

Installing Peripherals

HP 9000 Series 700 Computers



**HEWLETT
PACKARD**

**HP Part No. B2355-90041
Printed in USA August 1992**

**First Edition
E0892**

HP Computer Museum
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Printing History

The manual printing date and part number indicate its 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 manual part number will change when extensive changes are made.

Manual 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.

First Edition: August 1992 (HP-UX Release 9.0)

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Introduction

Overview

This manual is intended for System Administrators. It supplies information you will need to enable peripheral devices to communicate with the HP-UX operating system. It *does not* provide information on built-in devices. Refer to the *Owner's Guide* for the specific computer model you own for configuration information on built-in devices.

Peripheral installation on your S700 system is comprised of two parts:

- Connecting the device to the computer, and
- Configuring your HP-UX operating system to communicate with the device.

Note

The information in this manual was accurate at time of printing. However, support status for peripheral devices changes rapidly. For up-to-date support status on peripheral devices, contact your customer support engineer or HP sales and service representative.

Manual Organization

The *Installing Peripherals* manual has a “paired” chapter organization. For each family of devices you will find the following:

An “Installing ... ” chapter containing hardware installation guidelines and configuration values,

followed by;

A “Setting-Up ... ” chapter containing HP-UX configuration instructions.

For example, Chapter 4, “Installing Disk and Tape Drives” is followed by Chapter 5, “Setting Up HP-UX for Disk and Tape Drives Using SAM”.

The “Setting-Up ... ” chapters give the necessary procedures to set up your device using SAM (the System Administration Manager). SAM is a menu-driven system administration tool discussed later in this chapter. If SAM is not available, use Chapter 11, “Setting Up Devices Using HP-UX Commands” to learn how to set up HP-UX for devices using commands.

The manual’s organization is:

- Chapter 1 “Introduction”
- Chapters 2–10 Device-specific chapters in pairs
- Chapter 11 “Setting Up Devices Using HP-UX Commands”
- Appendix A “E/ISA Configuration”
- Index

How to Use this Manual

Before you install a new peripheral device, be sure you are familiar with the information presented in this Introduction.

This chapter:

- Summarizes the steps to follow to install most peripheral devices.
- Introduces the System Administration Manager (SAM), a menu-driven program that can help you install and configure new peripherals.
- Provides generic installation guidelines that apply to specific types of device interfaces.

When you are ready to install your new peripheral, turn to the chapter that discusses the type of device you are installing. For example, if you are installing a disk drive, turn to Chapter 4, “Installing Disk and Tape Drives” and find the specific disk drive you are installing. Follow the installation instructions given for your particular disk drive. Then go to the following chapter for instructions on finishing the installation using SAM.

If you are not using SAM to install your new peripheral device, turn to Chapter 11, “Setting Up Devices Using HP-UX Commands” to finish the installation. Chapter 11 covers the information you will need to set up a device using HP-UX commands.

Other References

The following documents will help you when you install and manage peripheral devices.

- The installation manual for your new device
- *System Administration Tasks* manual, HP part number B2355-90040
- *HP-UX Reference*, HP part number B2355-90033
- *Managing Clusters of HP 9000 Computers*, HP part number B1864-90015, if your system is part of an HP-UX cluster
- *How HP-UX Works: Concepts for the System Administrator*, HP part number B2355-90029, for conceptual information
- The HP Apollo 9000 Owner's Guide for your specific series 700 model
- The HP Apollo 9000 Technical Reference manual for your specific series 700 model

The I/O System of Series 700

The I/O system of the Series 700 hardware differs from the other HP 9000 computer systems and from Series 700 model to model. Figure 1-1 illustrates *one* typical Series 700 bus structure. Check your *Owner's Guide* and the *Technical Reference Manual* for your specific Series 700 model computer, for specific information about device addressing and bus structure.

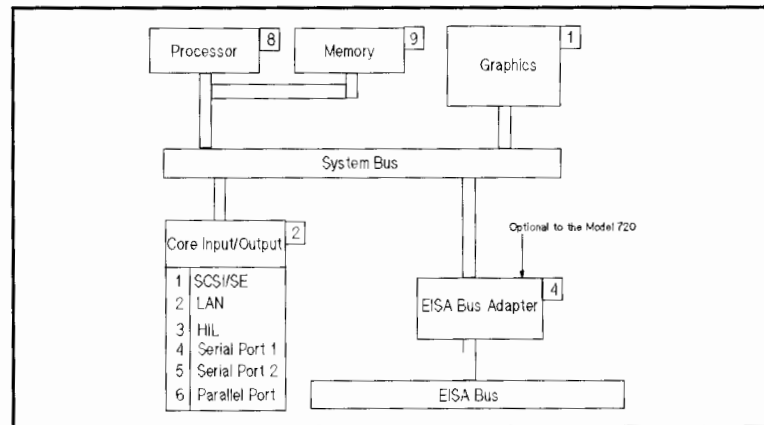


Figure 1-1. Series 700 Bus Structure

The major modules shown in the example above are the processor, the memory, the graphics module, the EISA Bus Adapter and the Core Input/Output system. In Figure 1-1, the small boxes appended to the modules contain the System Bus Module numbers. The Core Input/Output module contains separate interfaces, each represented by a function number. (Note that the interfaces contained by the Core Input/Output module may be different on your model 700 computer.)

The system bus module numbers and the function numbers become important when you create device files.

Overview of Adding a Peripheral

Ten basic steps are required to add peripheral devices to your system. The following general procedure highlights these steps. Consult the chapter in this manual for the specific peripheral you are adding to get more detailed information related to the following steps.

1. Determine the interface to which you will connect the peripheral.
2. Verify that the device drivers required for this device are included in your currently running kernel configuration file (usually the `/etc/conf/dfile`).

If you are adding a device that utilizes an interface type that is new on your system, you may have to add the necessary device drivers to the kernel configuration file. To verify that the necessary drivers, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the drivers or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason.

3. Play it safe.
 - a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see the *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.
 - b. TURN OFF the computer and unplug the power cord.

This step is highly recommended for all devices; for SCSI devices and interface cards, it is *required*.

4. Ensure that all power switches on the device and on the computer are in the OFF position.
5. Install the peripheral. This can involve two steps:
 - a. Installing an interface card (however, the interface card will most often already be installed)
 - b. Connecting the peripheral to the interface card
6. Connect the power cord and power on the device.
7. Reconnect the power cord to your computer and turn it on. This will cause your system to reboot.
8. Determine how the peripheral is to be accessed: block or character (raw) mode. A device file must exist for each type of access to the peripheral.
9. Determine if the device file necessary to communicate with the peripheral device already exists on your HP-UX system. Device files are located in the `/dev` directory. The device files shipped with your system are shown in Table 1-1 and Table 1-2. If you do not want to use these device names, you can link them to the name you want.
10. If the appropriate device file does not exist for the newly installed peripheral, you must create one. If you are using SAM to add your device, SAM will create the device file. If you are not using SAM, use the `mknod` command to create the device file.

Caution	If your system is a cluster, you must be logged into the cluster node to which the device is physically connected when you use SAM or HP-UX commands to add the device.
----------------	---

Device Files

The HP-UX operating system requires special files, called **device files**, to perform I/O to peripheral devices. Each peripheral on your system needs a device file associated with it for HP-UX to communicate with the peripheral. Device files are created using the *mknod*(1M) command. If you use SAM, SAM will automatically create device files for you when you add the peripheral to your system. If you do not use SAM, you must create device files by executing the **mknod** command. Adding your peripheral using the *mknod*(1M) command is described in Chapter 11, “Setting Up Devices Using HP-UX Commands”. Device files contain the code for the following peripheral attributes:

System Bus module (SBM)	There are separate module numbers for the Standard Graphics Connect (SGC) bus, Core I/O multifunction module, processor, memory and EISA bus adapter. See Figure 1-1 for the number associated with each module.
Slot Number	This applies to the EISA bus slot numbers. The value is 0 for non-EISA devices.
Function Number	For multifunction cards, each function is associated with a number.
File Type	Each device file is classified according to how it handles data transfer—by block or by character . For administrative consistency, you should follow the device file naming conventions discussed in Chapter 11, “Setting Up Devices Using HP-UX Commands”.
Device Driver	Each device and each interface card has a software module, called a device driver , that arbitrates communication with HP-UX. Device drivers are listed in the <i>/etc/master</i> file. The driver must be included in the kernel configuration file <i>/etc/conf/dfile</i> .

Device
Information

Additional information specific to the device. Some of this information might describe device behavior. For example, a tape drive can be instructed to rewind or not rewind after an access.

Included in this information are the major and minor numbers. The major number specifies the driver in numeric form. To find out what drivers are necessary to use your peripherals, look in `/etc/master` for the list of available drivers and a product number/driver alias table. Use the alias table to find the driver for your peripheral. Then determine the appropriate major number based on whether your peripheral is block- or character-oriented.

The minor number parameter contains the system bus module number, slot number, function number, and the device-specific information encoded in a six-digit hexadecimal number such as `0x201100`. For a detailed explanation of minor numbers, see Chapter 11, “Setting Up Devices Using HP-UX Commands”.

If SAM does not create a device file for you, you must create it yourself with the `mknod(1M)` command, which is described in Chapter 11, “Setting Up Devices Using HP-UX Commands”. There are four parameters to the `mknod(1M)` command:

- device filename (absolute or relative)
- file type
- major number
- minor number

Default Device Files

Several default device files are present on your system. Table 1-1 shows those files that fall into the miscellaneous device file class. The miscellaneous device class includes the device files that the system needs to run properly. Each HP-UX installation must have the device files; `/dev/null`, `/dev/console`, `/dev/mem`, `/dev/kmem`, `/dev/swap`, `/dev/root`, `/dev/rroot` and `/dev/tty`. The device file `/dev/null` is a null file (a “bit bucket”) used by many HP-UX commands. The device file `/dev/console` identifies the system console and the device file `/dev/tty` is a synonym for the control terminal associated with a process group.

These miscellaneous device files are copied to your system when HP-UX is installed. *Do not change or modify them.* If one or more of these files is accidentally deleted or otherwise destroyed, you can recreate it with the `mknod` command using the character/blocked designation, major, and minor numbers given in Table 1-1.

Additional device files created when HP-UX is installed are listed in Table 1-2. However, only the ones listed in Table 1-1 are vital to booting and running HP-UX.

Table 1-1. Miscellaneous Device Files

Device File	File Type	Major Number	Minor Number	Device Description
/dev/console	c	0	0x000000	System message port (driver is cn)
/dev/syscon	c	0	0x000000	System console (linked to console)
/dev/systty	c	0	0x000000	System tty (linked to console)
/dev/tty	c	2	0x000000	Process group control terminal (driver is sy)
/dev/null	c	3	0x000002	Null file ("bit bucket")
/dev/mem	c	3	0x000000	Physical memory image (driver is mm)
/dev/kmem	c	3	0x000001	Kernel virtual memory image (driver is mm)
/dev/swap	c	8	0x000000	Swap device
/dev/root	b	255	0xffffffff	Root device (driver is root)
/dev/rroot	c	255	0xffffffff	Root device (driver is rroot)

The `/dev/root` device file is the block device file that always refers to the current root device. The `/dev/rroot` file is the character device file referring to the root device. The major and minor number for these devices does not refer to a physical device address. However, there will also need to be an entry in the `/dev/dsk` and `/dev/rdsk` directories for the root device that incorporates the bus address of the device.

There needs to be a `/dev/systty` (which is linked to `/dev/console`), and a `/dev/syscon` (which is linked to some terminal—usually the console). This is explained in `init(1M)`.

Table 1-2. Additional Default Device Files

Device File	File Type	Major Number	Minor Number	Device Driver Name
/dev/dsk/c201dns0 ¹	b	7	0x201n00 ¹	scsi
/dev/rdisk/c201dns0 ¹	c	47	0x201n00 ¹	scsi
/dev/crt	c	12	0x100000	framebuf
/dev/ocrt	c	12	0x100001	framebuf
/dev/hiln ²	c	24	0x2030n0 ²	hil
/dev/hilkbd	c	25	0x203080	nimitz
/dev/rhil	c	23	0x203000	r8042
/dev/plt_rs232_a	c	1	0x204004	asio0
/dev/plt_rs232_b	c	1	0x205004	asio0
/dev/ptr_rs232_a	c	1	0x204004	asio0
/dev/ptr_rs232_b	c	1	0x205004	asio0
/dev/plt_parallel	c	11	0x206002	parallel
/dev/ptr_parallel	c	11	0x206002	parallel
/dev/scn_parallel	c	11	0x206003	parallel

1 Replace *n* with the SCSI bus address. The range of *n* is zero to six. Seven device files are shipped, each with a different bus address specified.

2 Replace *n* with the HP-HIL bus address. The range of *n* is one to seven. Seven device files are shipped, each with a different bus address specified.

Table 1-2. Additional Default Device Files (continued)

Device File	File Type	Major Number	Minor Number	Device Driver Name
/dev/lan2	c	52	0x202000	lan2
/dev/ieee0	c	52	0x202000	lan2
/dev/ether0	c	52	0x202001	lan2
/dev/nettrace	c	46	0x000000	netdiag1
/dev/netlog	c	46	0x000001	netdiag1
/dev/netman	c	60	0x000000	netman
/dev/ptyp ⁿ	c	16	0x00000 ⁿ	pty0
/dev/ptyr ⁿ	c	16	0x00000 ⁿ	pty0
/dev/ptyq ⁿ	c	16	0x00000 ⁿ	pty0
/dev/ttyp ⁿ	c	17	0x00000 ⁿ	pty1
/dev/rmt/0m	c	121	0x201302	scsitape
/dev/rmt/0mn	c	121	0x201303	scsitape
/dev/tty00	c	1	0x204004	tty
/dev/tty01	c	1	0x205004	tty

¹ Replace *n* with values zero through fifteen (f in hexadecimal).

The System Administration Manager (SAM)

SAM is an acronym for System Administration Manager. It is a tool that allows you to perform many system administration tasks without having to know the specific HP-UX commands that are associated with the task. SAM can also save you time and keystrokes.

You can use SAM to add peripherals. Read this section to learn how to use the SAM interface.

Starting SAM

To start SAM, logged in as superuser, type:

```
/usr/bin/sam
```

In a few moments, SAM's main window will appear. The appearance of this window depends on whether you are running SAM from an X Window System display server or from a text terminal.

Note

Navigation in the two interfaces is different. The X Window System interface makes use of the mouse pointing device, while the text-terminal interface uses special keys. Both types of interaction are described in this section.

Inside the window is a box containing a list of **functional areas**. The first of these is **highlighted**.

Using Control Buttons

In the window you will see **control buttons** with these labels:

```
Open  
Exit  
Options ...  
Help
```

Activate these buttons to make SAM carry out different actions.

To activate a control button in the X Window System interface, use the mouse to place the cursor over it and press the left mouse button once.

To activate a control button in the text terminal interface, do one of the following:

- **Highlight** the button by pressing the **Tab** key one or more times. When a button is highlighted, that indicates that is ready for activation.
Activate the highlighted control button by pressing **Spacebar** or **Return** on the keyboard.
- **Activate** a control button immediately by pressing a *mnemonic* key. For example, notice that the letter **H** on the **Help** control button is underlined. (On some terminals, it may be highlighted or displayed in an alternate color. Press the **H** key on the keyboard, and the **Help** control button will be highlighted and activated immediately.

Use the **Tab** key to return to “cycle through” all of the control buttons. To cycle through the control buttons in reverse order, hold down the **Shift** key while you press **Tab**. Eventually you will return to the list of functional areas.

Using Softkeys in the Text-Terminal Interface

Note This section does *not* apply to the X Window System interface. It applies *only* to the text-terminal interface.

Hewlett-Packard terminals (and some others) display eight **softkey labels** below the window area. The keyboard keys to which these labels correspond are in a row across the top of the terminal’s keyboard, and they are usually labeled **f1** through **f8**.

The labels may change when a new window appears. Table 1-3 lists the labels which you will see most often.

