problem, follow these steps:

- Step 1.** If already at the “Main Menu,” type **ser** (for “Service Menu”); go to step 2.

If not already at the “Main Menu,” type **main** (to return to the “Main Menu”), type **ser** (for “Service Menu”), then go to step 2.

- Step 2.** In the “Service Menu,” type the following command:

```
scsi path default
```

where *path* is the HBA’s path (the *hw\_path* in the error message).

This sets all of the SCSI parameters for the *path* to their default values, which will correct the unmatching SCSI parameters.

- Step 3.** Type **main** to get back to the “Main Menu.”

## Creating Missing Device Files

When the system boots after installation, the `insf` command creates the proper device files for the “ctl” interfaces (which are usually adapters) and the SCSI devices attached to the A6828A adapter. Sometimes, though, it does not create all of the needed device files. (One situation where this happens is when you attach SCSI disks to the adapter after the system boots [and the adapter is already installed in the system].) The following is an example of what the output of the `iocscan` command might look like when you issue it to verify the A6828A installation (see “Verifying Installation” on page 72):

```
disk 10 0/0/1/0/1.0.0 sdisk CLAIMED DEVICE SEAGATE ST39103LC
      /dev/dsk/c1t0d0 /dev/rdisk/c1t0d0
disk 11 0/0/1/0/1.2.0 sdisk CLAIMED DEVICE SEAGATE ST39103LC
      /dev/dsk/c1t2d0 /dev/rdisk/c1t2d0
disk 45 0/2/1/0/1.8.0 sdisk CLAIMED DEVICE HP 18.2GST318404LC
      /dev/dsk/c9t8d0 /dev/rdisk/c9t8d0
disk 46 0/2/1/0/1.10.0 sdisk CLAIMED DEVICE HP 18.2GST318404LC
      /dev/dsk/c9t10d0 /dev/rdisk/c9t10d0
```

In the `iocscan` output above, the second line shows the disks’ device files (`/dev/...` [shown in **bold** in the example above, for highlighting purposes]). If you see a disk (or other SCSI devices) listed without the second line, that means you are missing that device’s device files. To fix the problem, issue the `insf -e` command, which creates *all* of the device files.

---

## If the A6828A Adapter is Not Claimed

If the A6828A adapter is not claimed (it shows as “UNCLAIMED” in the output from the `ioscan` command), the most likely reason is that you installed the `c8xx` driver but did not install the required patches.

To fix this problem, perform the following steps:

- Step 1.** Confirm that the `c8xx` driver has not claimed the A6828A adapter, by issuing the following command:

```
ioscan -f
```

The applicable line in the `ioscan` output could look like this:

```
unknown -1 0/0/10/0/0 UNCLAIMED UNKNOWN PCI SCSI (10000021)
```

In the example above, the pieces of information that are abnormal—indicating an unclaimed adapter—are shown in **bold**, for highlighting purposes. (To see what “normal” output could look like, see “Verifying Installation” on page 72 or step 6 below.)

- Step 2.** Check to see if the `c8xx` driver is loaded in the kernel, by doing *one* of the following two things:

- Use SAM, as follows:
  1. Select the “Kernel Configuration” icon.
  2. Select the “Drivers” icon.
  3. On the “Kernel Configuration” screen, check to see if the `c8xx` driver is in the kernel.
- Issue the following command:

```
what /stand/vmunix | grep scsi_c8xx.c
```

Check to see if the `c8xx` driver is listed.

If the driver is in the kernel but the A6828A adapter is still not claimed, go to step 4.

If the driver is not in the kernel, go to step 3.

**Step 3.** Load the `c8xx` driver into the kernel through SAM by performing the following steps:

- a. Select the “Kernel Configuration” icon.
- b. Select the “Drivers” icon.
- c. In the “Kernel Configuration” screen, follow the normal steps for loading the driver into the kernel (and building a new kernel).

Note that you will need to reboot the system as part of these steps.

**Step 4.** If the `c8xx` driver is in the kernel but the A6828A adapter is still not claimed, check the `/var/adm/syslog.log` file for errors like these:

```
Jan 11 16:08:00 svt38 vmunix: SCSI: SIOP RAM address out of range
Jan 11 16:12:05 svt38 vmunix: init of hardware not successful. id=10000021 and
my_isc=24
```

If you encounter such errors, you must install the patches required for the `c8xx` driver. You can find information on the patches you need to install in the following places: (1) the README file for the March 2002 (and later) HWE1100 patch bundle (for HP-UX 11.0), and (2) the March 2002 (and later) *HP-UX 11i Release Notes* (for HP-UX 11i).

**Step 5.** Follow the normal procedure to install the required patches.

Note that you will need to reboot the system as part of these steps.

**Step 6.** After the system reboots, verify that the adapter is now claimed, by issuing the following command:

```
ioscan -fnk
```

The applicable line in the `ioscan` output could look like this:

```
ext_bus 0 0/0/10/0/0 c8xx CLAIMED INTERFACE SCSI C1010 Ultra160 Wide LVD A6828-60101
```

In the example above, the pieces of information that are normal—indicating a claimed adapter—are shown in **bold**, for highlighting purposes.

If the A6828A adapter is claimed, you have fixed the problem.

If the adapter is still not claimed, repeat steps 2 through 6, as needed.

## Setting and Confirming SCSI Parameters

You can ensure compatibility between the SCSI controller and SCSI devices using the commands available for setting and displaying the appropriate SCSI bus parameters, including SCSI IDs.

The procedure varies depending on which system the HP A6828A host bus adapter is installed in.

For HP A6828A host bus adapters installed in PA-RISC based systems, see “Setting and Confirming SCSI Parameters for HP A6828A Host Bus Adapters Installed in PA-RISC Based Systems” on page 71.

For HP A6828A host bus adapters installed in Itanium®-based systems, see “Setting and Confirming SCSI Parameters for HP A6828A Host Bus Adapter Installed in Itanium,-Based Systems” on page 76.

## Setting and Confirming SCSI Parameters for HP A6828A Host Bus Adapters Installed in PA-RISC Based Systems

If the HP A6828A SCSI host bus adapter is installed in a supported PA-RISC based system, use the `SCSI` command to display and select SCSI parameters.

The `SCSI` command is available from the boot menu displayed after the test station has booted (if autoboot is disabled). In the following illustration of the boot menu display, the `SCSI` command is emphasized with bold type:

Command	Description
-----	-----
Auto [BOot SEARch ON OFF]	Display or set the specified flag
BOot [PRI ALT <path> <args>]	Boot from a specified path
BootTimer [time]	Display or set boot delay time
CLEARPIM	Clear PIM storage
CPUconfig [<proc>] [ON OFF]	Configure/Deconfigure Processor
Default	Set the sytem to defined values
DIisplay	Display this menu
ForthMode	Switch to the Forth OBP interface
IO	List the I/O devices in the system
LS [<path> flash]	List the boot or flash volume
OS [hpux sppux]	Display/Select Operating System
PASSword	Set the Forth password
Path [PRI ALT CON] [<path>]	Display or modify a path
PDT [CLEAR DEBUG]	Display/clear Non-Volatile PDT state
PIM_info [cpu#] [HPMC TOC LPMC]	Display PIM of current or any CPU
RESET [hard debug]	Force a reset of the system
RESTRict [ON OFF]	Display/Select restricted access to Forth
<b>SCSI [INIT RATE] [bus slot val]</b>	<b>List/Set SCSI controller parms</b>
SEARch [<path>]	Search for boot devices
SECure [ON OFF]	Display or set secure boot mode
TIme [cn:yr:mo:dy:hr:mn[:ss]]	Display or set the real-time clock
VERsion	Display the firmware versions

### The SCSI Command

The SCSI command can be used to display and set SCSI bus parameters to ensure that the SCSI adapter is compatible with the SCSI devices.

### Displaying Transfer Rates

To display the SCSI transfer rate for an adapter using the SCSI command, use the following syntax:

```
SCSI rate bus_number slot_number
```

where

*bus\_number* Specifies the number of the bus on which the adapter is installed.

*slot\_number* Specifies the number of the slot the adapter is in.

For example:

- To display the SCSI transfer rate for an adapter installed on bus 5 slot 2, issue the following command:

```
SCSI rate 5 2
```

The command displays the following output:

```
PCI device /5.2 = no limit
```

- To list transfer rates for **all** the bus and slot numbers, issue the following command:

```
SCSI rate
```



### Setting Transfer Rates

To set the SCSI transfer rate for an adapter using the SCSI command, use the following syntax:

```
SCSI rate bus_number slot_number rate
```

where

- |                    |  |
|--------------------|--|
| <i>bus_number</i>  | Specifies the number of the bus on which the adapter is installed.   |
| <i>slot_number</i> | Specifies the number of the slot the adapter is in.  |
| <i>rate</i>        | Specifies the adapter's transfer rate: <ul style="list-style-type: none"><li>• 0 (no limit)</li><li>• 10 (Fast SCSI)</li><li>• 20 (Ultra SCSI)</li></ul> |

For example, to set the SCSI transfer rate for an adapter installed on bus 5 slot 2 to Fast SCSI, issue the following command:

```
SCSI rate 5 2 10
```

To display the result, issue the following command:

```
SCSI rate 5 2
```

The output is as follows:

```
PCI device /5.2 = fast SCSI
```

### Displaying SCSI IDs

To display the initiator SCSI IDs for an adapter using the SCSI command, use the following syntax:

```
SCSI init bus_number slot_number
```

where

*bus\_number* Specifies the number of the bus on which the adapter is installed.

*slot\_number* Specifies the number of the slot the adapter is in.

For example:

- To display the SCSI ID for an adapter on bus 5 slot 2, issue the following command:

```
SCSI init 5 2
```

The command displays the following output:

```
PCI device /5.2 = 7
```

- To list the SCSI IDs for **all** the bus and slot numbers, issue the following command:

```
SCSI init
```

### Setting SCSI ID

To set the initiator SCSI ID for an adapter using the SCSI command, use the following syntax:

```
SCSI init bus_number slot_number ID_number
```

where

*bus\_number* Specifies the number of the bus on which the adapter is installed.

*slot\_number* Specifies the number of the slot the adapter is in.

*ID\_num* Specifies the adapter's SCSI ID number.

For example, to set the SCSI ID for an adapter installed on bus 5 slot 2 to 6, issue the following command:

```
SCSI init 5 2 6
```

To display the result, issue the following command:

```
SCSI init 5 2
```

The output is as follows:

```
PCI device /5.2 = 6
```

## Setting and Confirming SCSI Parameters for HP A6828A Host Bus Adapter Installed in Itanium®-Based Systems

If the HP A6828A SCSI host bus adapter (HBA) is installed in a supported Itanium®-based system, use the following procedure to display and select SCSI parameters:

- Step 1.** At the EFI Shell prompt, issue the **drivers** command as illustrated in the following example:

```
Shell> drivers
          T   D
D        Y C I
R        P F A
V  VERSION  E G G #D #C DRIVER NAME                IMAGE NAME
== ===== = = = == == =====
14 00000010 B - - 8 18 PCI Bus Driver                PciBus
20 01010201 D X X 5 - LSI Logic Ultra160 SCSI Driver    PciRomSeg=00000000
21 01010201 D X X 1 - LSI Logic Ultra160 SCSI Driver    PciRomSeg=00000000
24 00000200 D X X 3 - LSI Logic Ultra SCSI Driver            PciRomSeg=00000000
25 00000200 D X X 1 - LSI Logic Ultra SCSI Driver            PciRomSeg=00000000
28 01010201 D X X 1 - LSI Logic Ultra160 SCSI Driver    PciRomSeg=00000000
2D 00000105 D X X 1 - HP Tachyon XL2 Fibre Channel Mass S PciRomSeg=00000000
2E 00000105 D X X 2 - HP Tachyon XL2 Fibre Channel Mass S PciRomSeg=00000000
31 00000020 ? - - - - USB Keyboard Driver                    UsbKeyBoard
32 00000010 ? - - - - UGA Console Driver                        GraphicsConsole
33 00000000 ? - - - - PCI VGA Mini Port Driver            PciVgaMiniPort
34 00000010 ? - - - - VGA Class Driver                        VgaClassDriver
35 00000010 B - - 1 1 Serial 16550 UART Driver                Serial16550
36 00000010 B - - 1 1 Serial Terminal Driver                Terminal
37 00000010 D - - 1 - Platform Console Management Driver        ConPlatform
38 00000010 D - - 1 - Platform Console Management Driver        ConPlatform
39 00000010 B - - 1 1 Console Splitter Driver                ConSplitter
```

- Step 2.** Find the driver handle designation <drv\_handle>.