Note VT-100 (and other ANSI-standard) terminals will not display these function-key labels. However, the keys **PF1** through **PF4** will provide the functions listed in Table 1-3.

Table 1-3 lists the keys or key combinations that give the equivalent result for these terminals.

Table 1-3. Function Keys for SAM's Text-Terminal Interface

Label	Meaning	Keys ¹	
		HP or Wyse	VT-100 or ANSI
Help on Context	Get help in understanding an element displayed on the screen	(f1)	(Help) or (PF 2)
Alt	Type alternate character	(f2)	(PF 1)
Select	Highlight an item or open a menu	(f3) or (Spacebar)	(Spacebar)
Menubar on/off	Move cursor to menubar	(f4)	(PF 1), (Spacebar) or (PF 1), (=)
Open	Open the highlighted functional area or subarea	(f5)	(Return)
Previous Level	Return to the previous level of SAM	(f6)	(none)
Shell	"Escape" (temporarily) to a shell	(f7)	(none)
Exit	Exit the current window	(f8)	(none)
Exit SAM	Exit SAM entirely	(f8)	(none)

¹ Keys are specified by the symbols which appear on their keycaps. The presence of a comma (",") between two keycaps means that the keys should be pressed in sequence.

Getting Help in SAM

SAM provides several different kinds of assistance. Table 1-4 describes the different kinds of help you can get from within SAM and how to request each kind of help.

Table 1-4. Help in SAM

Type of Help	What the Help covers	How to get it
Context Help	Information about elements within any window	Move the cursor to the element you want to know more about, then press the Help on Context softkey.
Functional Help	■ the current functional area ■ keyboard navigation within SAM ■ using the SAM help system ■ displaying the version of SAM you are currently running	Choose an item from the “Help” menu on the menubar. (For instructions on using the menubar, see “Using the Menubar”.)
Box help	Information about the attributes and tasks presented in the message box or dialog box currently being displayed	Activate the (Help) button in the message/dialog box.

Exiting SAM

To exit SAM:

- Activate any control button labeled **(Exit SAM)**, or
- On a text terminal, press the softkey labeled **Exit SAM**.

The main window (and any other windows that may be open) will close, and the shell prompt will return.

Entering a Functional Area

To use SAM you must first enter a **functional area**. A list of functional areas appears in the large box in the main window. Notice that one of the items is highlighted. This highlighted item is ready to be acted upon by SAM. If you want to enter a functional area other than the one that is highlighted, use the  and  arrow keys to highlight another area.

To enter the functional area:

- If you are using the X Window System interface, move the mouse cursor over the  control button to the right of the list and press the left mouse button once.
- On a text terminal, press .

SAM replaces the main window with one of the following:

- A **subarea window** containing a list of particular work areas which apply the functional area. Highlight and activate one of these to enter the functional area.

The presence of “->” at the end of the functional area name indicates that you will choose a functional area from a list in a subarea window.

- A **functional area window**.

Functional area list items that do *not* end in “->” lead directly to a functional area window.

The Object List

When the functional area window appears, it will contain a list within a large box. This is the **object list** of computer system elements (**objects**) you can control by using SAM. Different kinds of things can appear in an object list: files, peripheral devices, user accounts, and so forth.

If the box is empty, it means that there are no objects defined for that functional area. As you add objects to (or delete them from) the system, they will appear on (or disappear from) the object list of the appropriate functional areas.

To modify an object, first select it:

- In the X Window System interface, move the mouse cursor over the line that describes the object and press the left mouse button once to highlight it.
- On a text terminal, move the cursor to the line, using the **▲** and **▼** keys, and press **Spacebar** to highlight it.

Then choose an operation from the menubar “Actions” list, described in the next section.

Using the Menubar

In each functional area window there is a **menubar** near the top of the screen. It contains the titles “List”, “View”, “Options”, “Actions,” and (at the far right of the screen) “Help.”

To move the cursor to the menubar:

- If you are using the X Window System interface, place the mouse cursor over the title in the menu item.
- On a text terminal:
 - Press **f4** (the **Menubar On/Off** softkey) on HP or Wyse terminals
 - Press **PF 1**, then **Spacebar** on VT100 or ANSI terminals.

Menus

The menubar always contains the same five menus. Table 1-5 lists the kinds of items you can expect to see within each menu.

Table 1-5. Menus and Menu Items

Menu	Types of Menu Items
List	■ Alternate views of the functional area (chosen by means of radio buttons). See “Radio Buttons”. ■ Exit
View	Menu items for changing the content and appearance of the object list: ■ Arranging columns ■ Filtering to display only certain objects ■ Sorting objects to change the order of the list ■ Saving a particular “view” for future use
Options	Special actions (like refreshing the display) that apply to the entire window.
Actions	Menu items for adding, modifying, or deleting objects.
Help	Assistance for using SAM.

Opening a Menu

To see the menu items within a particular menu:

- If you are using the X Window System interface, place the mouse cursor over the menu. Press down and hold the left mouse button.
- On a text terminal, make sure that the cursor is on the menubar, then do one of the following:
 - Use the **◀** and **▶** keys to highlight the menu you wish to see, then press **Spacebar**, or
 - Type the mnemonic (the underlined character) for the menu.

Choosing a Menu Item

To **choose** a menu item:

- If you are using the X Window System interface, drag the mouse cursor through the menu until it highlights the desired item. Then release the mouse button.
- On a text terminal, do either of the following:
 - **Highlight** the menu item of your choice by using the **▲** and **▼** keys. The highlight moves in response. When a menu item is highlighted, that indicates that it is ready for choosing. Notice that if you press either of the arrow keys many times, the highlight “cycles through” the menu over and over again.

Choose the highlighted menu item by pressing the **Spacebar** on the keyboard.
 - If the menu item contains an underlined character, you can **choose** it immediately by pressing a *mnemonic* key. For example, the last item in every “List” menu is **Exit**. The “E” on the **Exit** menu item is underlined. (On some terminals, it may be highlighted or displayed in an alternate color.) Press the **E** key on the keyboard, and the **Exit** menu item will be highlighted and activated immediately.

Using Buttons and Checkboxes

There are several features in SAM that have a special appearance and which exhibit special behavior.

Menu Buttons

Some screen buttons present a range of settings from which you must choose. These **menu buttons** differ in appearance from ordinary buttons by the presence of “->” after the button label. Menu buttons look like this in the text-terminal interface:

[*label* ->]

To “open” a menu button:

- In the X Window System interface, move the mouse cursor over it and hold down the left mouse button.
- On a text terminal, highlight the button and press **Spacebar**.

When “opened”, a menu button expands into a small menu. To select one of the menu items:

- In the X Window System interface, drag the cursor to highlight the item you wish, then release the mouse button.
- On a text terminal, press the **▲** and **▼** keys to move the highlight to your choice, then press **Spacebar**.

The choice will be displayed on the menu button.

Radio Buttons

Within the “List” menu, you may find two or more views of a functional area. Access to these alternate views is controlled by a **radio button** which may be turned “on” or “off”. Radio buttons differ in appearance from ordinary buttons by the presence of a diamond shape to the left of the button label. On a text terminal, a radio button looks like this when it is turned “on”:

```
<*> view_name
```

On a text terminal, a radio button looks like this when it is turned “off”:

```
< > view_name
```

In the X Window System interface, the diamond shape appears “down” when the button is on and “up” when the button is off.

To turn a radio button on or off:

- In the X Window System interface, place the mouse cursor over the diamond shape and press the left mouse button.
- On a text terminal, highlight the radio button with the  or  arrow keys and press . The screen will change to another functional area.

Radio buttons are *mutually exclusive*: within a “List” menu, only one button at a time may be turned on.

Checkboxes

A **checkbox** is an object which can be turned “on” or “off.” Checkboxes differ in appearance from ordinary buttons by the presence of a square shape to the left of the button label. On a text terminal, a checkbox looks like this when it is turned “on”:

☒ *label*

On a text terminal, a checkbox looks like this when it is turned “off”:

☐ *label*

In the X Window System interface, the square shape appears “down” when the button is on and “up” when the button is off.

To turn a checkbox “on” or “off”:

- In the X Window System interface, place the mouse cursor over the square shape and press the left mouse button.
- On a text terminal, use the ☐ to move the highlight over the checkbox, then press ☐. If it was “on,” the **x** in the checkbox disappears. If it was “off,” an **x** appears in the checkbox.

Checkboxes are *not* mutually exclusive. You may turn “on” or “off” as many as you need.

Navigating with Keys and Key Combinations in the Text-Terminal Interface

Note This section does *not* apply to the X Window System interface. It applies *only* to the text-terminal interface.

You must use particular keys and combinations of keys to navigate and perform particular tasks in SAM. Table 1-6 lists the special meanings of the keys you must use to navigate within the windows in SAM's text-terminal interface.

Table 1-6. Meanings of Selected Keys

Action	Keys ¹	
	HP or Wyse	VT-100 or ANSI
Move the cursor one space to the right		
Move the cursor one space to the left		
Move the cursor up one line		
Move the cursor down one line		
Move the cursor to the next field		
Move the cursor to the menubar		

¹ Keys are specified by the symbols which appear on their keycaps. The presence of a comma (",") between two keycaps means that the keys should be pressed in sequence. The presence of a hyphen ("-") between two keycaps indicates that the keys should be pressed simultaneously.

Table 1-6. Meanings of Selected Keys (continued)

Action	Keys ¹	
	HP or Wyse	VT-100 or ANSI
Scroll a list up one page	Shift – ▲	(none)
Scroll a list down one page	Shift – ▼	(none)
Scroll a list up one line	f2 , ▲	PF1 , ▲
Scroll a list down one line	f2 , ▼	PF1 , ▼
Scroll a list left one page	Prev	(none)
Scroll a list right one page	Next	(none)
Scroll a list left one character	f2 , ◀	(none)
Scroll a list right one character	f2 , ▶	(none)
Highlight one item	f3 or Spacebar	Spacebar
Highlight all items in a list	f2 , /	PF 1 , /
Highlight a range of items	1. f2 , f3 on first item 2. Move cursor 3. f2 , f3 on last item	1. PF 1 , . on first item 2. Move cursor 3. PF 1 , . on last item or 1. Find on first item 2. Move cursor 3. Find on last item
Dehighlight one item	f3 or Spacebar	Spacebar
Dehighlight all items in a list	f2 , \	PF 1 , \
Open a menu on the menubar by using a mnemonic (first letter of menu)	f2 , <i>mnemonic key</i>	PF 1 , <i>mnemonic key</i>
Close a menu	f4 or Spacebar	PF 3 or Spacebar

HP-IB Device Guidelines

Devices that require an HP-IB interface can be connected to your system via the EISA HP-IB interface card (HP 25560A). This card is an option on some Series 700 systems. Consult your *S700 Configuration Guide* for current support information.

Keep the following guidelines in mind when you connect HP-IB devices to your system.

- *Do not* connect or disconnect an HP-IB device while the system is running, or turn power on or off to an HP-IB peripheral while it is connected to a powered-up system. Doing so could result in bad data on the HP-IB bus.
- If you need to change the bus address switch settings on an HP-IB peripheral, be sure to perform the task in the following sequence:
 1. Shut down and halt the system using the `/etc/shutdown -h` command.
If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.
 2. TURN OFF the computer and unplug the power cord.
 3. Turn off and unplug the device.
 4. Change the switch settings on the device.
 5. Plug in and turn on the device.
 6. Plug in and turn on your system.

HP-IB devices can be connected to other HP-IB devices in a daisy-chained arrangement as shown in Figure 1-2. A close-up of the piggy-backed HP-IB connectors on the last device on the chain is provided in Figure 1-3.

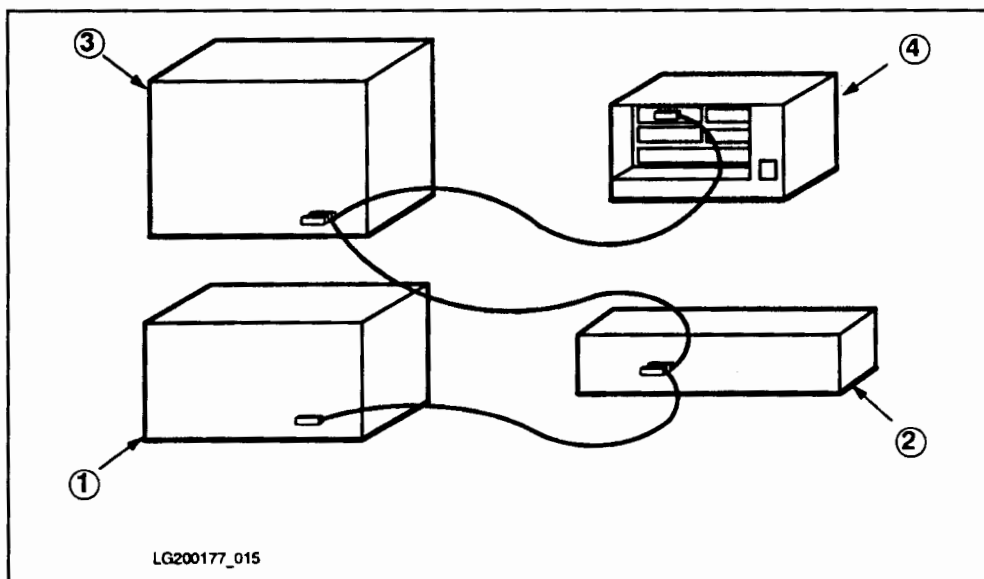
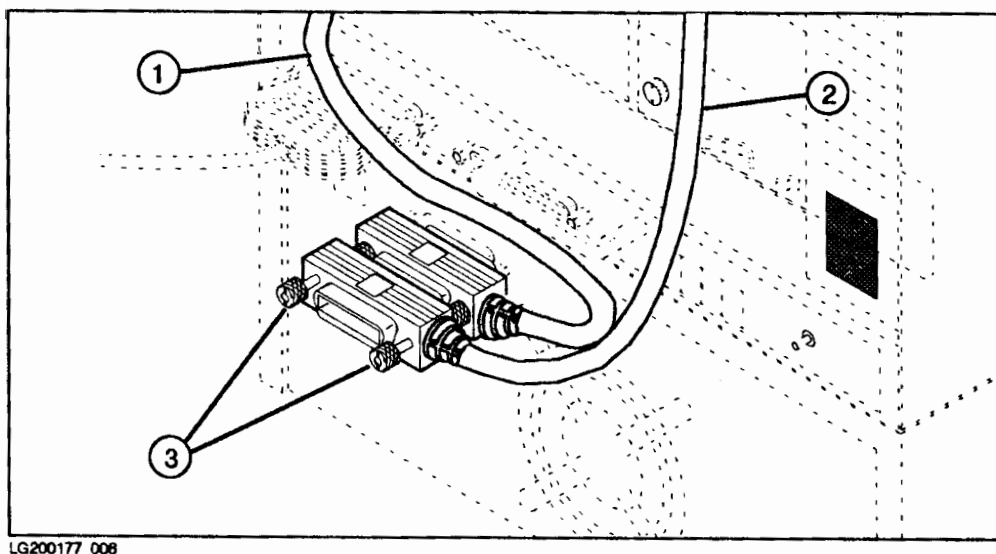


Figure 1-2. Daisy-Chained HP-IB Devices

- ① Computer system.
- ② First peripheral device.
- ③ Second peripheral device.
- ④ Last peripheral device in chain.



LG200177_008

Figure 1-3. Piggy-Backed HP-IB Connectors

- ① Cable to the interface or previous device.
 - ② Cable to the new peripheral device.
 - ③ Thumb screws to be tightened.
- When only standard speed devices are used, the total HP-IB cabling on the interface is limited to two meters per device load or 20 meters total, whichever is less.
 - When only high speed devices are used, the total HP-IB cabling on the interface is limited to one meter per device load or 10 meters total, whichever is less.
 - Avoid a star configuration when connecting HP-IB devices. The recommended configuration for HP-IB cabling is a single run of multi-drop (daisy-chained) segments.