For the A6828A HBA, the <drv\_handle> designation will be in the DRV column that corresponds to the LSI Logic Ultra160 SCSI Driver listing in the DRIVER NAME column.

In the preceding example, there are two versions of the LSI Logic Ultra160 SCSI Driver. The <drv\_handle> designations that correspond to the two LSI Logic Ultra SCSI Drivers are 20 and 21.

**Step 3.** Find the controller handle designation, <cntrl\_handle>.

At the EFI Shell prompt, issue the **drvcfg** command as illustrated in the following example:

```
Shell> drvcfg
Configurable Components
  Drv[20]  Ctrl [1A] Lang [eng]
  Drv[20]  Ctrl [1B] Lang [eng]
  Drv[20]  Ctrl [1D] Lang [eng]
  Drv[20]  Ctrl [1E] Lang [eng]
  Drv[20]  Ctrl [23] Lang [eng]
  Drv[21]  Ctrl [22] Lang [eng]
  Drv[24]  Ctrl [27] Lang [eng]
  Drv[24]  Ctrl [2B] Lang [eng]
  Drv[24]  Ctrl [2C] Lang [eng]
  Drv[25]  Ctrl [26] Lang [eng]
  Drv[28]  Ctrl [29] Lang [eng]
  Drv[2D]  Ctrl [30] Lang [eng]
  Drv[2E]  Ctrl [2A] Lang [eng]
  Drv[2E]  Ctrl [2F] Lang [eng]
  Drv[48]  Ctrl [1F] Lang [eng]
```

From the output of the **drvcfg** command, look for the line(s) where the NN in Drv[NN] is same as the <drv\_handle> for the driver(s) you are using.

The 2nd column, Ctrl [NN], contains the corresponding <cntrl\_handle>, where NN is the controller handle. For example, controller handle 1A, 1B, 1D, 1E, and 23 correspond to driver handle 20, and controller handle 22 corresponds to driver handle 21.

**Step 4.** Once the driver handle and the controller handle are identified, the SCSI parameters can be displayed and set for any driver and corresponding controller (HBA) on the SCSI bus.

Enter the **drvcfg -s <drv\_handle> <cntrl\_handle>** command at EFI shell prompt. The Global Properties screen containing a list of the controller (HBA) to which the controller handle corresponds is displayed; refer to the following example:

Setting and Confirming SCSI Parameters

```

LSI Logic Host Bus Adapters
Adapter      PCI  PCI      PCI          IRQ  NVM  LSI Logic
              Bus Device Function          Control
<53C875      60  01      01>          0   Yes  Enabled
    
```

Press the [Enter] key. This displays the Adapter Properties screen containing the controller (HBA) settings; refer to the following example:

**Adapter Properties**

```

Adapter      PCI  PCI      PCI
              Bus Device Function
53C875      60  01      01
    
```

<Device Properties>

```

Boot Support          [Enabled]
SCSI Parity           [Yes]
Host SCSI ID          [ 5]
SCSI Bus Scan Order   [Low to High (0..Max)]
Spinup Delay (Secs)   [ 2]
Secondary Cluster Server [Yes]
Termination Control   [Auto]
<Restore Defaults>
    
```

Use the arrow keys to highlight the different SCSI parameters.

Use the plus (+) and minus (-) keys to change the highlighted SCSI parameter.

---

**NOTE**

Modify only the Host SCSI ID and the Secondary Cluster Server parameters, if necessary.

Set the Secondary Cluster Server to Yes if more than one initiator is connected to the SCSI bus.

Do not change the default values of other SCSI parameters listed on the screen.

---

**Step 5.** Press the [ESC] key to exit the Adapter Properties screen.

If you did not modify any of the SCSI parameters, then the Global Properties screen appears.

However, if you modified any of the SCSI parameters, then the following screen appears:

```
Adapter and/or device property changes have been made.  
<Cancel Exit>  
<Save changes then exit this menu>  
<Discard changes then exit this menu>  
Exit the Configuration Utility
```

Use the arrow keys to highlight your selection from the listed choices, and then press the [ENTER] key to return to the Global Properties screen.

**Step 6.** Press the [ESC] key. This displays the following screen:

```
Are you sure you want to exit?  
<Cancel Exit>  
Save changes then exit this menu  
Discard changes then exit this menu  
<Exit the Configuration Utility>
```

Use the arrow keys to highlight your selection from the listed choices, and then press the [ENTER] key to return to the EFI shell prompt.

**Step 7.** At the EFI shell prompt, issue the following command to reboot the system:

```
reset
```

---

**NOTE**

The system reboot is required for the new setting to take effect.

## Domain Validation

Domain Validation provides a way to automatically detect, and if necessary, compensate for hardware that is not performing to the optimal level. It does this by reducing the data transfer rate and bus width. This allows you to have data integrity even if data transfers cannot occur at the maximum data transfer rate supported by the HBA. If Domain Validation does reduce the rate and bus width, a message is generated so that you can correct the problem.

Domain Validation is automatically enabled for all SCSI devices on the bus, as long as you have set the HBA's maximum data transfer rate to its maximum speed (160 MB/s for the A6828A). See “Maximum Data Transfer Rate” on page 45 for more information on setting the HBA's transfer rate.

---

### TIP

If necessary, you can disable Domain Validation—if you want to do diagnostics, for example—by lowering the transfer rate to less than Ultra160 through the commands in the BCH menus (see “Maximum Data Transfer Rate” on page 45).

---

Domain Validation runs each time the initiator device and target device negotiate the transfer rate and bus width. A few things that can cause this are as follows:

- A protocol violation or some other exception condition occurs on the SCSI bus.
- A SCSI device is powered on and then I/O occurs to that device.

Things that Domain Validation might detect are as follows:

- Incorrect or improper SCSI bus termination (for example, a missing or bad terminator or an incorrect auto termination setting)
- Incorrect hardware configuration
- Cables with the wrong impedance
- Major cable errors (for example, a broken wire within a cable)
- SCSI device spacing problems



- Path width errors (for example, a Narrow cable used with a Wide SCSI device)
- Damaged or marginal transceivers
- Excessive cross talk
- Excessive system noise

When Domain Validation determines that communication with the target device is not possible at the maximum data transfer rate supported by the HBA (Ultra160), it writes the following warning message to the `/var/adm/syslog.log` file:

```
SCSI:Ultra160 SCSI Adapter at hw_path: fallback occurred for  
target target_ID. Possible causes are improper termination,  
improper cabling, or malfunctioning hardware. Verify the  
hardware at the next opportunity.
```

Later, it “falls back” (lowers the transfer rate and bus width) by one level, according to Table 3-1 below.

**Table 3-1 Domain Validation Fallback Levels**

Type of SCSI	Bus Width	Data Transfer Rate (MB/s)
Ultra160	Wide	160
Ultra2 Wide	Wide	80
Ultra2	Narrow	40
Ultra Wide	Wide	40
Ultra	Narrow	20
Fast Wide	Wide	20
Fast	Narrow	10
Asynchronous	Narrow	<5

---

**NOTE**

The number of entries in Table 3-1 above is subject to change. We are providing it here to give you an example of how the fallback procedure works.

---

As mentioned earlier, Domain Validation tests are run on all targets on the SCSI bus, even those targets that do not have Ultra160 capabilities. Therefore, the starting point in Table 3-1 depends on the parameters that were negotiated for any particular target. In addition, since a SCSI bus can contain up to 15 targets, different SCSI parameters might be in effect at any one time on the bus (because Domain Validation is running on all of the targets at the same time).

If a fallback does occur and you fix the problem with the target hardware, you need to power cycle (power off and then power on) the target hardware and then run `ioscan` without the `-k` option (you can specify any other options, though). This restarts Domain Validation for that target and restores the negotiated parameters to the highest possible transfer rate and bus width. Next, look in the `/var/adm/syslog.log` file for any *new* “fallback” warning messages

(shown earlier in this section). If the problem was fixed properly and Domain Validation is at the correct level, you will not see any new warning messages.

As an example, if the parameters originally negotiated during the normal SCSI initiator/target communications are equivalent to Ultra160, but Domain Validation determines that the SCSI bus or the target cannot support that data transfer rate, Domain Validation falls back to Ultra2 Wide. Later, Domain Validation repeats its test. If the bus or target still cannot support the transfer rate, Domain Validation falls back another level, to Ultra2 Narrow. As long as failures occur, fallback continues, one level at a time, until the last level in Table 3-1 (Asynchronous) is reached. (Note that a “fallback” warning message—shown earlier in this section—is not generated each time Domain Validation falls back a level, but only when it successfully settles at a level.) If the last level is reached and a failure still occurs, the following message is written to the `/var/adm/syslog.log` file:

```
SCSI:Ultra160 SCSI Adapter at hw_path: Error: The domain
validation test for target target_ID determined that
communication may not be possible to this target. Verify the
hardware at the next opportunity.
```

To be able to restore communication to the target hardware, you must fix the problem with the target, power cycle (power off and then power on) the target, and then run `ioscan` *without* the `-k` option to restart Domain Validation and renegotiate the parameters for that target. Next, you need to check `/var/adm/syslog.log` for any new “fallback” warning messages. The lack of new “fallback” messages means you successfully fixed the problem, and the data transfer rate and bus width are at the correct levels.

Note that when a Domain Validation test succeeds, no message is written to the `/var/adm/syslog.log` file. The reason is that this would generate a large volume of messages, especially on a system that is used heavily. Not only would this make the file very large, but the more important warning and error messages would not be easy to see.

In addition, a SCSI selection timeout—when a target device does not respond to selection within a certain length of time—will terminate a Domain Validation test on a target, and the target will be considered to be non-existent. This is so that a bus scan or system boot will not be extended by Domain Validation waiting several times for a target that does not exist.

---

**NOTE**

A Domain Validation test that is terminated for one target does not affect the tests being run on any of the other target devices on the SCSI bus.

---

## Using Support Tools Manager (STM)

STM is a software application that can be run from the console to obtain status and descriptive information about the A6828A adapter, diagnose problems, and update firmware. For the A6828A adapter, you must use STM version A.29.00 or later. See the *Support Tools Manager User's Guide* for more details about STM.

---

## Contacting Your Hewlett-Packard Representative

If the equipment is covered by an HP service contract, document the problem as a service request and forward it to your HP representative. Include the following information wherever applicable:

- Describe the problem, including the events and symptoms leading up to the problem. Attempt to describe the source of the problem.

Include commands, communication subsystem commands, functionality of user programs, result codes and messages, and data that can reproduce the problem.

- Obtain the version, update, and fix information for all software.

To check the version of the kernel, issue the following command:

```
uname -r
```

To check patches, issue the following command:

```
what /stand/vmunix | grep scsi
```

This allows HP to determine if the problem is already known and the correct software is installed at your site.

- Illustrate the context of messages as clearly as possible. Record all error messages and numbers that appear at the user terminal and the system console.
- Prepare the formatted output and a copy of the log file for the HP representative to analyze.
- Prepare a listing of the HP-UX I/O configuration being used for the HP representative to analyze.
- Try to determine the general area within the software where the problem might exist. Refer to the appropriate reference manual and follow the guidelines on gathering information for that product.
- Document your interim (workaround) solution. The cause of the problem can sometimes be found by comparing the circumstances in which the problem occurs with the circumstances in which the problem does not occur.
- In the event of a system failure, obtain a full memory dump.

- If the directory `/var/adm/crash` exists, the HP-UX utility `/sbin/savecore` automatically executes during reboot to save the memory dump. HP **recommends** that you create the `/tmp/syscore` directory after successfully installing this product. Send the output of the system failure memory dump to the HP representative.

If the equipment is not covered by an HP service contract, a charge for time and materials might be necessary.

Troubleshooting

**Contacting Your Hewlett-Packard Representative**



---

# **A** **SCSI Sense Codes**

This appendix shows the possible codes that appear in SCSI error messages.