HP-IB Cabling information

If you need to replace your HP-IB cable for any reason, consult the following list of available HP-IB cables and their lengths:

HP 10833A 1.0 meter HP-IB cable

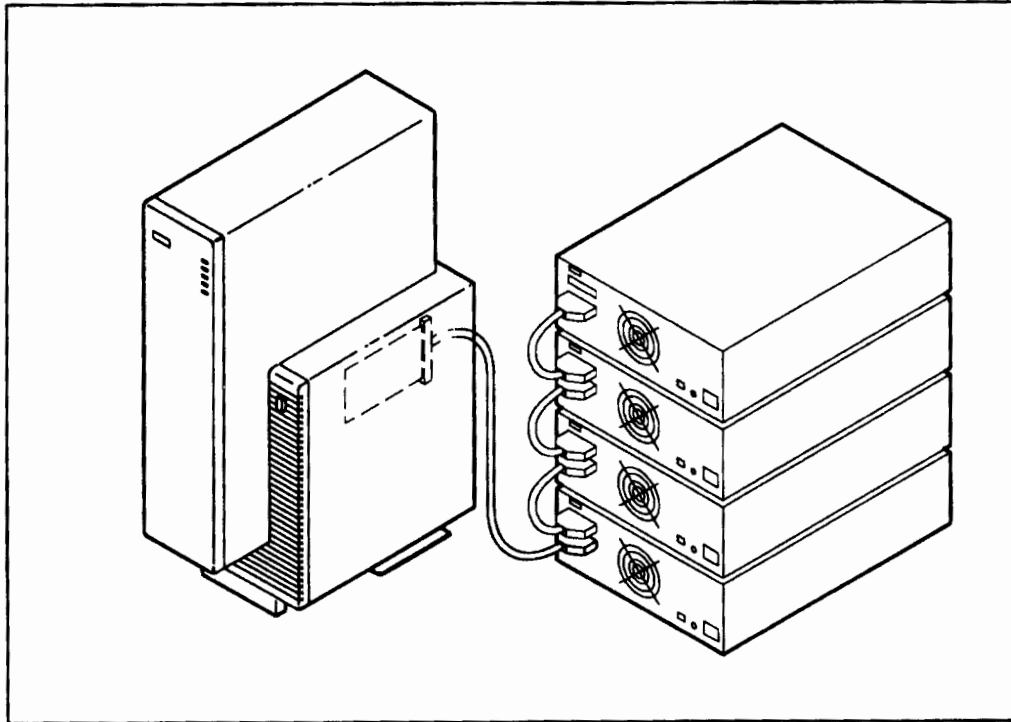
HP 10833B 2.0 meter HP-IB cable

HP 10833C 4.0 meter HP-IB cable

HP 10833D 0.5 meter HP-IB cable

SCSI Device Guidelines

A device using the Small Computer System Interface (SCSI) bus (also referred to as SCSI-II or SCSI-2) can be connected directly to your computer, or to another SCSI device in a daisy-chained arrangement.



LG200212_001

Figure 1-4. SCSI Bus Example

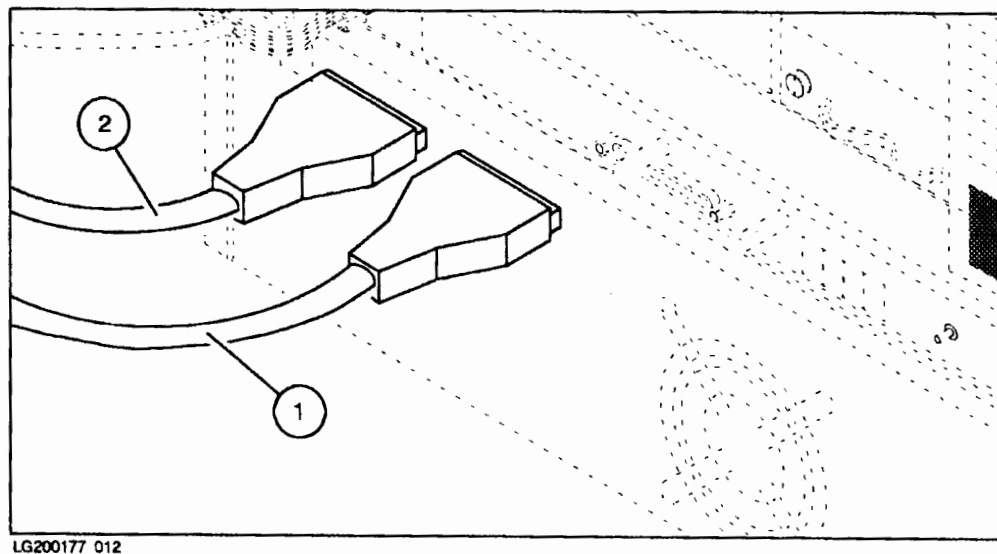


Figure 1-5. SCSI Connection

- ① Cable to the interface or previous device.
- ② Cable to the new peripheral device.

The following list provides some guidelines for SCSI devices.

- Each bus has exactly two terminators. The SCSI bus is terminated at one end by termination resistors that are part of the SCSI interface. The last SCSI device in the chain, even if it is the only one, *must have* an appropriate terminator (either single-ended or differential) installed to its second connector. This terminator provides matching impedance on the bus circuits. Without the terminator, the bus will not work. Using a single-ended terminator on a differential interface, or the reverse, also prevents the bus from working.
- If your system has an internal SCSI device, but no external SCSI devices, be sure the terminator is connected to the back of your computer. All HP-UX Series 700 systems have a high-density terminator installed on the back panel.



- Ensure that there are no unterminated cables; all cables must be attached to a device at both ends.
- A single-ended SCSI interface is connected to the system card. A fast differential SCSI interface is available via an EISA option. *DO NOT* attach a single-ended SCSI device on a differential bus, or a differential SCSI device on a single-ended bus. Such a configuration does not work.

Note

A wide differential SCSI interface will be connected to the system card on some Series 700 models. This option is not available at release introduction. Consult your *Owner's Guide* for your model 700 for specific information on SCSI connectivity.

- Although multiple devices can be connected to a SCSI interface simultaneously, there are limitations to the number of same type devices that are supported on individual S700 models. Check your *Owner's Guide* for this information.
- Hewlett-Packard's standard support process does not include the use of third-party peripherals.
- *Shutdown and power-off* your system before you connect or disconnect a SCSI device. *Do not* connect or disconnect any SCSI device while the system is running, or turn power on or off to any SCSI device while it is connected to a powered-up system. Doing so could result in data corruption or a system panic, which in turn could lead to corruption of the file system.
- Keep all devices powered on during and after system boot-up.

- If you need to change the bus ID on a SCSI device, perform the task in the following sequence:

1. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

2. TURN OFF the computer and unplug the power cord.
3. Turn off the device.
4. Change the bus ID on the device.
5. Turn on the device.

Power on all SCSI peripherals and make sure they have time to complete their selftest before powering on the SPU (System Processor Unit).

6. Turn on your system.

- All SCSI devices must have a unique bus (target) address (also referred to as the device ID) between 0 and 6. The bus address 7 is reserved for the SCSI interface. *Do not* use it for SCSI devices.

Note

A wide differential SCSI interface will be connected to the system card on some Series 700 models. This connection will allow addressing from 0 to 6 and from 8 to 15. This option is not available at release introduction. Consult your *Owner's Guide* for your model 700 for specific information on SCSI connectivity.

Note that some devices require more than one bus address. For example, the C1700A, Magneto Optical Disk Autochanger, requires three SCSI addresses (one for the autochanger and one for each of its two drives).

- The Boot ROM searches from bus address 6 to 0. Your root disk should have a higher bus address than any other device on the bus. It is recommended that the root disk be set to SCSI address 6.

- All devices must be connected to a common (single-point) system reference ground. The system ground must be isolated from other electrical devices such as copying machines, arc welders and air conditioners. HP-supplied cables ground correctly.
- Ensure that the total cable length (including external and internal cables) does not exceed six meters for a single-ended SCSI bus, or 25 meters for a fast differential SCSI bus. You should keep the length of the bus as short as possible, but it must not be less than 0.5 meters. Refer to the documentation that came with the device and with your Series 700 computer for internal cable length information.

Calculating SCSI Cable Length Example

Table 1-7 demonstrates how to calculate SCSI bus cable lengths for a typical installation. The SCSI 0.5 meter cable (HP 92222A) used in the example is available through your HP Sales and Support Office. Other lengths are also available.

Table 1-7. Example of SCSI Cable Length Calculation

Starting Point Device	Cable to Next Device		Internal Cable	Cumulative Cable Length
SCSI host adapter	5062-3383	1.0m	0.1m	1.1m
HP device #1	HP 92222A	0.5m	0.2m	1.8m
HP device #2	HP 92222A	0.5m	0.4m	2.7m
HP device #3	HP 92222A	0.5m	0.3m	3.5m
HP device #4	none		0.4m	3.9m
Total		2.5m	1.4m	3.9m

Because SCSI cable impedance and construction can have a significant effect on signal quality, only HP cables are recommended. The following cables can be used with either a single-ended or differential SCSI bus:

- K2296 cable with 0.9 meter length
- K2297 cable with 1.5 meter length

If you are connecting SCSI devices together in a daisy-chain, use the following cables:

- 92222A cable with 0.5 meter length
- 92222B cable with 1.0 meter length
- 92222C cable with 2.0 meter length

RS-232C Cabling Guidelines

Terminology and Background

The type of connect that a device (SPU or peripheral) provides is usually one of, or a variant of:

DCE	Data Communications Equipment
DTE	Data Terminal Equipment
DQE	Nominally wired DCE, but with DTE hidden on pins unused by EIA.

Historically, DCEs were modems, and DTEs were whatever “terminated” the data path, typically an actual terminal at one end, and the computer at the other. A pair of DCEs were always assumed to be in the link, and they used something other than RS-232 to communicate with each other. The generalized circuit was:

```
Computer[DTE]---{ DCE~~phone lines~~DCE }---[DTE] terminal
```

The connectors and pin-outs at the DCE (“-{}” above) are specified. The cable termination at the DTE itself is not, and in the early days, the cable was hard-wired right into the device (typically an ASR-33 TTY).

When the EIA created RS-232, it failed to adequately describe the case of direct computer-peripheral connection. This is the now-common configuration of DTEs connecting directly to other DTEs, with no DCEs in sight. This may be what you are trying to do, and why you are reading this document. Today’s devices, and their serial connectors, often do not clearly fall under DTE or DCE, and they provide an assortment of connector genders, styles and pin counts.

Although nominally a 25-pin connection, HP systems typically provide a maximum of nine pins, sometimes seven, and all that is really required for a device-device direct connection is three pins.

Despite this potential confusion, the terms DTE and DCE still have their uses. For our purposes, when normalized to 25 pins:

DCE:

- Transmits on pin 3
- Receives on pin 2
- Monitors pins 4 (RTS), 20 (DTR), if present
- Asserts pins 5 (CTS), 6 (DSR), 8 (CD), 22 (RI), if present

DTE:

- Transmits on pin 2
- Receives on pin 3
- Asserts pins 4 (RTS), 20 (DTR), if present
- Monitors pins 5 (CTS), 6 (DSR), 8 (CD), 22 (RI), if present

DQE: Wired for DCE-25F, but convertible to DTE-25M with 92219Q cable.

Pin 7 is signal ground for both DCE and DTE.

Pin Counts

When there are fewer than 25 pins (especially with the 9-pin connection), the actual pin numbers vary. The type of connector implied by the counts listed in this guide are:

50	Amp "blue ribbon" D-style
25	DB-25 subminiature D-style
9	DB-9 subminiature D-style
4	USOC RJ-11C (same as on contemporary consumer telephones)

Connector Gender

Actual DCEs, such as modems, are still usually 25-pin female. No particular connector gender is common to DTEs. The abbreviations used here are:

M	Male
F	Female

The following tables are intended to be a quick-reference to selection of RS-232 cables for connecting serial devices directly to an HP 9000 Series 700 workstation. It does not cover RS-422. It does not cover the case of direct CPU-CPU connections, as LAN has replaced RS-232 in this application.

Table 1-8. RS-232-C Interconnections

Host Type	Device Type	Cable Suggested
DTE-4F	DCE-25F	Not recommended for actual DCEs. Use 92219T + 17255=D otherwise.
DTE-4F	DTE-25F	92219T
DTE-4F	DTE-25M	92219T plus 92224F adaptor
DTE-9F	DCE-25F	92221M, or 98561-61604 plus 40242M
DTE-9F	DTE-25F	92221P, or 98561-61604 plus 40242G
DTE-9F	DTE-25M	98561-61604 plus 40242C
DTE-9M	DCE-25F	24542M, or 98574-61606 plus 92221M, or 98574-61606 + 98561-61604 + 40242M
DTE-9M	DTE-25F	24542G, or 98574-61606 plus 92221P, or 98574-61606 + 98561-61604 + 40242G
DTE-9M	DTE-25M	24542H, or 98574-61606 + 98561-61604 + 40242C
DCE-25F	DCE-25F	40242G
DCE-25F	DTE-25F	40242M, or 92224M adaptor, if cables present
DCE-25F	DTE-25M	40242C, or simply directly interconnect, if cables present
DQE-25F	DCE-25F	92219Q
DTE-25F	DCE-25F	40242M, or 92224M adaptor, if cables present
DTE-25F	DTE-25F	40242G
DTE-25F	DTE-25M	17255D
DTE-50F	DCE-25F	5061-4215
DTE-50F	DTE-25F	5061-4216 plus 92224M
DTE-50F	DTE-25M	5061-4216

Table 1-9. Peripheral Types

Type	HP Peripheral Products
DCE-25F	These devices are all modems, and require that the host provide at least a 9-pin DTE connection. K1489, K1492, K1494, K1498, 37212A/B, 39301A, 50759A, 92203A, 92205A/B
DTE-25F	C1001, C1002, C1003, C1006, C1010, C1200A, C1202A#1A9, C1600A, C1601A, C1602A#1AX, C1620A, C1625A, C1627A, C1629A, C1631A, C2106A, HP150, 2225D, 2227A, 2228A, 2235, 2276A, 2277A, 2382A, 2390-series, 2560-series (#049), 2601A, 2602A, 2603A, 2620-series (port 2), 2631B, 2684A (w/26843A), 2686, 2687A, 2930-series, 3082A/B, 33440A, 33447A, 33449A, 33459A, 33471A, 3630A#001, 41063A, 45810, 45850, 7440A#001, 7475A#001, 7570A, 7575A, 7576A, 7580, 7585, 7586B, 7595, 7596A, 7599A, 9666A 9807
DTE-25M	C1004, C1007, C1017, 7510A, 7550A

E/ISA Configuration Guidelines

This section provides an overview of the `eisa_config` program and gives some guidelines for swapping to an E/ISA device. For detailed information on installing EISA and ISA cards and using the `eisa_config` utility, refer to Appendix A, “E/ISA Configuration”.

The `eisa_config` program helps you create a conflict-free configuration for E/ISA cards. (E/ISA is a term that includes both EISA and ISA.) Each E/ISA card in a backplane can use one or more system resources, such as direct-memory-access channels, interrupt lines, and memory. However, a given card may be able to use only a subset of the choices available for a resource. For example, 11 interrupt lines might be available, but some cards might only be able to use lines 3, 5, and 6. Hence, you need a way to tell the card which resources to use.

When you add a card, you may need to add a device driver to the kernel. When adding or moving a card, you must also create device files. The card manufacturer should supply the drivers and the information you need to create device files.

Swapping to an E/ISA Device

If you are adding a device to your system that you plan to use as a primary swap device, and the device will be connected to an E/ISA card, you *must* perform the task in the following order:

- Shut down the system without changing the kernel (still swapping to the original swap device).
- Add the E/ISA board and connect the new device.
- Boot the system, which is still swapping to the original swap device.
- Configure the kernel to swap to the new E/ISA device.
- Reboot the system.
- If the new swap device is connected to an EISA card, it will be configured automatically by `eisa_config`. If it is connected to an ISA card, you must run `eisa_config` manually to configure the new swap device.

Cluster Configuration Guidelines

This section gives an overview of the following topics:

- shared vs. exclusive resources
- adding peripherals:to the cluster root server
- adding peripherals:to a cluster client

You will find detailed information about managing a cluster configuration in *Managing Clusters of HP 9000 Computers*, HP part number B2355-90038. Specifically, the following chapters apply to tasks you might need to perform when installing peripherals in a clustered environment:

- Chapter 10, “Booting and Shutting Down Clusters and Cluster Nodes”
- Chapter 11, “Reconfiguring the Kernel for a Cluster Node”
- Chapter 12, “Adding Peripherals to a Cluster”

Shared vs. Exclusive Resources

Table 1-10 shows what choices you have for distributing peripheral resources in a cluster. In this table, the column labeled “Shared?” shows whether the resource can be shared with other nodes in the cluster, while “Exclusive?” shows whether the resource can be privately owned by the cluster node it’s attached to. A “yes” in both columns means that the resource (a printer, for example) can be configured to be either shared or exclusive.

Table 1-10. Availability of Resources in a Cluster

Resource	Shared?	Exclusive?	Comments
Disk drives:			
<i>file systems</i>	Yes	No	Always shared, no matter where disk drive is attached. Root must be on server's disk.
<i>device swap</i>	Yes	Yes	Server's swap usually shared. Client's swap on local disk can be exclusive or shared.
<i>file system swap</i>	Yes	Yes	Client can enable file system swap on its own local disk.
Tape drives	No	Yes	Available only to users logged in to the node where the drive is attached.
Printers, plotters	Yes	Yes	Spooled printers can be attached to any node and are available to all. Unspooled printers available only to local node.
Modems	No	Yes	Available only to users logged in to the node where the modem is attached. Modems used with cu and uucp supported only on root server.
Terminals	No	Yes	Users log in on local node. Can rlogin to other nodes.

Adding Peripherals to the Cluster Root Server

You can use any peripheral on a cluster root server that is supported by that model of computer.

In a cluster, however, you should think carefully about how you want to distribute peripherals between the root server and the clients. There is a discussion of this in Chapter 12, "Adding Peripherals to a Cluster" of the *Managing Clusters of HP 9000 Computers* manual.

You add peripherals to the root server in much the same way as you would to a standalone computer, but you must keep two important points in mind:

- When configuring HP-UX to communicate with a peripheral attached to the server, you must be logged in to the server.
- When you reboot the server, you automatically reboot the entire cluster.

Adding Peripherals to a Cluster Client

Peripherals in a cluster may need to be used differently depending on whether they're attached to the cluster server or to a client. Disk drives in particular raise many issues, which are discussed in Chapter 12, "Adding Peripherals to a Cluster" of *Managing Clusters of HP 9000 Computers*. Tape drives and printers are more straightforward, but there are some points to keep in mind, which are also discussed in *Managing Clusters of HP 9000 Computers*.

Keep the following important differences in mind when adding a peripheral to a cluster client:

- You must log in as **root** to the cluster client to which you are attaching the peripheral, to perform the configuration tasks associated with adding a peripheral.
- Adding a peripheral device means shutting down the system. Note that:
 - If this client is acting as an **auxiliary swap server** (that is, if it has a local disk to which other clients are swapping), shutting down and rebooting it will shutdown and reboot the other clients that are swapping to this disk as well.
 - If this client is acting as an **auxiliary file server** (that is, if it has a local disk that is being used for a locally mounted file system), shutting down the client will unmount the file system.

- If you are connecting a disk drive that you plan to use as the primary swap device, and the disk is to be connected to an E/ISA card, make sure the card is configured before the client attempts to swap to the drive. If the card is not configured, the client “panics”. For more details, see “Swapping to an E/ISA Device” in this chapter and Appendix A, “E/ISA Configuration”.

Caution	Consult <i>Managing Clusters of HP 9000 Computers</i> , HP part number B2355-90038 before you reconfigure a cluster client's kernel.
----------------	--

Installing Terminals and Modems

Introduction

This chapter contains the installation procedures and configuration information for terminals and modems supported on the Series 700 system. The following list represents those devices supported at the time this book was published.

However, support for devices is constantly being revised. Check your *HP Apollo 9000 Series 400 & Series 700 U.S. Pricing and Configuration Guide* for the most up-to-date support information.

HP Terminals

- HP C1001 Model 700/92
- HP C1002 Model 700/94
- HP C1064 Model 700/96
- HP C1065 Model 700/98
- HP C23xx Model 700/X Family
- HP C27xx Model 700/RX Family
- HP 37212B 1200/2400 Baud Modem
- HP 92205A/C Hayes Smartmodem 1200
- HP 92205B Hayes Smartmodem 2400

HP Terminals

This section describes the installation procedures for all HP terminals. HP Terminals connect to any supported RS-232C interface.

Before Connecting This Device

Before you install a terminal:

- Have the documentation shipped with your terminal handy. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, “Introduction”. It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system, you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks.

For more information about adding devices to a system configured as an HP-UX cluster, refer to *Managing Clusters of HP 9000 Computers*, Chapter 12, “Adding Peripherals to a Cluster”.

What You're Going To Do

The following table contains detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this detailed information. Complete the hardware installation as outlined in the following section, then refer to Chapter 3, "Setting Up HP-UX for Terminals and Modems Using SAM" for set up instructions.

If you use commands to set up HP-UX to communicate with your terminal, complete the hardware installation as outlined in this section. Once hardware installation is complete, use the information provided in this table to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 2-1. HP Terminals Connected to RS-232-C Interfaces

Device Name	Path Name ¹	File Type	Major Number	Driver Name	Function Number	Minor Number
HP Terminal	/dev/tty00	c	1	asio0	4 ²	0x204004
HP Terminal	/dev/tty00	c	1	asio0	4 ²	0x204004
HP Terminal	/dev/tty01	c	1	asio0	5 ³	0x205004
HP Terminal	/dev/tty01	c	1	asio0	5 ³	0x205004

¹ The path name shown here assumes these are the first and second terminals you are connecting (tty00 and tty01). Refer to the "Default Device Files" section in Chapter 1, "Introduction" for the terminal device files shipped with your system.

See Chapter 11, "Setting Up Devices Using HP-UX Commands" for device file naming conventions.

² Built in RS-232-C interface port A.

³ Built in RS-232-C interface port B.

Connecting the Terminal to an RS-232-C Interface

The following summary supplements the procedures outlined in your hardware installation documentation for this terminal. Read through this summary before proceeding with the installation.

1. *Verify that the drivers required for this device are included in your **dfile** file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the **/etc/conf/dfile**. However, if you have edited your **dfile** you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your **dfile** for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your **dfile** for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the **/etc/conf/dfile**, or are commented out with a comment symbol (such as the ***** sign), edit the **dfile** to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the **dfile** for any reason. Use the **/etc/config** program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

2. *Play it safe.*

- a. Shut down and halt the system using the **/etc/shutdown -h** command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

2-4 Installing Terminals and Modems

3. *Determine your interface.*

The following RS-232-C interfaces can be used:

- The built-in Core I/O RS-232-C port A.
- The built-in Core I/O RS-232-C port B.

Caution

The HP 9000 Series 700 has both parallel and RS-232-C ports. These ports frequently appear identical. The built-in parallel interface should be labeled PARALLEL. Make sure you plug your cable into an RS-232-C port, labeled Port A or Port B.

4. *Ensure all power switches on the device and on the computer are in the OFF position.*

5. *Connect the terminal to your computer.*

Connect the terminal to your computer following the instructions provided in the hardware installation manual for the device.

6. *Connect the terminal's power cord.*

7. *Plug in and power on the terminal.*

8. *Plug in and power on the computer.*

9. *Configure the terminal.*

Set up the terminal's communication's protocols by entering the datacomm configuration menu on the terminal. Refer to the manuals that came with the terminal for specific instructions on setting these values.

Table 2-2 shows recommended values for configuring your terminal. Not all of the characteristics listed in the table will apply to your terminal.

Hardware Installation Complete!

What To Do Next

If you are using SAM to complete the software set up portion of this procedure, refer to Chapter 3, "Setting Up HP-UX for Terminals and Modems Using SAM". If you are using the commands method to install this device, refer to Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 2-2.
Recommended Terminal Characteristics.

Characteristic	Setting	Comments
Alternate Set	Line(B)	Suggested
ASCII 8 Bits	No	YES required for NLS support
Asterisk	Off	Suggested
AUTO LF	Off	Required
Auto Terminator	No	Suggested
Baud Rate	9600	HP-UX Std.
Bell	On	Suggested
BLOCK MODE	Off	Required
Block Terminator	RS	Suggested
Break Time	200ms	Suggested
BufSiz	128	Suggested
Caps Lock	Off	May change after login
Carrier Detect	Open	Suggested
Check Parity	No	Required
Circuit Assurance	Closed	Cabling may require
Clear Terminator	No	Suggested
Clock	INT	Required
CPU Break	Open	Suggested
CS(CB)Xmit	No	Cabling may require
Cursor Type	Line	Your choice
Continued on next page ...		

**Recommended terminal characteristics.
(continued)**

Characteristic	Setting	Comments
Data Bits	8	Required for NLS support
Data Speed Select	Open	Suggested
Datacomm Handshake	XonXoff	Required
DISPLAY FUNCTIONS	Off	Suggested
Display Off After	15 min.	Your choice
DM(CC)Xmit	No	Cabling may require
EnqAck	No	EnqAck not supported
Esc Xfer	Yes	Suggested
Fast Binary Read	Closed	Suggested
Field Separator	US	Suggested
GraphCompat		Your choice
Inh DC2	Yes	Required
InhDcTest	Yes	Suggested
InhEolWrp	No (Closed)	Required
InhHndShk	Yes	Required
InhSkfTst	No	Suggested
Insert & delete sense	Closed	Suggested
Inverse Background		Your choice
Keyboard		Should match your keyboard
LINE MODIFY	Off	Suggested
Continued on next page ...		

**Recommended terminal characteristics.
(continued)**

Characteristic	Setting	Comments
Line/Page	Line	Required
Local Echo	Off	Suggested
Main Channel	Closed	Should have no effect
MEMORY LOCK	Off	Suggested
MODIFY ALL	Off	Suggested
Parity	None (Open)	Required for NLS support
Power On	Terminal	Suggested
Printer Code 4		Your choice
Printer Nulls		Your choice
RecvPace	XonXoff (Open)	Required
Remote/Serial Dev	PORT1/PORT2	If using terminal's port 1
	PORT2/PORT1	If using terminal's port 2
Remote	On	Required
Resolution	512x390	Required
RETURN Def	CR	Required
RETURN=ENTER	No	Required
RR(CF)Recv	No	Cabling may require
SPOW	No (Closed)	Strongly suggested
SR(CH)	Lo	Modem use may require
SRRInvert	No	Cabling may require
Continued on next page ...		

**Recommended terminal characteristics.
(continued)**

Characteristic	Setting	Comments
SRRXmit	No	Cabling may require
Start Column	1	Suggested
Stop Bits	1	HP-UX
STOP Function	XonXoff	Suggested
StripNulDel	No	Suggested
Tab=Spaces	No	Required
Terminal Id	2622A	Suggested for 2392A
	2623A	Required for DGL on HP150 and 2393A
Terminal Mode	HP	Required by default terminfo
Transmit	All Fields	Suggested
Transmit indicator	Closed	Suggested
TR(CD)	Hi	Modem use may require
XmitFnctn	No (Closed)	vi changes as needed
XmitPace	XonXoff	Suggested

HP Modems

This section describes the installation procedures for all modems. Modems connect to any supported RS-232C interface.

Before Connecting This Device

Before you install a modem:

- Have the documentation shipped with your modem handy. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, “Introduction”. It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system, you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks.

For more information about adding devices to a system configured as an HP-UX cluster, refer to *Managing Clusters of HP 9000 Computers*, Chapter 12, “Adding Peripherals to a Cluster”.

What You're Going To Do

The following table contains detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this detailed information. Complete the hardware installation as outlined in the following section, then refer to Chapter 3, "Setting Up HP-UX for Terminals and Modems Using SAM" for set up instructions.

If you use commands to set up HP-UX to communicate with your modem, complete the hardware installation as outlined in this section. Once hardware installation is complete, use the information provided in this table to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 2-3. HP Modems

Device Name ¹	Path Name ²	File Type	Major Number	Driver Name	Function Number	Minor Number
HP Modem	/dev/ttyd00	c	1	asio0	4 ³	0x204004
HP Modem	/dev/cua00	c	1	asio0	4 ³	0x204004
HP Modem	/dev/cul00	c	1	asio0	4 ³	0x204004
HP modem	/dev/ttdy01	c	1	asio0	5 ⁴	0x205004
HP modem	/dev/cua01	c	1	asio0	5 ⁴	0x205004
HP modem	/dev/cul01	c	1	asio0	5 ⁴	0x205004

¹ Modems require the dial-in modems device file `ttydxx` and the dial-out ports device file `culxx`. If you are using a non-HoneyDanBear uucp, you will need a third modem device file, `cuaxx` with the same minor number as the `culxx` device file.

² The path name shown here assumes this is the first modem you are connecting (`ttyd00`). If not, change the path name accordingly. Refer to the "Default Device Files" section in Chapter 1, "Introduction" for the modem device files shipped with your system.

See Chapter 11, "Setting Up Devices Using HP-UX Commands" for device file naming conventions.

³ Built in RS-232-C interface port A.

⁴ Built in RS-232-C interface port B.

HP Modems

Connecting the Terminal to an RS-232-C Interface

The following summary supplements the procedures outlined in your hardware installation documentation for this terminal. Read through this summary before proceeding with the installation.

1. *Verify that the drivers required for this device are included in your **dfile** file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the **/etc/conf/dfile**. However, if you have edited your **dfile** you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your **dfile** for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your **dfile** for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the **/etc/conf/dfile**, or are commented out with a comment symbol (such as the ***** sign), edit the **dfile** to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the **dfile** for any reason. Use the **/etc/config** program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

2. *Play it safe.*

- a. Shut down and halt the system using the **/etc/shutdown -h** command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

3. *Determine your interface.*

The following RS-232-C interfaces can be used:

- The built-in Core I/O RS-232-C port A.
- The built-in Core I/O RS-232-C port B.

Caution The HP 9000 Series 700 has both parallel and RS-232-C ports. These ports frequently appear identical. The built-in parallel interface should be labeled PARALLEL. Make sure you plug your cable into an RS-232-C port, labeled Port A or Port B.

4. *Ensure all power switches on the device and on the computer are in the OFF position.*

5. *Set the modem configuration values.*

Before you connect your modem, consider the following:

- Is the DTR (Data Terminal Ready) line forced high? If so, set it to follow the line or do not force it high.
- Is the CD (Carrier Detect) line forced high? If so, set it to follow the line or do not force it high.
- Is the modem a Hayes compatible? If so, the SO register needs to be set to one or greater. If you are going to use `cu` or `uucp` then the number should not be greater than three or the connection will fail.

An HP 24542M cable is recommended.

6. *Connect the modem to your telephone cable and to your computer.*

Connect the modem to your telephone cable and to your computer following the instructions provided in the hardware installation manual for the modem. Be sure to set any special modem configuration values as instructed in the installation manual for the modem.

7. *Connect the modem's power cord.*

8. *Plug in and power on the modem.*

9. *Plug in and power on the computer.*

What To Do Next

If you are using SAM to complete the software set up portion of this procedure, refer to Chapter 3, “Setting Up HP-UX for Terminals and Modems Using SAM”. If you are using the commands method to install this device, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands”.

Setting Up HP-UX for Terminals and Modems Using SAM

Introduction

This chapter discusses setting up HP-UX to communicate with your terminal. Setting up HP-UX for a terminal or modem consists of:

- ensuring the appropriate HP-UX device driver is part of the current kernel configuration.
- creating the device file, or verifying that the correct device file already exists, for communication with the device.
- creating an entry in the `/etc/inittab` file for the device.

The SAM method of setting up HP-UX for terminals and modems is discussed here. Refer to Chapter 11, “Setting Up Devices Using HP-UX Commands” for a description of the HP-UX commands method if you are not using SAM to add this device.