The following example shows a typical SCSI error message:

```
[+6708 72410001 002a9858 0:7] scsi disk: CHECK CONDITION on disk 0:6:5:0
Read of logical block 509856, count 128
disk sd45a, block 254920, 65536 bytes
Valid = 1, Error code = 0x70
Segment number = 0x00, Filemark = 0, EOM = 0, ILI = 0
Sense key = 0x1, "RECOVERED ERROR"
Information = 0x00 0x07 0xc7 0xe4
[+6709 72410001 002a9a10 0:7] scsi disk:      Additional sense length = 0x0a
Command-specific information = 0x00 0x00 0x00 0x00
Additional sense = 0x18, Qualifier = 0x01
Field replaceable unit code = 0xea
SKSV = 1, C/D = 0, BPV = 0, Bit pointer = 0
Field pointer = 0x0003
```

The status (**CHECK CONDITION**) and sense key (**RECOVERED ERROR**)—shown in **bold** in the example above, for highlighting purposes—are interpreted for you in the error message text. Each **Additional sense** and its corresponding **Qualifier code**—also shown in **bold** in the example above—require interpretation on your part. Use the two codes together to determine the meaning. In the example above, the **Additional sense (0x18)** and **Qualifier (0x01)** codes together mean “recovered data with error correction and retries applied.” You can look up the various codes and keys in the tables on the next pages.

Table A-1 below lists all possible SCSI status codes and their meanings.

**Table A-1**                      **SCSI Status Codes**

<b>SCSI Status Code</b>	<b>Meaning</b>
0x00	Good
0x02	Check condition
0x04	Condition met
0x08	Busy
0x10	Intermediate
0x14	Intermediate—condition met
0x18	Reservation conflict
0x22	Command terminated
0x28	Queue full

Table A-2 below lists all possible SCSI sense keys and their meanings.

**Table A-2**                      **SCSI Sense Keys**

<b>SCSI Sense Key</b>	<b>Meaning</b>
0	No sense
0x1	Recovered error
0x2	Not ready
0x3	Medium error
0x4	Hardware error
0x5	Illegal request
0x6	Unit attention
0x7	Data protect
0x8	Blank check
0x9	Vendor-specific
0xa	Copy aborted
0xb	Aborted command
0xc	Equal
0xd	Volume overflow
0xe	Miscompare
0xf	Reserved

Table A-3 below lists the Additional sense codes and Qualifier codes and their meanings. Remember that you must use the combined codes—an Additional sense code/Qualifier code pair—to find the correct meaning.

**Table A-3**      **SCSI Additional Sense Code/Qualifier Code Pairs**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x00	0x00	No additional sense information
	0x01	Filemark detected
	0x02	End-of-partitions/medium detected
	0x03	Setmark detected
	0x04	Beginning of partition/medium detected
	0x05	End-of-data detected
	0x06	I/O process terminated
	0x11	Audio play operation in progress
	0x12	Audio play operation paused
	0x13	Audio play operation successfully completed
	0x14	Audio play operation stopped due to error
	0x15	No current audio status to return
0x01	0x00	No index/sector signal
0x02	0x00	No seek complete
0x03	0x00	Peripheral device write fault
	0x01	No write current
	0x02	Excessive write errors

**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x04	0x00	Logical unit not ready, cause not reportable
	0x01	Logical unit in process of becoming ready
	0x02	Logical unit not ready, initializing command required
	0x03	Logical unit not ready, manual intervention required
	0x04	Logical unit not ready, format in progress
0x05	0x00	Logical unit does not respond to selection
0x06	0x00	Reference position found
0x07	0x00	Multiple peripheral devices selected
0x08	0x00	Logical unit communication failure
	0x01	Logical unit communication time-out
	0x02	Logical unit communication parity error
0x09	0x00	Track following error
	0x01	Tracking servo failure
	0x02	Focus servo failure
	0x03	Spindle servo failure
0x0a	0x00	Error log overflow
0x0c	0x00	Write error
	0x01	Write error recovered with auto reallocation
	0x02	Write error—auto reallocation failed

**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x10	0x00	ID crc or ecc error
0x11	0x00	Unrecovered read error
	0x01	Read retries exhausted
	0x02	Error too long to correct
	0x03	Multiple read errors
	0x04	Unrecovered read error—auto reallocate failed
	0x05	l-ec uncorrectable error
	0x06	circ unrecovered error
	0x07	Data resynchronization error
	0x08	Incomplete block read
	0x09	No gap found
	0x0a	Miscorrected error
	0x0b	Unrecovered read error—recommend reassignment
	0x0c	Unrecovered read error—recommend rewrite the data
0x12	0x00	Address mark not found for ID field
0x13	0x00	Address mark not found for data field

**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x14	0x00	Recorded entity not found
	0x01	Record not found
	0x02	Filemark or setmark not found
	0x03	End-of-data not found
	0x04	Block sequence error
0x15	0x00	Random positioning error
	0x01	Mechanical positioning error
	0x02	Positioning error detected by read of medium
0x16	0x00	Data synchronization mark error
0x17	0x00	Recovered data with no error correction applied
	0x01	Recovered data with retries
	0x02	Recovered data with positive head offset
	0x03	Recovered data with negative head offset
	0x04	Recovered data with retries and/or circ applied
	0x05	Recovered data using previous sector ID
	0x06	Recovered data without ecc—data auto-reallocated
	0x07	Recovered data without ecc—recommend reassignment
	0x08	Recovered data without ecc—recommend rewrite



**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x18	0x00	Recovered data with error correction applied
	0x01	Recovered data with error correction and retries applied
	0x02	Recovered data—data auto-reallocated
	0x03	Recovered data with circ
	0x04	Recovered data with lec
	0x05	Recovered data—recommend reassignment
	0x06	Recovered data—recommend rewrite
0x19	0x00	Defect list error
	0x01	Defect list not available
	0x02	Defect list error in primary list
	0x03	Defect list error in grown list
0x1a	0x00	Parameter list length error
0x1b	0x00	Synchronous data transfer error
0x1c	0x00	Defect list not found
	0x01	Primary defect list not found
	0x02	Grown defect list not found
0x1d	0x00	Miscompare during verify operation
0x1e	0x00	Recovered ID with ecc
0x20	0x00	Invalid command operation code