SAM will create the device file needed to communicate with the terminal or modem and add the necessary `getty` entry to the `/etc/inittab` file.

Setting Up HP-UX for Terminals and Modems Using SAM

Adding a Terminal to Your System

Make sure that the terminal or modem is physically connected to a port on your computer's serial interface before continuing.

3

To configure HP-UX for a new terminal:

1. Log on as root.
2. Run SAM:

```
# /usr/bin/sam
```
3. Highlight **Peripheral Devices->** and activate **Open**.
4. Highlight **Terminals and Modems->** and activate **Open**.
5. From the "Actions" menu in the "Terminals and Modems" window, choose **Add Terminal....**
6. In the "Add Terminal" window, set or select the following parameters:
 - The hardware path to the serial interface to be used by this terminal.
 - The port number to be used by this terminal.
 - The speed (baud rate) to be used by this terminal.
 - Whether or not this will be a UUCP connection.When you finish setting the parameters, activate **OK**.
7. You will receive a series of messages indicating the progress of the task.

Note	You will receive a message advising you of the necessity to connect the terminal.
-------------	---

When you receive the message **Task completed**, activate **OK**.

8. Exit SAM by returning to the "System Administration Manager" window and activating **Exit SAM**.

3-2 Setting Up HP-UX for Terminals and Modems Using SAM

Setting Up HP-UX for Terminals and Modems Using SAM

To configure HP-UX for a new modem:

1. Log on as **root**.
2. Run SAM:

```
# /usr/bin/sam
```

3. Highlight **Peripheral Devices->** and activate **Open**.
4. Highlight **Terminals and Modems->** and activate **Open**.
5. From the “Actions” menu in the “Terminals and Modems” window, choose **Add Modem...**
6. In the “Add Modem” window, set or select the following parameters:
 - The hardware path to the serial interface to be used by this modem.
 - The port number to be used by this modem.
 - The speed (baud rate) to be used by this modem.
 - Whether or not this modem will be used for calling out from your system.
 - Whether or not this modem will receive incoming calls.
 - Whether of not this is a CCITT (International protocol) modem.
 - Whether or not this will be a UUCP connection. If you specify that this will be a UUCP connection, a list of modem types will appear from which to select.

When you finish setting the parameters, activate **OK**.

7. You will receive a series of messages indicating the progress of the task.

Note	You will receive a message advising you of the necessity to connect the modem.
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When you receive the message **Task completed**, activate **OK**.

8. Exit SAM by returning to the “System Administration Manager” window and activating **Exit SAM**.

Installing Disk and Tape Drives

Introduction

This chapter contains installation and configuration information for the following disk and tape drives:

- HP A1999A Series 6100 Model 700/S SCSI CD-ROM Drive
- Optical Disk Library Systems
- HP C1701A Series 6300 Model 650/A Optical Disk Drive
- Mass Storage Systems
- HP C3034/35/36T Mass Storage Devices
- HP C2425J/K and C2427J/K Disk Arrays
- HP 9144A/45A Tape Drive
- HP 7979S Tape Drive
- HP 7980S/SX Tape Drives
- HP C1512A Series 6400 Model 1300S SCSI DDS-Format Tape Drive
- HP C1520/21A SCSI DDS-Format Tape Drive

HP A1999A Series 6100 Model 700/S SCSI CD-ROM Drive

The HP A1999A Series 6100 Model 700/S SCSI CD-ROM drive is a half height device.

Before Installing This Device

Before you install this device:

- Have the documentation that came with your CD-ROM handy. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, "Introduction". It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If your system is configured as an HP-UX cluster, refer to Chapter 12, "Adding Peripherals to a Cluster" in *Managing Clusters of HP 9000 Computers* before adding this device to your system.

Disk and tape drives can be added in a cluster environment to your client or server.

What You're Going To Do

The following table contains detailed HP-UX software set up information. If you use SAM to install this device, you will not need all of this information. Complete the hardware installation as outlined in the following section, then refer to Chapter 5, "Setting Up HP-UX for Disk and Tape Drives Using SAM" for set up instructions.

If you use commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in the following section. Then use the information provided in this table to complete the set up task as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 4-1.
HP A1999A Model 700/S CD-ROM Drive Setup Information

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Minor Number ²
Model 700/S CD-ROM	/dev/dsk/#s0	b	7	scsi	0x201n00
Model 700/S CD-ROM	/dev/rdisk/#s0	c	47	scsi	0x201n00

¹ Replace the # with any unique number, using the same number in both the /dev/dsk and /dev/rdisk. SAM uses a longer naming convention that maps more closely to the hardware address of your device. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for details.

² n is a number that identifies the target (bus) address. Replace n with a 2 if the bus address was set to 2, use 3 if the address set to 3, and so on.

**HP A1999A Series 6100
Model 700/S CD-ROM Drive**

Connecting the Disk Drive

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

Caution

CDFS (CD-ROM) file systems must reside on a drive attached to the cluster root server.

You must, however, configure the CDFS software “driver” into *every* cluster node’s kernel. See Chapter 11, “Reconfiguring the Kernel for a Cluster Node” in *Managing Clusters of HP 9000 Computers*, HP part number B2355-90038.

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, “Setting Up Devices Using HP-UX Commands” for detailed information on this procedure.

4-4 Installing Disk and Tape Drives

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

3. *Locate the SCSI connector on the back of your computer.*

4. *Set the SCSI bus address on your device.*

Note

Familiarize yourself with the SCSI addresses that are currently in use on your system. Determine the SCSI address(es) that are available. Use the worksheet at the end of this book to note already-used addresses.

You are limited to seven devices per SCSI interface, bus addresses 0 through 6. Address 7 is reserved for the system's SCSI controller.

Refer to the documentation that came with your CD-ROM drive for specific instructions on how to set the SCSI bus address on your device.

5. *Set the Parity, Arbitration, and Test switches on your device.*

Parity and Arbitration switches should be set to 1 (up) and the Test switch should be set to 0 (down). Refer to your User's Guide for specific instructions on how to set these switches.

**HP A1999A Series 6100
Model 700/S CD-ROM Drive**

6. *Ensure all power switches on the device and on the computer are in the OFF position.*
7. *Connect the CD-ROM drive to your computer.*

Connect your Model 700/S to your computer following the instructions in your *HP Series 6100 Model 700/S User's Guide*.

The HP Series 6100 Model 700/S CD-ROM drive has an internal bus length of 0.3 meters.

4

The SCSI bus length is limited to a maximum of six meters. This length includes the cable length between devices and the internal bus length for each device on the bus. Available SCSI cables and terminators are included in the "SCSI Device Guidelines" section of Chapter 1.

8. *Connect the power cord to your device.*
9. *Plug in and power on the computer.*

Hardware installation complete! If you are using SAM, complete the software set up portion of this procedure by following the instructions in Chapter 5, "Setting Up HP-UX for Disk and Tape Drives Using SAM". If you are using the commands method to install this device, refer to Chapter 11, "Setting Up Devices Using HP-UX Commands"

Optical Disk Library Systems

The Deskside and Rackmount Optical Disk Library Systems are direct access secondary storage (DASS) peripherals that allow multiple rewritable optical disks to be shared between one, two or four optical disk drives.

- The Model 10 Optical Disk Library System can hold as many as 16 disks. Each disk can store 325 Mbytes of data per side providing a total of 10.4 Gbytes of storage. The Model 10 is can be upgraded to a Model 20 with a 32 disk capacity.
- The Model 10LC Optical Disk Library System is the same as a Model 10 except it cannot be upgraded to a Model 20.
- The Model 20 Optical Disk Library System can hold as many as 32 disks. Each disk can store 325 Mbytes of data per side providing a total of 20.8 Gbytes of storage.
- The Model 60 Optical Disk Library System can hold as many as 88 disks. Each disk can store 325 Mbytes of data per side providing a total of 57.2 Gbytes of storage.
- The Model 100 Optical Disk Library System can hold as many as 144 disks. Each disk can store 325 Mbytes of data per side providing a total of 93.6 Gbytes of storage.

The Optical Disk Library Systems connect to your computer with a single-ended SCSI interface and can be accessed as a conventional magnetic disk drive.

Optical Disk Library Systems

Before Installing This Device

Note Optical Disk Library Systems should be installed by an HP Customer Engineer. The installation cost is included in the purchase price of the device. Your HP Customer Engineer will set up and install your Optical Disk Library System for you. For these details, please refer to the unpacking and installation procedures that came with the device.

4

Before having this device installed:

- Arrange to have your Hewlett-Packard Customer Engineer install your device.
- Have the documentation that came with your device handy.
- If you have not added this type of device to your system before, read the material in Chapter 1, “Introduction”. It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution If your system is configured as an HP-UX cluster, refer to Chapter 12, “Adding Peripherals to a Cluster” in *Managing Clusters of HP 9000 Computers* before adding this device to your system.

Disk and tape drives can be added in a cluster environment to your client or server.

4-8 Installing Disk and Tape Drives

Optical Disk Library Systems

The SCSI bus length is limited to a maximum of six meters. This length includes the cable length between devices and the internal bus length for each device on the bus. Available SCSI cables and terminators are included in the “SCSI Device Guidelines” section of Chapter 1.

Check the documentation that came with your Optical Disk Library System for information on internal SCSI cabling lengths.

Optical Disk Library Systems

What You're Going To Do

Have your Hewlett-Packard Customer Engineer install and set up your Optical Disk Library system.

Note that there are one, two or four optical disk drive devices for read/write data transfer (depending on which library model you have) inside the autochanger. Each optical disk drive device and the autochanger are assigned a unique SCSI address.

The device drivers required for this device are **autox**, **autoch**, and **scsi**. Device files reside in **/dev/ac** and **/dev/rac**.

The table shown below lists the device drivers, major and minor numbers that the SCSI Optical Autochanger requires.

Table 4-2. Optical Disk Library Setup Information

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Minor Number ²	Interleave Factor
The mechanical autochanger	/dev/rac/ioc1	c	33	autox , autoch , scsi	0x201n00	1
Optical disk 1, block, side a and b	/dev/ac/c201d#_1a /dev/ac/c201d#_1b	b	10	autox , autoch , scsi	0x201n0n	1
Optical disk 1, character, side a and b	/dev/rac/c201d#_1a /dev/rac/c201d#_1b	c	55	autox , autoch , scsi	0x201n0n	1

1 See Chapter 11, "Setting Up Devices Using HP-UX Commands" for device file naming conventions for Optical Disk Libraries.

2 The first *n* is a hexadecimal representation of the number that identifies the SCSI bus address, multiplied by two. Therefore, if the bus address is set to 2, enter 4 here; if the address is set to 6, enter c, and so on. The second *n* is a hexadecimal representation of the surface number.

Note

The device file names and minor number formats shown in the previous table are shown as examples only. You will need two device files for each optical disk surface and one for the mechanical changer. For example, in a library that contains 32 disks there are 64 optical disk surfaces, each requiring a block and character mode device file, totalling 129 device files. Therefore, use the script files that came with your Optical Disk Library or SAM to complete the configuration of your library.

4-10 Installing Disk and Tape Drives



Connecting the Optical Disk Library Systems

The following summary supplements the procedures outlined in the hardware installation documentation that came with this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

Optical Disk Library Systems

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

3. *Ensure all power switches on the device and on the computer are in the OFF position.*

4

4. *Complete the hardware installation.* Complete hardware installation as outlined in the Optical Disk Library Systems Setup Guide for the optical disk library model you have purchased.

5. *Complete the software set up task.* After the hardware is installed, use SAM to create the necessary device files. If you do not have SAM available on your system, follow the steps outlined in the *Configuring and Using the Optical Disk Library System* manual for your system type.

Note

If you do not have pre-initialized media, you will need to initialize each optical disk surface.

HP C1701A Model 650A/C Optical Disk Drive

The HP C1701A is a stand-alone 5.25-inch rewritable optical disk drive. The removable Magneto-Optical (MO) disk can store 650 Mbytes of data (325 Mbytes per side) and complies with the Continuous-Composite format. This disk drive connects to your computer with a SCSI interface and can be accessed as a conventional magnetic disk drive.

The HP C1701A optical disk drive is supported as mass storage device or a boot device, although it is not recommended for use as a boot device.

4

Before Installing This Device

Before you install this device:

- Have the hardware installation documentation that came with the device handy. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, "Introduction". It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If your system is configured as an HP-UX cluster, additional procedures may be necessary. The *Managing Clusters of HP 9000 Computers* manual, Chapter 12, "Adding Peripherals to a Cluster" provides this information.

Disks and tape drives may be added in a cluster environment to your client or server.

HP C1701A Model 650GB Optical Disk Drive

What You're Going To Do

The following table contains detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this detailed information. Complete the hardware installation as outlined in the following section, then refer to Chapter 5, "Setting Up HP-UX for Disk and Tape Drives Using SAM" for set up instructions.

If you are using commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in the following section. Once the hardware installation is complete, use the information provided in this table to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 4-3. HP 1701A/C Setup Information

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Minor Number ²	Interleave Factor
C1701A/C Model 650	/dev/dsk/#s0	b	7	scsi	0x201n00	1
C1701A/C Model 650	/dev/rdisk/#s0	c	47	scsi	0x201n00	1

¹ Replace the # with any unique number, using the same number in both the `/dev/dsk` and `/dev/rdisk`. SAM uses a longer naming convention that maps more closely to the hardware address of your device. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for details.

² *n* is a number that identifies the address (set in step 4 of this installation procedure). Replace *n* with a 2 if the address was set to 2, use 3 if the address set to 3, and so on.

Connecting the Model 650 Optical Disk Drive

The following summary supplements the procedures outlined in your installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, “Setting Up Devices Using HP-UX Commands” for detailed information on this procedure.

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

HP C1701A Model 650GB Optical Disk Drive

3. *Locate the SCSI connector on the back of your computer.*

4. *Set the SCSI bus address on your device.*

Note

Familiarize yourself with the SCSI addresses that are currently in use on your system. Determine the SCSI address(es) that are available. Use the worksheet at the end of this book to note already-used addresses.

You are limited to seven devices per SCSI interface, bus addresses 0 through 6. Address 7 is reserved for the system's SCSI controller.

4

- a. Choose an available SCSI bus address and make note of it.
 - b. Follow the procedures in the hardware installation documentation that came with the device for setting the SCSI bus address.
5. *Ensure all power switches on the device and on the computer are in the OFF position.*
6. *Connect the disk drive to your computer.*

Connect your device to your computer following the instructions in the installation documentation for the device.

The SCSI bus length is limited to a maximum of six meters. This length includes the cable length between devices and the internal bus length for each device on the bus. Available SCSI cables and terminators are included in the "SCSI Device Guidelines" section of Chapter 1.

The HP C1701A/C optical disk drive has an internal bus length of 0.3 meters.

HP C1701A Model 650GB Optical Disk Drive

7. *Connect the power cord to your device.*
8. *Turn on the disk drive.* Do NOT turn on the power to the computer before the disk drive.

Caution If you are using the Model 650 as a boot device, insert the optical disk *before* the system is powered up and do not remove it until after the system is powered down.

9. *Plug in and power on the computer.*

Hardware installation complete! If you are using SAM, complete the software set up portion of this procedures by following the instructions in Chapter 5, “Setting Up HP-UX for Disk and Tape Drives Using SAM”. If you are using the commands method to install this device, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands”

Note Since optical media is removable, *do not* use the media as part of your automatically-mounted file systems (that is, do not add this disk drive to `/etc/checklist`).

Mass Storage Systems

The Series 6000 Mass Storage systems are available with various combinations of SCSI devices as factory installed options or field upgrade kits. Refer to the *HP Series 6000 Mass Storage System Configuration Quick Reference Card* that came with your device for complete information on the options and upgrade kits available for your device.

HP C2213A and C2216T Mass Storage System

The HP C2213A and C2216T Mass Storage System contain a power supply, 5.25-inch hard disk drive, two open slots within the cabinet to install additional SCSI (Small Computer System Interface) devices and a 664 Mbyte disk. (The HP C2213A is also referred to as a Series 6000 Model 660S. Text in this section will refer to this product as the HP C2213A. The HP C2216T is also referred to as a Series 6000 Model 670SE. Text in this section will refer to this product as the HP C2216T.)