**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x21	0x00	Logical block address out of range
	0x01	Invalid element address
0x22	0x00	Illegal function
0x24	0x00	Invalid field in cdb
0x25	0x00	Logical unit not supported
0x26	0x00	Invalid field in parameter list
	0x01	Parameter not supported
	0x02	Parameter value invalid
	0x03	Threshold parameters not supported
0x27	0x00	Write protected
0x28	0x00	Not ready to ready transition (medium may have changed)
	0x01	Import or export element assessed
0x29	0x00	Power on, reset, or bus device reset occurred
0x2a	0x00	Parameters changed
	0x01	Mode parameters changed
	0x02	Log parameters changed
0x2b	0x00	Copy cannot execute since host cannot disconnect
0x2c	0x00	Command sequence error
	0x01	Too many windows specified

**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x2f	0x00	Commands cleared by another initiator
0x30	0x00	Incompatible medium installed
	0x01	Cannot read medium—unknown format
	0x02	Cannot read medium—incompatible format
	0x03	Cleaning cartridge installed
0x31	0x00	Medium format corrupted
0x32	0x00	No defect spare location available
	0x01	Defect list update failure
0x33	0x00	Tape length error
0x36	0x00	Ribbon, ink, or tower failure
0x37	0x00	Rounded parameter
0x39	0x00	Saving parameters not supported
0x3a	0x00	Medium not present

**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x3b	0x00	Sequential positioning error
	0x01	Tape position error at beginning-of-medium
	0x02	Tape position error at end-of-medium
	0x03	Tape or electronic vertical forms unit not ready
	0x04	Slew failure
	0x05	Paper jam
	0x06	Failed to sense top-of-form
	0x07	Failed to sense bottom-of-form
	0x08	Reposition error
	0x09	Read past end of medium
	0x0a	Read past beginning of medium
	0x0b	Position past end of medium
	0x0c	Position past beginning of medium
	0x0d	Medium destination element full
	0x0e	Medium source element empty
0x3d	0x00	Invalid bits in identify message
0x3e	0x00	Logical unit has not self-configured yet

**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x3f	0x00	Target operation conditions have changed
	0x01	Microcode has been changed
	0x02	Changed operating definition
	0x03	Inquiry data has changed
0x40	0x00	RAM failure
	<i>nn</i>	Diagnostic failure on component <i>nn</i>
0x41	0x00	Data path failure
0x42	0x00	Power-on or self-test failure
0x43	0x00	Message error
0x44	0x00	Internal target failure
0x45	0x00	Select or reselect failure
0x46	0x00	Unsuccessful soft reset
0x47	0x00	SCSI parity error
0x48	0x00	Initiator detected error message received
0x49	0x00	Invalid message error
0x4a	0x00	Command phase error
0x4b	0x00	Data phase error
0x4c	0x00	Logical unit failed self-configuration
0x4e	0x00	Overlapped commands attempted

**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x50	0x00	Write append error
	0x01	Write append position error
	0x02	Position error related to timing
0x51	0x00	Erase failure
0x52	0x00	Cartridge fault
0x53	0x00	Media load or eject failed
	0x01	Unload tape failure
	0x02	Medium removal prevented
0x54	0x00	SCSI to host system interface failure
0x55	0x00	System resource failure
0x56	0x00	Reserved
0x57	0x00	Unable to recover table of contents
0x58	0x00	Generation does not exist
0x59	0x00	Updated block read
0x5A	0x00	Operator request or state change input (unspecified)
	0x01	Operator medium removal request
	0x02	Operator selected write protect
	0x02	Operator selected write permit

**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x5B	0x00	Log exception
	0x01	Threshold condition met
	0x02	Log counter at maximum
	0x03	Log list codes exhausted
0x5C	0x00	RPL status change
	0x01	Spindles synchronized
	0x02	Spindles not synchronized
0x5D	0x00	Reserved
0x5E	0x00	Reserved
0x5F	0x00	Reserved
0x60	0x00	Lamp failure
0x61	0x00	Video acquisition error
	0x01	Unable to acquire video
	0x02	Out of focus
0x62	0x00	Scan head positioning error
0x63	0x00	End of user area encountered on this track
0x64	0x00	Illegal mode for this track
0x65	0x00	Reserved
0x66	0x00	Reserved
0x67	0x00	Reserved
0x68	0x00	Reserved

**Table A-3 SCSI Additional Sense Code/Qualifier Code Pairs (Continued)**

<b>SCSI Additional Sense Code</b>	<b>SCSI Qualifier Code</b>	<b>Meaning</b>
0x69	0x00	Reserved
0x6A	0x00	Reserved
0x6B	0x00	Reserved
0x6C	0x00	Reserved
0x6D	0x00	Reserved
0x6E	0x00	Reserved
0x6F	0x00	Reserved



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## **B** **Technical Specifications**

This chapter contains the following sections that contain the technical specifications for the A6828A adapter:

- “Physical Attributes” on page 107.

- “Environmental” on page 108.

## **Physical Attributes**

The physical attributes of the A6828A adapter are as follows:

- Length: 8.95 inches (22.7 cm)
- Height: 4.25 inches (10.7 cm)
- Width: 0.721 inches (1.8 cm)
- Weight: 0.287 pounds (0.1 kg)

## Environmental

The environmental specifications for the A6828A adapter are as follows:

- Non-operating temperature range: -40 degrees to +70 degrees C
- Operating temperature range: 0 to 45 degrees C
- Recommended operating temperature range: 25 degrees C
- Non-operating relative humidity range: 90%
- Recommended operating relative humidity range: 40% (at 22 degrees C)

---

# **C** **Regulatory Information**

This appendix contains all of the regulatory-related information for the A6828A adapter.

## Regulatory Statements

This section contains all of the regulatory statements for the A6828A adapter.

### **FCC Statement (For U.S.A. Only)**

The Federal Communications Commission (in 47 CFR 15.105) has specified that the following notice be brought to the attention of the users of this product.

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. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user's authority to operate the equipment.

### **IEC Statement (Worldwide)**

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.

### **DOC Statement (Canada)**

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.

## Spécification ATI Classe A (France)

DECLARATION D'INSTALLATION ET DE MISE EN EXPLOITATION d'un matériel de traitement de l'information (ATI), classé A en fonction des niveaux de perturbations radioélectriques émis, définis dans la norme européenne EN 55022 concernant la Compatibilité Electromagnétique.

Cher Client,

Conformément à la Réglementation Française en vigueur l'installation ou le transfert d'installation, et l'exploitation de cet appareil de classe A, doivent faire l'objet d'une déclaration (en deux exemplaires) simultanément auprès des services suivants:

- Comité de Coordination des Télécommunications 20, avenue de Ségur - 75700 PARIS
- Préfecture du département du lieu d'exploitation

Le formulaire à utiliser est disponible auprès des préfetures.