This Mass Storage System is shipped in a cabinet with two additional 5.25-inch slots available for additional SCSI devices.

HP C2460R/F Mass Storage System

The HP C2460R Mass Storage System contains a power supply, 3.5-inch hard disk drive, three full-height slots within the cabinet to install additional SCSI (Small Computer System Interface) devices and a 422 Mbyte disk. (The HP C2460R is also referred to as a Series 6000 Model 420R. Text in this section will refer to this product as the HP C2460R.)

The HP C2460F Mass Storage System is the same as the C2460R, except in a floor-standing model with seven shelves.

HP C2481A, C2482A and C2217T Mass Storage Systems

The HP C2481A/C2482A Mass Storage Systems contain a power supply, 5.25-inch hard disk drive, three full-height slots within the cabinet to install additional SCSI (Small Computer System Interface) devices, and a 677 Mbyte disk drive or 1300 Mbyte disk drive respectively. (The HP C2481A/C2482A are also referred to as a Series 6000 Models 670SX and 1350SX respectively. Text in this section will refer to these products as the HP C2481A and C2482A.)

The HP C2217T Mass Storage System is the same as the C2482A, except in a floor-standing tower model.

4

Before Installing This Device

Before you install this device:

- Have the hardware installation documentation that came with the device handy. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, "Introduction". It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If your system is configured as an HP-UX cluster, additional procedures may be necessary. The *Managing Clusters of HP 9000 Computers* manual, Chapter 12, "Adding Peripherals to a Cluster" provides this information.

Disks and tape drives may be added in a cluster environment to your client or server.

Mass Storage Systems

What You're Going To Do

The following table contains detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this detailed information. Complete the hardware installation as outlined in the following section, then refer to Chapter 5, "Setting Up HP-UX for Disk and Tape Drives Using SAM" for set up instructions using SAM.

If you are using commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in the following section. Once hardware installation is complete, use the information provided in this table to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 4-4. Example HP Mass Storage System Setup Information

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Interleave Factor	Minor Number ²
disk drive	/dev/dsk/#s0	b	7	scsi	1	0x201 n00
disk drive	/dev/rdisk/#s0	c	47	scsi	1	0x201 n00
optical disk	/dev/dsk/#s0	b	7	scsi	1	0x201 n00
optical disk	/dev/rdisk/#s0	c	47	scsi	1	0x201 n00
DDS-format drive, no rewind	/dev/rmt/0mn	c	121	scsitape	-	0x201 n07
DDS-format drive, rewind	/dev/rmt/0m	c	121	scsitape	-	0x201 n06
CD-ROM	/dev/dsk/#s0	b	7	scsi	-	0x201 n00
CD-ROM	/dev/rdisk/#s0	c	47	scsi	-	0x201 n00

1 Replace the # with any unique number, using the same number in both the /dev/dsk and /dev/rdisk. SAM uses a longer naming convention that maps more closely to the hardware address of your device. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for details.

2 n is a number that identifies the bus address. Replace n with a 2 if the bus address was set to 2, use 3 if the address set to 3, and so on.

4-20 Installing Disk and Tape Drives

Connecting the Mass Storage System

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, “Setting Up Devices Using HP-UX Commands” for detailed information on this procedure.

Mass Storage Systems

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

3. *Locate the SCSI connector on the back of your computer.*

4. *Set the SCSI bus address(es) on your device(s).*

Note

Familiarize yourself with the SCSI addresses that are currently in use on your system. Determine the SCSI address(es) that are available. Use the worksheet at the end of this book to note already-used addresses.

You are limited to seven devices per SCSI interface, bus addresses 0 through 6. Address 7 is reserved for the system's SCSI controller.

- a. Set the hard disk SCSI bus address(es).

- Choose an available SCSI bus address and make note of it.
- Set the SCSI bus address according to the instructions in the hardware installation documentation provided with the device.

Note

For optimum disk performance, your system disk should be set to SCSI address 6. The SCSI interface gives highest priority to the highest address (6) and priority decreases as you work back towards zero (0).

- b. Set the SCSI bus address of any additional SCSI devices that are part of your Mass Storage system. For example, the CD-ROM, DDS-format tape drive, and/or the optical disk drive. Setting the SCSI address of other devices supported in the Mass Storage System is described in the *HP Series 6000 Mass Storage Systems Owner's Manual* specific to your model of Mass Storage System.

4-22 Installing Disk and Tape Drives

5. *Ensure all power switches on the device and on the computer are in the OFF position.*

6. *Connect the Mass Storage System to your computer.*

Connect the mass storage device to your computer following the instructions outlined in the hardware installation manual provided with the device.

The SCSI bus length is limited to a maximum of six meters. This length includes the cable length between devices and the internal bus length for each device on the bus. Available SCSI cables and terminators are included in the “SCSI Device Guidelines” section of Chapter 1.

Check your hardware installation documentation for internal SCSI cable lengths on each device.

7. *Connect the power cord to the device.*
8. *Turn on the power to the Mass Storage System.*

Do NOT turn on the power to the computer before you power on the Mass Storage System.

Note	Apparent disk drive self test failure will occur when only computer power is off. When computer power is added, the self test failure should clear. If you are concerned about the apparent self test failure, disconnect both SCSI connectors from the Mass Storage System and observe the self test completion.
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9. *Plug in and power on the computer.*

Hardware installation complete! If you are using SAM, complete the software set up portion of this procedures by following the instructions in Chapter 5, “Setting Up HP-UX for Disk and Tape Drives Using SAM”. If you are using the commands method to install this device, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands”

HP 2425/2427JK Disk Arrays

The HP Series 6000 Disk Array products, HP part numbers C2427JK and C2427JK, are mass storage devices consisting of multiple disks under the command of a single array controller. The disk array is connected as a single device on the host's SCSI differential interface.

Your disk array product is installed and configured very differently from other disk drive products. Refer to the *HP Series 6000 Mass Storage Systems Disk Array Utilities Manual* part number 5961-0714, and the *HP Series 6000 Disk Array User's Manual* part number 5961-0722, for specific instructions on setting up and operating your disk array.

HP C3034T/35T/36T Mass Storage Devices

The HP C3034T Mass Storage device contains a power supply and two 5.25-inch SCSI hard disk drives, each having a two Gbyte capacity. The C3035 and C3036 Mass Storage devices each contain a power supply. The C3035 contains four, 3.5-inch SCSI hard disk drives, each having a one Gbyte capacity. The C3036T contains seven, 3.5-inch SCSI hard disk drives, each with a one Gbyte capacity. These device are in a floor-standing tower.

Note

These devices will attach to your system via a built-in wide differential interface (also called a 16-bit SCSI differential interface) available on some Series 700 models. This connectivity is not available at release introduction. Check your *Owner's Guide* for the Series 700 system you have for connectivity information.

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Before Installing This Device

Before you install this device:

- Have the hardware installation documentation that came with the device handy. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, "Introduction". It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the **wall** or **cwall** command to do this.

Caution

If your system is configured as an HP-UX cluster, additional procedures may be necessary. The *Managing Clusters of HP 9000 Computers* manual, Chapter 12, "Adding Peripherals to a Cluster" provides this information.

Disks and tape drives may be added in a cluster environment to your client or server.

HP C3034T/35T/36T Mass Storage Devices

What You're Going To Do

The following table contains detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this detailed information. Complete the hardware installation as outlined in the following section, then refer to Chapter 5, "Setting Up HP-UX for Disk and Tape Drives Using SAM" for set up instructions using SAM.

If you are using commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in the following section. Once hardware installation is complete, use the information provided in this table to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 4-5.
Example HP Wide Differential Mass Storage System Setup
Information

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Interleave Factor	Minor Number ²
disk drive	/dev/dsk/#s0	b	7	scsi	1	0x207n00
disk drive	/dev/rdisk/#s0	c	47	scsi	1	0x207n00

¹ Replace the # with any unique number, using the same number in both the /dev/dsk and /dev/rdisk. SAM uses a longer naming convention that maps more closely to the hardware address of your device. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for details.

² n is a number that identifies the bus address. Replace n with the hexadecimal representation of the bus address. Bus addresses 0 through 6 and 8 through 15 are available on wide differential SCSI devices. Therefore, if the bus address is set to 3, use 3, if the address was set to 15, use f.

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Connecting the Mass Storage System

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

HP C3034T/35T/36T Mass Storage Devices

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

3. *Locate the SCSI connector on the back of your computer.*

4. *Set the SCSI bus address(es) on your device(s).*

Note

Familiarize yourself with the SCSI addresses that are currently in use on your system. Determine the SCSI address(es) that are available. Use the worksheet at the end of this book to note already-used addresses.

For these devices you are limited to 15 devices per wide differential SCSI interface, bus addresses 0 through 6 and 8 through 15. Address 7 is reserved for the system's SCSI controller.

- Set the hard disk SCSI bus address(es).
 - Choose an available SCSI bus address and make note of it.
 - Set the SCSI bus address according to the instructions in the hardware installation documentation provided with the device.

5. *Ensure all power switches on the device and on the computer are in the OFF position.*
6. *Connect the Mass Storage System to your computer.*

Connect the mass storage device to your computer following the instructions outlined in the hardware installation manual provided with the device.

The SCSI bus length is limited to a maximum of six meters. This length includes the cable length between devices and the internal bus length for each device on the bus. Available SCSI cables and terminators are included in the “SCSI Device Guidelines” section of Chapter 1.

Check your hardware installation documentation for internal SCSI cable lengths on each device.

7. *Connect the power cord to the device.*
8. *Turn on the power to the Mass Storage System.*

Do NOT turn on the power to the computer before you power on the Mass Storage System.

Note	Apparent disk drive self test failure will occur when only computer power is off. When computer power is added, the self test failure should clear. If you are concerned about the apparent self test failure, disconnect both SCSI connectors from the Mass Storage System and observe the self test completion.
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9. *Plug in and power on the computer.*

Hardware installation complete! If you are using SAM, complete the software set up portion of this procedures by following the instructions in Chapter 5, “Setting Up HP-UX for Disk and Tape Drives Using SAM”. If you are using the commands method to install this device, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands”

HP 9144A/45A Tape Drive

The HP 9144A/45A Tape Drives use 1/4 inch tape cartridges. Two formatted storage capacities are available using the 88140SC (a package of 5, 150 ft. cartridge tapes, each 16.7 megabyte) or the 88140LC (a package of 5, 600 ft. cartridge tapes, each 67.0 megabyte) cartridges. The tape drive provides read-after-write capability for data verification as well as data-recovery and auto-sparing, and it is compatible with existing 1/4 inch cartridges built into other HP mass storage devices.

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The HP 9144A tape drive can read and write to 16 track tape only. The HP 9145A tape drive reads 16 track tape and can read and write to 32 track tape.

The 9144A/45A tape drives connect to your computer via the optional EISA HP-IB interface.

Before Installing This Device

Before you install this device:

- Have the hardware installation documentation that came with the device handy. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, "Introduction". It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If your system is configured as an HP-UX cluster, additional procedures may be necessary. The *Managing Clusters of HP 9000 Computers* manual, Chapter 12, "Adding Peripherals to a Cluster" provides this information.

Disks and tape drives may be added in a cluster environment to your client or server.

What You're Going To Do

The following table contains detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this detailed information. Complete the hardware installation as outlined in the following section, then refer to Chapter 5, "Setting Up HP-UX for Disk and Tape Drives Using SAM" for set up instructions using SAM.

If you are using commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in the following section. Once the hardware installation is complete, use the information provided in this table to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 4-6. HP 9144A/45A Setup Information

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Minor Number ²
HP 9144A/45A	/dev/rct/#s0	c	4	cs80 ³	0x4e0n00

1 # is a number that identifies the device (for example, 1 for the first tape device installed. Replace # with any unique number.

2 e is the EISA slot number. n is a number that identifies the bus address (set in step 4 of the installation procedure). Replace n with a 2 if the address is set to 2, use 3 if the address is set to 3, and so on.

3 To use the cs80 driver, you must also ensure that the hshpib driver is part of the kernel configuration.

HP 9144A/45A Tape Drive

Connecting Your Tape Drive

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, “Setting Up Devices Using HP-UX Commands” for detailed information on this procedure.

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

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3. *Locate the HP-IB interface on your computer.*

Note Do not install HP-IB tape drives on the same interface as the root device (main disk drive). Doing so can degrade your disk driver's performance.

4. *Set the HP-IB bus address.*

Note Familiarize yourself with the HP-IB addresses that are currently in use on your system. Determine the available HP-IB address(es). Use the worksheet at the end of this book to note already-used addresses.

You are limited to eight devices per HP-IB card, addresses 0 through 7.

- a. Choose an available HP-IB bus address and make note of it.
- b. Set the HP-IB bus address according to the instructions in the hardware installation documentation provided with the device.

5. *Ensure all power switches on the device and on the computer are in the OFF position.*

6. *Connect the tape drive to your computer.*

Connect the device to your computer following the instructions given in the hardware installation manual for the device.

7. *Connect the power cord.*

8. *Turn on the device.*

9. *Plug in and power on the computer.*

Hardware installation complete! If you are using SAM, complete the software set up portion of this procedure by following the instructions in Chapter 5, "Setting Up HP-UX for Disk and Tape Drives Using SAM". If you are using the commands method to install this device, refer to Chapter 11, "Setting Up Devices Using HP-UX Commands"

HP 7980S/SX Tape Drives

The HP 7980S is a SCSI 125 ips 1/2-inch 9-track open-reel tape drive which supports 1600 Phase Encoded (PE) format and 6250 Group Coded Recording (GCR) format.

The HP 7980SX is the same as the 7980S, with the added feature of being able to read and write in compressed format.

There is an orderable option (option 800) to both of these products to support 800 bpi Non-Return to Zero Inverted (NRZI) format.

Before Installing This Device

Note	Arrange to have your HP Customer Engineer install your tape drive. The installation cost is included in the purchase price of the unit.
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Before you have this device installed:

- Have the hardware installation documentation that came with the device handy.
- If you have not added this type of device to your system before, read the material in Chapter 1, "Introduction". It provides interface and cabling guidelines to follow when adding devices to your system.

- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution If your system is configured as an HP-UX cluster, additional procedures may be necessary. The *Managing Clusters of HP 9000 Computers* manual, Chapter 12, “Adding Peripherals to a Cluster” provides this information.

Disks and tape drives may be added in a cluster environment to your client or server.

What You're Going To Do

Your HP Customer Engineer will unpack and install your tape drive, following these general procedures.

Caution Do not attempt to operate the unit until your HP Customer Engineer has installed the unit for you.

The following tables contain detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this detailed information. Have the hardware installation completed as outlined in the following section, then refer to Chapter 5, “Setting Up HP-UX for Disk and Tape Drives Using SAM” for set up instructions using SAM.

HP 7979S and 7980S/SX Tape Drives

If you are using commands to set up HP-UX to communicate with your device, have the hardware installation completed as outlined in the following section. Once the hardware installation is complete, use the information provided in these tables to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 4-7.
HP 7980S Tape Drive
Connected to a SCSI Disk Interface

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Minor Number ²
HP 7980S, 6250 bpi, Berkeley, no rewind	/dev/rmt/#hn	c	121	scsitape	0x201n0b
HP 7980S, 6250 bpi, Berkeley, autorewind	/dev/rmt/#h	c	121	scsitape	0x201n0a
HP 7980S, 6250 bpi, AT&T, no rewind	/dev/rmt/#hn	c	121	scsitape	0x201n09
HP 7980S, 6250 bpi, AT&T, autorewind	/dev/rmt/#h	c	121	scsitape	0x201n08
HP 7980S, 1600 bpi, Berkeley, no rewind	/dev/rmt/#mn	c	121	scsitape	0x201n07
HP 7980S, 1600 bpi, Berkeley, autorewind	/dev/rmt/#m	c	121	scsitape	0x201n06
HP 7980S, 1600 bpi, AT&T, no rewind	/dev/rmt/#mn	c	121	scsitape	0x201n05
HP 7980S, 1600 bpi, AT&T, autorewind	/dev/rmt/#m	c	121	scsitape	0x201n04

¹ # is a number that identifies the magnetic tape drive. Replace # with any unique number (e.g., /dev/rmt/0m for the first mag tape).