La déclaration doit être faite dans les 30 jours suivant la mise en exploitation.

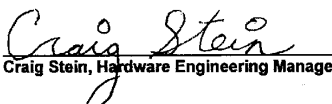
Le non respect de cette obligation peut être sanctionné par les peines prévues au code des Postes et Télécommunications et celles indiquées dans la loi du 31 mai 1993 susvisée.

Arrêté du 27 Mars 1993, publié au J.O. du 28 Mars - ATI

## VCCI Statement (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラス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。

## Declaration of Conformity

<b>DECLARATION OF CONFORMITY</b> According to ISO/IEC Guide 22 and EN 45014	
<b>Manufacturer's Name:</b>	Hewlett-Packard Company Systems Interconnect Solutions Lab
<b>Manufacturer's Address:</b>	8000 Foothills Blvd. Roseville, CA 95747 USA
<b>declares, that the product</b>	
<b>Product Name:</b>	PCI (4X) ULTRA160 Single/ Dual channel SCSI Adapter
<b>Model Number(s):</b>	A6828A and A6829A
<b>Product Options:</b>	All
<b>conforms to the following Product Specifications:</b>	
<b>Safety:</b>	IEC 950:1991 + A1, A2, A3, A4 / EN 60950:1992 + A1, A2, A3, A4, A11 GB 4943-1995. IEC 825-1:1993/ EN60825-1:1994+A1, Class 1 Laser
<b>EMC:</b>	CISPR 22:1997 / EN 55022:1998 - Class A CNS 13438, GB 9254-1988, CFR47, Part 15 Class A CISPR 24:1997 / EN 55024:1998 IEC 61000-4-2 IEC 61000-4-3 / ENV 50204 IEC 61000-4-4 IEC 61000-4-6 IEC 61000-4-8
<b>Supplementary Information:</b>	
The product herewith complies with the requirements of the EMC Directive 89/336/EEC and carries the CE marking accordingly.	
1) The Product was tested in a typical configuration with Hewlett-Packard information technology equipment.	
Cupertino, CA, November, 2001	 Craig Stein, Hardware Engineering Manager
European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department HQ-TRE, Herrenberger Straße 130, D-71034 Böblingen (FAX: + 49-7031-14-3143)	



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# Glossary

## A

**address** A specific location in memory, designated either numerically or by a symbolic name.

**asynchronous data transfer** One of the ways data is transferred over the SCSI bus. It is slower than synchronous data transfer.

## B

**bit** A binary digit. The smallest unit of information a computer uses. The value of a bit (0 or 1) represents a two-way choice, such as on or off, true or false.

**Boot Console Handler (BCH)** Provides, among other things, the reading and setting of SCSI parameters without the OS running.

**bus** A collection of wires in a cable or copper traces on a circuit board used to transmit data, status, and control signals. EISA, PCI, and SCSI are examples of buses.

**bus mastering** A high-performance way to transfer data. The host bus adapter controls the transfer of data directly to and from system memory without bothering the computer's microprocessor. This is the fastest way for multi-tasking operating systems to transfer data.

**byte** A unit of information consisting of eight bits.

## C

**central processing unit (CPU)** The "brain" of the computer that performs the actual computations. The term Micro Processor Unit (MPU) is also used.

**chain** A topology in which every device is connected to two others, except for two-end devices that are connected to only one other.

**Committee, International and Special, for Protection in Radio (CISPR)** An international committee on radio frequency interference.

**configuration** Refers to the way a computer is set up; the combined hardware components (computer, monitor, key board, and peripheral devices) that make up a computer system; or the software settings that allow the hardware components to communicate with each other.

**Cyclic Redundancy Check (CRC)** 32-bit scheme (referred to as CRC-32) included in Ultra160 that ensures complete integrity of the transferred data. CRC is guaranteed to detect all single bit errors, any two bits in error, or any combination of errors within a single 32-bit range.

## D

**device driver** A program that allows a microprocessor (through the operating system) to direct the operation of a peripheral device.

**differential** A hardware configuration for connecting SCSI devices. It uses a pair of lines for each signal transfer (as opposed to single-ended SCSI, which references each SCSI signal to a common ground).

**direct memory access (DMA)** A method of moving data from a storage device directly to RAM, without using the CPU's resources.

**DMA bus master**

**DMA bus master** A feature that allows a peripheral to control the flow of data to and from system memory by blocks, as opposed to PIO (Programmed I/O), where the flow is byte by byte.

**Domain Validation** A software procedure in which a host system queries a device to determine the device's ability to communicate at the data transfer rate that was negotiated.

**E**

**electronically erasable programmable read-only memory (EEPROM)** A memory chip typically used to store configuration information. See **Non-Volatile Random Access Memory (NVRAM)**.

**external SCSI device** A SCSI device installed outside the computer cabinet. External SCSI devices are connected in a chain using shielded cables.

**F**

**Fast SCSI** A standard for SCSI data transfers. It allows a transfer rate of up to 10 MBytes/sec over an 8-bit SCSI bus, and up to 20 MBytes/sec over a 16-bit SCSI bus.

**FCC** Federal Communications Commission.

**firmware** Software that is permanently stored in ROM. In the case of PDC, it can be accessed during boot time without the aid of an operating or file system.

**H**

**hard disk** A rigid disk permanently sealed into a drive cartridge. A hard disk can store very large amounts of information.

**host** The computer system in which a SCSI host bus adapter is installed. It uses the SCSI host bus adapter to transfer information to and from devices attached to the SCSI bus.

**host bus adapter (HBA)** A circuit board and/or integrated circuit device that provides a SCSI bus connection to the computer system.

**I**

**internal SCSI device** A SCSI device installed inside the computer cabinet. These devices are connected in a chain using an unshielded ribbon cable.

**interrupt request channel (IRQ)** A path through which a device can get the immediate attention of the computer's CPU. The PCI bus assigns an IRQ path for each SCSI host bus adapter.

**K**

**KByte (kilobyte)** A measure of computer storage equal to 1024 bytes.

**L**

**logical unit** A subdivision, either logical or physical, of a SCSI device. Most devices have only one logical unit, but up to sixteen are allowed for a 16-bit SCSI bus and eight for an 8-bit SCSI bus.

**logical unit number (LUN)** An encoded three-bit number for the logical unit.

**Low Voltage Differential (LVD)** A robust design methodology that improves power consumption, data integrity, cable lengths, and support for multiple devices while providing a migration path for increased I/O performance.

## M

**main memory** The part of a computer's memory that is directly accessible by the CPU (usually synonymous with RAM).

**mainboard** A large circuit board that holds RAM, ROM, the microprocessor, custom integrated circuits, and other components that make a computer work. It also has expansion slots for host bus adapters and other plug-in boards.

**megabyte (MByte)** A measure of computer storage equal to 1024 kilobytes.

**motherboard** See **mainboard**. In some countries, the term motherboard is not appropriate.

**multi-tasking** The initiation and control of more than one sequence of operations. This allows programs to operate in parallel.

**multi-threading** The simultaneous accessing of data by more than one SCSI device. This increases the aggregate data throughput.

## N

**Non-Volatile Random Access Memory (NVRAM)** An EEPROM used to store configuration information.

## O

**operating system (OS)** A program that organizes the internal activities of the computer and its peripheral devices. An operating system performs basic tasks such as moving data to and from devices and managing information in memory. It also provides the user interface.

## P

**parity checking** A way to verify the accuracy of data transmitted over the SCSI bus. One bit in the transfer is used to make the sum of all the 1 bits either odd or even (for odd or even parity). If the sum is not correct, an error message appears. SCSI uses odd parity for data transfer rates less than 160 MB/s.

**peripheral component interconnect (PCI)** A local bus specification that allows connection of integrated peripheral controller components, peripheral add-in boards, and processor/memory systems.

**peripheral devices** A hardware device (such as a video monitor, disk drive, printer, or CD-ROM) used with a computer and under the computer's control. SCSI peripherals are controlled through a SCSI host bus adapter.

**pin-1 orientation** The alignment of pin 1 on a SCSI cable connector and the pin 1 position on the SCSI connector into which it is inserted. External SCSI cables are keyed to ensure proper alignment, but internal SCSI ribbon cables might not be.

**port address**

**port address** Also **port number**. The address through which commands are sent to a host bus adapter. This address is assigned by the PCI bus.

**port number** See **port address**.

**Processor Dependent Code (PDC)** The system firmware on HP PA-RISC systems. It provides basic read/write capability. Usually kept as firmware (ROM based). The system firmware on the main board of a computer is used to boot and control the system.

**programmed input/output (PIO)** A way the CPU can transfer data to and from memory via the computer's I/O ports. PIO can be faster than DMA, but requires CPU time.

**Q**

**queue tags** A way to keep track of multiple commands while allowing increased throughput on the SCSI bus.

**R**

**Random Access Memory (RAM)** In general, the computer's primary working memory in which program instructions and data are stored and are accessible to the CPU. Information can be written to and read from RAM. The contents of RAM are lost when the computer is turned off.

**Read-Only Memory (ROM)** Memory from which information can be read but not changed. The contents of ROM are not erased when the computer is turned off.

**Reduced Instruction Set Computer (RISC) core** The HBA's SCSI chips contain a RISC processor, programmed through microcode scripts.

**S**

**SCSI bus** A host bus adapter and one or more SCSI peripherals connected by cables in a linear chain configuration. The host bus adapter can exist anywhere on the chain, allowing connection of both internal and external SCSI devices. A system can have more than one SCSI bus by using multiple host bus adapters.

**SCSI device** Any device conforming to the SCSI standard that attaches to the SCSI bus by means of a SCSI cable. This includes SCSI host bus adapters and SCSI peripherals.

**SCSI ID** A unique identification for each SCSI device on the SCSI bus. Each SCSI bus has fifteen available SCSI IDs numbered 0 through 15 for Wide SCSI or 0-7 for 8-bit SCSI. The host bus adapter is usually assigned ID 7, which gives it priority to control the bus.

**SCSI-2** The SCSI specification that adds features to the original SCSI-1 standard.

**SCSI-3** The current SCSI specification, which adds features to the SCSI-2 standard.

**single-ended (SE) SCSI** A hardware specification for connecting SCSI devices. It references each SCSI signal to a common ground, as opposed to differential SCSI and low-voltage differential SCSI, which use a separate return for each signal.

**small computer system interface (SCSI)** A specification for a high-performance peripheral bus and command set. The original standard is now referred to as SCSI-1.

**synchronous data transfer** One of the ways data is transferred over the SCSI bus. Transfers are clocked with fixed-frequency pulses.

**system firmware** Controls the low level POST (Power On Self Test) and basic operation of the CPU and computer system.

## T

**termination** The electrical connection required at each end of the SCSI bus, composed of a set of resistors.

## U

**Ultra SCSI** A standard for SCSI data transfers. It allows a transfer rate of up to 20 MBytes/sec over an 8-bit SCSI bus, and up to 40 MBytes/sec over a 16-bit SCSI bus. The STA (SCSI Trade Association) supports using the term “Ultra SCSI” over the older term “Fast-20.”

**Ultra160 SCSI** (Also called Ultra3 SCSI) A standard for SCSI data transfers. It allows a data transfer rate of up to 160 MBytes/second over a 16-bit SCSI bus. The bus width is always 16 bits.

**Ultra2 SCSI** A standard for SCSI data transfers. It allows a transfer rate of up to 40 MBytes/sec over an 8-bit SCSI bus, and up to 80 MBytes/sec over a 16-bit SCSI bus. The STA (SCSI Trade Association) supports using the term “Ultra2 SCSI” over the older term “Fast-40.”

## V

**VCCI** Voluntary Control Council for Interference.

**VHDCI** Very High Density Cable Interconnect.

## W

**Wide SCSI** A SCSI-2 feature allowing 16-bit transfers on the SCSI bus. This doubles the transfer rate over the standard 8-bit SCSI bus.

**Wide Ultra SCSI** The STA (SCSI Trade Association) term for SCSI bus width 16 bits, SCSI bus speed maximum data rate 40 MBytes/sec.

**Wide Ultra2 SCSI** The STA (SCSI Trade Association) term for SCSI bus width 16 bits, SCSI bus speed maximum data rate 80 MBytes/sec.



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