² n is a number that identifies the SCSI bus address. Replace n with a 0 if the address was set to 0, use 2 if the address was set to 2, and so on.

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HP 7979S and 7980S/SX Tape Drives

Table 4-8.
HP 7980SX Tape Drive
Connected to a SCSI Disk Interface

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Minor Number ²
HP 7980SX, 6250 bpi, Berkeley, no rewind, compressed	/dev/rmt/#hcn	c	121	scsitape	0x201n0f
HP 7980SX, 6250 bpi, Berkeley, autorewind, compressed	/dev/rmt/#hc	c	121	scsitape	0x201n0e
HP 7980SX, 6250 bpi, AT&T, no rewind, compressed	/dev/rmt/#hcn	c	121	scsitape	0x201n0d
HP 7980SX, 6250 bpi, AT&T, autorewind, compressed	/dev/rmt/#hc	c	121	scsitape	0x201n0c

1 # is a number that identifies the magnetic tape drive. Replace # with any unique number

2 n is a number that identifies the SCSI bus address. Replace n with a 0 if the address was set to 0, use 2 if the address was set to 2, and so on.

HP 7979S and 7980S/SX Tape Drives

Connecting Your Tape Drive

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

2. *Play it safe.*
 - a. Shut down and halt the system using the `/etc/shutdown -h` command.
If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.
 - b. TURN OFF the computer and unplug the power cord.
3. *Locate the SCSI connector on the back of your computer.*
4. *Connect the power cord to the device.*
5. *Turn ON the tape drive.*
6. *Set the SCSI bus address on your device.*

Note	Familiarize yourself with the SCSI addresses that are currently in use on your system. Determine the SCSI address(es) that are available. Use the worksheet at the end of this book to note already-used addresses. You are limited to seven devices per SCSI interface, bus addresses 0 through 6. Address 7 is reserved for the system's SCSI controller.
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- a. Choose an available SCSI bus address and make note of it.
- b. Set the SCSI bus address according to the instructions in the hardware installation documentation provided with the device.

HP 7979S and 7980S/SX Tape Drives

7. *Ensure all power switches on the device and on the computer are in the OFF position.*
8. *Connect the tape drive to the computer.*

Connect the device to the computer following the instructions provided in the hardware installation documentation for the device.

The SCSI bus length is limited to a maximum of six meters. This length includes the cable length between devices and the internal bus length for each device on the bus. Available SCSI cables and terminators are included in the “SCSI Device Guidelines” section of Chapter 1.

The HP 7980S/SX SCSI tape drives have internal bus lengths of 0 meters.

Hardware installation complete! If you are using SAM, complete the software set up portion of this procedures by following the instructions in Chapter 5, “Setting Up HP-UX for Disk and Tape Drives Using SAM”. If you are using the commands method to install this device, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands”

HP C1512A Model 1300S SCSI DDS-Format Tape Drive

The HP C1512A Model 1300S is a tape drive that stores data in a format called Digital Data Storage (DDS) on cassettes that can each hold up to 1.3 gigabytes (1300 megabytes) of data. It is a standalone drive and uses a SCSI (Small Computer System Interface) interface. The Model 1300S is a high-capacity, medium transfer-rate device for offline data storage on tape. It is a streaming tape that has a fast search capability.

Note	Use only HP labeled DDS media in HP DDS-format tape drives. A box of five (60m) HP labeled DDS-format tapes is available, HP part number 92283A. Use only 60 meter tapes on this drive. Full height (5 1/2-inch) DDS-format tape drives cannot read or write to 90 meter cassettes.
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Before Installing This Device

Before you install this device:

- Have the hardware installation documentation that came with the device handy. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, “Introduction”. It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the **wall** or **cwall** command to do this.

Caution	If your system is configured as an HP-UX cluster, additional procedures may be necessary. The <i>Managing Clusters of HP 9000 Computers</i> manual, Chapter 12, “Adding Peripherals to a Cluster” provides this information.
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Disks and tape drives may be added in a cluster environment to your client or server.

C1512A SCSI DDS-Format Tape Drive

What You're Going To Do

The following table contains detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this detailed information. Complete the hardware installation as outlined in the following section, then refer to Chapter 5, "Setting Up HP-UX for Disk and Tape Drives Using SAM" for set up instructions using SAM.

If you are using commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in the following section. Once hardware installation is complete, use the information provided in this table to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 4-9. C1512A SCSI DDS-Format Drive

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Minor Number ²
HP C1512A SCSI DDS, no rewind	/dev/rmt/0mn	c	121	scsitape	0x201 n07
HP C1512A SCSI DDS, rewind	/dev/rmt/0m	c	121	scsitape	0x201 n06

1 # is a number that identifies the device. Replace # with any unique number.

2 n is a number that identifies the bus address. Replace n with a 2 if the bus address was set to 2, use 3 if the address set to 3, and so on.

Connecting Your Tape Drive

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

C1512A SCSI DDS-Format Tape Drive

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

3. *Locate the SCSI connector on the back of your computer.*

4. *Set the SCSI bus address on your device.*

Note

Familiarize yourself with the SCSI addresses that are currently in use on your system. Determine the SCSI address(es) that are available. Use the worksheet at the end of this book to note already-used addresses.

You are limited to seven devices per SCSI interface, bus addresses 0 through 6. Address 7 is reserved for the system's SCSI controller.

- a. Choose an available SCSI bus address and make note of it.

- b. Set the SCSI bus address according to the instructions in the hardware installation documentation provided with the device.

5. *Set the Parity (P) switch to on (1).*

6. *Ensure all power switches on the device and on the computer are in the OFF position.*

C1512A SCSI DDS-Format Tape Drive

7. *Connect the tape drive to your computer.*

Connect your device to your computer following the instructions in the hardware installation manual for the device.

The HP C1512A DDS-Format drive has an internal bus length of .55 meters.

The SCSI bus length is limited to a maximum of six meters. This length includes the cable length between devices and the internal bus length for each device on the bus. Available SCSI cables and terminators are included in the “SCSI Device Guidelines” section of Chapter 1.

8. *Turn on the drive.*

9. *Insert tape.*

Note	You must insert the tape <i>before</i> turning on the computer. If the DDS-format drive is found on the bus before the root disk during the automatic boot sequence, and no tape is inserted, the system will wait for you to insert a tape.
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10. *Plug in and power on the computer.*

Hardware installation complete! If you are using SAM, complete the software set up portion of this procedures by following the instructions in Chapter 5, “Setting Up HP-UX for Disk and Tape Drives Using SAM”. If you are using the commands method to install this device, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands”

HP C1520A/C1521A HP Series 6400 SCSI DDS-Format Tape Drives

The HP C1520A Digital Audio Tape (DAT) drive is a streaming tape drive that stores data in a format called Digital Data Storage (DDS). It is a high-capacity, medium transfer-rate standalone tape drive that uses a SCSI (Small Computer System Interface) interface. The C1520B has a fast search capability and can read data compressed tapes.

The HP C1521A is the same as the HP C1520A except that it can both read and store data in a data compressed DDS format.

A sixty meter (60m) DDS cassettes can hold up to 1.3 gigabytes (1300 megabytes) of uncompressed data. In compressed mode, a 60m DDS cassette can hold approximately 5.2 gigabytes (5200 megabytes) of data. A ninety meter (90m) DDS cassettes can hold up to 2.0 gigabytes (2000 megabytes) of uncompressed data. In compressed mode, a 90m DDS cassette can hold approximately 8.0 gigabytes (8000 megabytes) of data.

Note

- Data storage rate and capacity, especially in compressed mode, is dependent upon the computer's capacity to keep up with the device and the type of data being stored.
 - Use only HP labeled DDS-format tapes in HP DDS-format tape drives. HP 92283A contains five (60m) HP labeled DDS-format tapes; and HP 92283B contains five (90m) HP labeled DDS-format tapes.
-

Before Installing This Device

Before you install this device:

- Have the hardware installation documentation that came with the device handy. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, "Introduction". It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If your system is configured as an HP-UX cluster, additional procedures may be necessary. The *Managing Clusters of HP 9000 Computers* manual, Chapter 12, "Adding Peripherals to a Cluster" provides this information.

Disks and tape drives may be added in a cluster environment to your client or server.

C1520A/C1521A SCSI DDS-Format Tape Drives

What You're Going To Do

The following table contains detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this detailed information. Complete the hardware installation as outlined in the following section, then refer to Chapter 5, "Setting Up HP-UX for Disk and Tape Drives Using SAM" for set up instructions using SAM.

If you are using commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in the following section. Once hardware installation is complete, use the information provided in this table to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 4-10. C1520A SCSI DDS-Format Tape Drive

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Minor Number ²
HP C1520A SCSI DDS, standard density, partition 0, Berkeley close, autorewind	/dev/rmt/#m	c	121	scsitape	0x201n42
HP C1520A SCSI DDS, standard density, partition 0, Berkeley close, no rewind	/dev/rmt/#mn	c	121	scsitape	0x201n43

¹ # is a number that identifies the device. Replace # with any unique number.

² n is a number that identifies the bus address. Replace n with a 2 if the bus address was set to 2, use 3 if the address set to 3, and so on.

C1520A/C1521A SCSI DDS-Format Tape Drives

Table 4-11. C1521A SCSI DDS-Format Tape Drive

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Minor Number ²
HP C1521A SCSI DDS, uncompressed, partition 1, Berkeley close, autorewind	/dev/rmt/#m	c	121	scsitape	0x201n52
HP C1521A SCSI DDS, uncompressed, partition 1, Berkeley close, no rewind	/dev/rmt/#mn	c	121	scsitape	0x201n53
HP C1521A SCSI DDS, compressed, partition 1, Berkeley close, autorewind	/dev/rmt/#c	c	121	scsitape	0x201nd2
HP C1521A SCSI DDS, compressed, partition 1, Berkeley close, no rewind	/dev/rmt/#cn	c	121	scsitape	0x201nd3
HP C1521A SCSI DDS, uncompressed, partition 0, AT&T close, no rewind	/dev/rmt/#mn	c	121	scsitape	0x201n41
HP C1521A SCSI DDS, uncompressed, partition 1, AT&T close, no rewind	/dev/rmt/#mn	c	121	scsitape	0x201n51
HP C1521A SCSI DDS, compressed, partition 0, AT&T close, no rewind	/dev/rmt/#cn	c	121	scsitape	0x201nc1
HP C1521A SCSI DDS, compressed, partition 1, AT&T close, no rewind	/dev/rmt/#cn	c	121	scsitape	0x201nd1

¹ # is a number that identifies the device. Replace # with any unique number.

² n is a number that identifies the bus address. Replace n with a 2 if the bus address was set to 2, use 3 if the address set to 3, and so on.

C1520A/C1521A SCSI DDS-Format Tape Drives

Connecting Your Tape Drive

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

C1520A/C1521A SCSI DDS-Format Tape Drives

2. *Play it safe.*
 - a. Shut down and halt the system using the `/etc/shutdown -h` command.
If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.
 - b. TURN OFF the computer and unplug the power cord.
3. *Locate the SCSI connector on the back of your computer.*
4. *Set the SCSI bus address on your device.*

Note Familiarize yourself with the SCSI addresses that are currently in use on your system. Determine the SCSI address(es) that are available. Use the worksheet at the end of this book to note already-used addresses.

You are limited to seven devices per SCSI interface, bus addresses 0 through 6. Address 7 is reserved for the system's SCSI controller.

- a. Choose an available SCSI bus address and make note of it.
 - b. Set the SCSI bus address according to the instructions in the hardware installation documentation provided with the device.
5. *Ensure all power switches on the device and on the computer are in the OFF position.*



6. *Connect the tape drive to your computer.*

Connect your device to your computer following the instructions in the hardware installation manual for the device.

The HP C1520A DDS-Format drive has an internal bus length of .14 meters. The HP C1521A DDS-Format drive has an internal bus length of .14 meters.

The SCSI bus length is limited to a maximum of six meters. This length includes the cable length between devices and the internal bus length for each device on the bus. Available SCSI cables and terminators are included in the “SCSI Device Guidelines” section of Chapter 1.

7. *Turn on the drive.*

8. *Insert tape.*

Note

You must insert the tape *before* turning on the computer. If the DDS-format drive is found on the bus before the root disk during the automatic boot sequence, and no tape is inserted, the system will wait for you to insert a tape.

9. *Plug in and power on the computer.*

Hardware installation complete! If you are using SAM, complete the software set up portion of this procedures by following the instructions in Chapter 5, “Setting Up HP-UX for Disk and Tape Drives Using SAM”. If you are using the commands method to install this device, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands”

Setting Up HP-UX for Disk and Tape Drives Using SAM

Introduction

This chapter discusses setting up HP-UX to communicate with your disk drive. Setting up HP-UX for a disk drive consists of:

- creating the device file or verifying the correct device file already exists for communication with the device.
- ensuring the appropriate HP-UX device driver is part of the current kernel configuration.

There are two methods for setting up HP-UX:

- SAM method
- HP-UX Commands method

This chapter focuses on the SAM method to set up HP-UX for disk drives.

Note	SAM does not support setting up HP-UX to communicate with tape drives.
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Refer to Chapter 11, “Setting Up Devices Using HP-UX Commands” for a description of the HP-UX commands method if:

- you do not have SAM resident on your system.
- you are setting up HP-UX to communicate with a tape drive.

Setting Up HP-UX for a Disk Drive

Before you begin:

Make sure that you know how you intend to use this disk:

- For file storage only
- For swap space only
- For both file storage and swap space

Also, make a note of the disk drive model and its hardware address (select code and bus address).

To set up HP-UX for your disk drive:

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1. Log on as root.
2. Run SAM:

```
$ /usr/bin/sam
```
3. Highlight **Disks and File Systems->** and activate **Open**.
4. Highlight **CD-ROM, Floppy, and Hard Disks** or **Magneto-optical Disks** and activate **Open**.
5. From the “Actions” menubar title in the “Disk and File System Manager” window, highlight and choose **Add a Hard Disk Drive...**
6. Within the “Add a Hard Disk Drive” window, highlight and choose **Select disk to add**.
7. Within the “Select disk to add” window, highlight the disk you wish to add. You can identify it by its model number, select code and bus address. Activate **OK**.
8. Within the “Add a Hard Disk Drive” window, highlight and choose **Set disk usage and options**.

5-2 Setting Up HP-UX for Disk and Tape Drives Using SAM

Setting Up HP-UX for Disk and Tape Drives Using SAM

9. Within the “Set disk usage and options” window:
 - a. Activate the highlighted menu button. Highlight and choose the disk usage you prefer (**File System**, **Swap**, or **File System and Swap**).
 - b. In the “Mount Directory;” field, type in the name of the directory that will be the mount point for the file system on this disk. Press **Return**.
 - c. You may receive an advisory message at this point. Read any such message carefully before activating **Yes** or **No**.

If you choose **No**, repeat the previous step by typing in a different directory name.
 - d. Turn on the checkbox labeled “Create a new file system.”
 - e. Several checkbox options appear below “Create a new file system.” Turn on or off any of these checkbox options as required by your new filesystem.
 - f. Activate **OK**.
10. You may need to change certain options, such as when to mount the disk and how its access permissions are set. If so, within the “Add a Hard Disk Drive” window, highlight and activate **Modify Defaults**, then within the dialog box, turn on the checkboxes that apply.
11. Within the “Add a Hard Disk Drive” window, highlight and activate **OK**.
12. A “Messages” Box appears, reporting the progress of the task. When the task is finished, activate **OK**.
13. Exit SAM by returning to the “System Administration Manager” window and activating **Exit SAM**.

Setting Up HP-UX for a Tape Drive

Before you begin:

Make a note of the tape drive model and its hardware address (select code and bus address).

To set up HP-UX for your tape drive:

1. Log on as root.
2. Run SAM:

```
$ /usr/bin/sam
```
3. Highlight **Peripheral Devices->** and activate **(Open)**.
4. Highlight **Tape Drives** and activate **(Open)**.
5. From the “Actions” menubar title in the “Tape Drive Manager” window, highlight and choose **Add...**
6. Within the “Add a Tape Drive” window, read the instructions, then activate **(OK)**.
7. SAM may detect that you HP-UX kernel lacks the drivers necessary to make use of the tape drive. If so, within the “Device Driver Check” window, read the messages and choose the appropriate action.

If **Build a new kernel and shut down the system immediately.** is your choice, SAM will create the kernel you need and reboot your computer. The rebooted system will be able to use the tape drive.
8. If you had to shutdown your system in order to physically connect the tape drive, re-enter SAM and repeat steps 3 through 6 above.
9. Highlight the new tape drive. You can identify it by its model number, select code and bus address.
10. From the “Actions” menubar, highlight and choose **Create Device Files**.
11. Activate **(OK)** and exit SAM.

5-4 Setting Up HP-UX for Disk and Tape Drives Using SAM

Installing Printers

Introduction

This chapter contains installation instructions for the following printers:

- HP 33471A LaserJet-IIP Printer
- HP 33449A *LaserJet Series III* Printer
- HP 33459A *LaserJet Series IIID* Printer
- HP 3630A PaintJet Printer
- HP C1602A PaintJet XL Printer
- HP C1645A PaintJet XL 300 Printer
- HP C2113A PaintJet XL 300 Printer
- HP 2563/64/66/67C Impact Printers

HP 33471A LaserJet-IIP Printer

The HP 33471A LaserJet-IIP printer connects to your computer via an RS-232-C (serial) or parallel interface.

The LaserJet-IIP printer supports network based printing via a LAN interface card installed in the printer. Detailed installation instructions are provided with the interface card.

Before Installing This Device

Before you install this device:

- Refer to your printer manual(s) for instructions on unpacking and preparing your printer for installation. Keep this documentation at hand. You will need to refer to it during this procedure.

Note	Your printer may be preconfigured at the factory to operate in parallel mode. If you intend to connect the printer to a serial interface, you will need to reconfigure the printer for serial operation mode. See your printer's documentation for details.
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- If you have not added this type of device to your system before, read the material in Chapter 1, "Introduction". It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system, you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution	If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks.
	For more information about adding devices to a system configured as an HP-UX cluster, refer to <i>Managing Clusters of HP 9000 Computers</i> , Chapter 12, "Adding Peripherals to a Cluster".

What You're Going To Do

The following tables contain detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this detailed information. Complete the hardware installation as outlined in the following section, then refer to Chapter 7, "Setting Up HP-UX for Printers Using SAM" for set up instructions.

If you are using commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in the following section. Once the hardware installation is complete, use the information provided in these tables to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 6-1.
HP 33471A LaserJet-IIP Printer Connected to an RS-232-C
(serial) Interface

Device Name	Path Name	File Type	Major Number	Driver Name	Function Number	Minor Number
HP 33471A <i>LaserJet-IIP</i>	/dev/ptr_rs232_a ¹	c	1	asio0	4 ²	0x204004
HP 33471A <i>LaserJet-IIP</i>	/dev/lp33471A	c	1	asio0	4 ²	0x204004
HP 33471A <i>LaserJet-IIP</i>	/dev/ptr_rs232_b ¹	c	1	asio0	5 ³	0x205004
HP 33471A <i>LaserJet-IIP</i>	/dev/lp33471A	c	1	asio0	5 ³	0x205004

¹ This device file is shipped with your system.

² Built in RS-232-C interface port a (0).

³ Built in RS-232-C interface port b (1).

HP 33471A LaserJet-IIP Printers

Table 6-2.
HP 33471A LaserJet-IIP Printer Connected to Built-in Parallel Interface

Device Name	Path Name	File Type	Major Number	Driver Name	Function Number	Minor Number
HP 33471A <i>LaserJet-IIP</i>	/dev/ptr_parallel ¹	c	11	parallel	6 ²	0x206002
HP 33471A <i>LaserJet-IIP</i>	/dev/ptr33471A	c	11	parallel	6 ²	0x206002

1 This device file is shipped with your system.

2 Built in parallel interface.

Note SAM uses the naming convention `lp_xxxx` for device files. If you want to use the device files shipped with your system (`ptr_parallel`) you can specify the shipped device file name on the SAM screen for adding a printer.

Connecting the Printer

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

HP 33471A LaserJet-IIP Printers

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

3. *Determine your interface.*

Table 6-3. Interface Options

Serial Interfaces ¹	Parallel Interfaces
Built-in Core I/O RS-232-C port A	Built-in PARALLEL
Built-in Core I/O RS-232-C port B	
E/ISA serial I/O interface card	

¹ If you have more than one serial port, make note of the address of the serial port you are using. You will need this information for testing and configuring your device.

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Caution

The HP 9000 Series 700 has both parallel and RS-232-C (serial) ports. Make sure you plug your cable into the correct port or you could damage your device. The built-in parallel interface is labeled PARALLEL.

4. *Ensure all power switches on the device and on the computer are in the OFF position.*

5. *Connect the printer to your computer.*

Connect the printer to your computer following the instructions provided in the hardware installation manual for the device.

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6. *Connect the power cord.*
7. *Turn on the device.*
8. *Plug in and power on the computer.*

Hardware installation complete! You can now proceed to the set up procedures in Chapter 7, “Setting Up HP-UX for Printers Using SAM”. If you are not using SAM, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands” for instructions on how to configure your system using commands.

If you intend to use your printer as a network-based printer, use the procedure entitled “Adding a Network-Based Printer Using SAM” in the next chapter.

HP 33449A LaserJet Series III
HP 33459A LaserJet Series IIID
HP 33491A LaserJet Series IIIsi Printers

The HP 33449A, HP 33459A and the HP 33491A LaserJet printers can be connected to your system via an RS-232-C (serial) or parallel interface. The HP 33459A printer can be connected to your system via a parallel interface only.

The LaserJet III, IIID, and IIIsi printers also support network based printing via a LAN interface card installed in the printer. Detailed installation instructions are provided with the interface card.

Before Installing This Device

Before you install this device:

- Refer to your printer manual(s) for instructions on unpacking and preparing your printer for installation. Keep this documentation at hand. You will need to refer to it during this procedure.

Note	Your printer may be preconfigured at the factory to operate in parallel mode. If you intend to connect the printer to a serial interface, you will need to reconfigure the printer for serial operation mode. See your printer's documentation for details.
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- If you have not added this type of device to your system before, read the material in Chapter 1, "Introduction". It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system, you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution	If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks. For more information about adding devices to a system configured as an HP-UX cluster, refer to <i>Managing Clusters of HP 9000 Computers</i>, Chapter 12, "Adding Peripherals to a Cluster".
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HP 33449A LaserJet III
HP 33459A LaserJet IIID
HP 33491A LaserJet IIIsi

What You’re Going To Do

The following tables contain detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this information. Complete the hardware installation as outlined in the following section, then refer to Chapter 7, “Setting Up HP-UX for Printers Using SAM” for set up instructions.

If you are using HP-UX commands to set up HP-UX to communicate with your printer, complete the hardware installation as outlined in the following section. Once the hardware installation is complete, use the information provided in these tables to complete the software set up as outlined in Chapter 11, “Setting Up Devices Using HP-UX Commands”.

Table 6-4.
HP LaserJet III/IIID/IIIsi Printers Connected to an RS-232-C Interface

Device Name	Path Name	File Type	Major Number	Driver Name	Function Number	Minor Number
HP LaserJet III's	/dev/ptr_rs232_a ¹	c	1	asio0	4 ²	0x204004
HP LaserJet III's	/dev/lp33449A ³	c	1	asio0	4 ²	0x204004
HP LaserJet III's	/dev/ptr_rs232_b ¹	c	1	asio0	5 ⁴	0x205004
HP LaserJet III's	/dev/lp33449A ³	c	1	asio0	5 ⁴	0x205004

- 1 This device file is shipped with your system.
- 2 Built in RS-232-C interface port a (0).
- 3 Substitute 33459 or 33491 for those models.
- 4 Built in RS-232-C interface port b (1).

HP 33449A LaserJet III
HP 33459A LaserJet IIID
HP 33491A LaserJet IIIsi

Table 6-5.
**HP 33449A/59A/91A LaserJet Printers Connected to Built-in
Parallel Interface**

Device Name	Path Name	File Type	Major Number	Driver Name	Function Number	Minor Number
HP LaserJet III's	/dev/ptr_parallel ¹	c	11	parallel	6 ²	0x206002
HP LaserJet III's	/dev/ptr33449A ³	c	11	parallel	6 ²	0x206002

1 This device file is shipped with your system.

2 Built in parallel interface.

3 Substitute 33459 or 33491 for those models.

Note	SAM uses the naming convention <code>lp_xxxx</code> for device files. If you want to use the device files shipped with your system (<code>ptr_parallel</code>) you can specify the shipped device file name on the SAM screen for adding a printer.
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HP 33449A LaserJet III
HP 33459A LaserJet IIID
HP 33491A LaserJet IIIsi

Connecting the Printer

The following summary supplements the procedures provided in your hardware installation documentation for this printer. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

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3. *Determine your interface.*

Table 6-6. Interface Options

Serial Interfaces (HP 33449A only) ¹	Parallel Interfaces
Built-in Core I/O RS-232-C port A	Built-in PARALLEL
Built-in Core I/O RS-232-C port B	
E/ISA serial I/O interface card	

¹ If you have more than one serial port, make note of the address of the serial port you are using. You will need this information for testing and configuring your device.

Caution

HP 9000 Series 700 computers have both parallel and RS-232-C ports. Make sure you plug your cable into the correct port or you could damage your device. The built-in parallel interface is can be identified easily because it is labeled PARALLEL.

4. *Ensure all power switches on the device and on the computer are in the OFF position.*

5. *Connect the printer to your computer.*

Connect the printer to your computer following the instructions provided in the hardware installation manual for the device.

6. *Connect the power cord.*

7. *Turn on the device.*

8. *Plug in and power on the computer.*

Hardware installation complete! You can now proceed to the set up procedures in Chapter 7, "Setting Up HP-UX for Printers Using SAM". If you are not using SAM, refer to Chapter 11, "Setting Up Devices Using HP-UX Commands" for instructions on how to configure your system using commands.

If you intend to use your printer as a network-based printer, use the procedure entitled "Adding a Network-Based Printer Using SAM", in the next chapter.

HP 3630A PaintJet Printer

The HP 3630A PaintJet printer connects to your computer through a parallel, RS-232-C (serial), or HP-IB interface.

Before Installing This Device

Before you install this device:

- Refer to the manual(s) that came with your printer for instructions on unpacking and preparing your printer for installation. Keep this documentation at hand. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, “Introduction”. It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system, you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks.

For more information about adding devices to a system configured as an HP-UX cluster, refer to *Managing Clusters of HP 9000 Computers*, Chapter 12, “Adding Peripherals to a Cluster”.

What You're Going To Do

The following tables contain detailed HP-UX software set up information. If you use SAM to install your printer, you will not need all this information. Complete the hardware installation as outlined in the following section, then refer to Chapter 7, "Setting Up HP-UX for Printers Using SAM" for set up information.

If you use commands to set up HP-UX to communicate with your printer, complete the hardware installation as outlined in the following section. Once the hardware installation is complete, use the information provided in these tables to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 6-7.
HP 3630A PaintJet Printer Connected to an RS-232-C Interface

Device Name	Path Name	File Type	Major Number	Driver Name	Function Number	Minor Number
HP 3630A <i>PaintJet</i>	/dev/ptr_rs232_a ¹	c	1	asio0	4 ²	0x204004
HP 3630A <i>PaintJet</i>	/dev/lp3630A	c	1	asio0	4 ²	0x204004
HP 3630A <i>PaintJet</i>	/dev/ptr_rs232_b ¹	c	1	asio0	5 ³	0x205004
HP 3630A <i>PaintJet</i>	/dev/lp3630A	c	1	asio0	5 ³	0x205004

¹ This device file is shipped with your system.

² Built in RS-232-C interface port a (0).

³ Built in RS-232-C interface port b (1).

SAM uses the naming convention `lp_xxxx` for printer device files. If you want to use the device files shipped with your system (`ptr_rs232_a` or `ptr_rs232_b`) you can specify the shipped device file name on the SAM screen for adding a printer.

HP 3630A PaintJet Printer

Table 6-8.

HP 3630A PaintJet Printer Connected to Built-in Parallel Interface

Device Name	Path Name	File Type	Major Number	Driver Name	Function Number	Minor Number
HP 3630A <i>PaintJet</i>	/dev/ptr_parallel ¹	c	11	parallel	6 ²	0x206002
HP 3630A <i>PaintJet</i>	/dev/ptr3630A	c	11	parallel	6 ²	0x206002

1 This device file is shipped with your system.

2 Built in parallel interface.

Table 6-9.

HP 3630A PaintJet Printer Connected to HP-IB Card #25560A

Device Name	Path Name	File Type	Major Number	Driver Name	Function Number	Minor Number
HP 3630A <i>PaintJet</i>	/dev/ptr_hp-ib ¹	c	21	hpib	0	0x440x00 ²

1 This device file is shipped with your system.

2 Where **x** is the HP-IB bus address.

SAM uses the naming convention **lp_xxxx** for device files. If you want to use the device files shipped with your system (**ptr_parallel**) you can specify the shipped device file name on the SAM screen for adding a printer.

Connecting the Printer

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, “Setting Up Devices Using HP-UX Commands” for detailed information on this procedure.

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

HP 3630A PaintJet Printer

3. *Determine your interface.*

Table 6-10. Interface Options

Serial Interfaces ¹	HP-IB Interfaces	Parallel Interfaces
Built-in Core I/O RS-232-C port A	HP-IB Card No. 25560A	Built-in PARALLEL
Built-in Core I/O RS-232-C port B		
E/ISA serial I/O interface card		

¹ If you have more than one serial port, make note of the address of the serial port you are using. You will need this information for testing and configuring your device.

Caution The HP 9000 Series 700 has both parallel and RS-232-C ports. These ports frequently appear identical. The built-in parallel interface should be labeled PARALLEL. Make sure you plug your cable into the correct port or you could damage your device.

6

4. *Ensure all power switches on the device and on the computer are in the OFF position.*
5. *Connect the printer to your computer.*

Connect the printer to your computer following the instructions provided in the hardware installation manual for the device.
6. *Connect the power cord.*
7. *Turn on the device.*
8. *Plug in and power on the computer.*

Hardware installation complete! You can now proceed to the set up procedures in Chapter 7, "Setting Up HP-UX for Printers Using SAM". If you are not using SAM, refer to Chapter 11, "Setting Up Devices Using HP-UX Commands" for instructions on how to configure your system using commands.

HP C1602A PaintJet XL

HP C1645A PaintJet XL 300

HP C2113A PaintJet XL 300 Printers

The HP C1602A PaintJet XL, C1645A PaintJet XL 300 and C2113A PaintJet XL 300 printers are high-speed color printers suited for shared, high-volume user environments. They connect to your computer via the RS-232-C (serial), parallel or HP-IB interfaces.

Note	If you use graphics software, check your software documentation (or software supplier) for specific computer hardware and memory requirements. When you install your software, you may have to configure the graphics software.
-------------	--

HP C1602A PaintJet XL
HP C1645A PaintJet XL 300
HP C2113A PaintJet XL 300 Printers

Before Installing This Device

Before you install this device:

- If you have not added this type of device to your system before, read the material in Chapter 1, “Introduction”. It provides interface and cabling guidelines to follow when adding devices to your system.
- Refer to your printer manual(s) for instructions on unpacking and preparing your printer for installation. Keep this documentation at hand. You will need to refer to it during this procedure.

Note

Your printer may be preconfigured at the factory to operate in parallel mode. If you intend to connect the printer to a serial interface, you will need to reconfigure the printer for serial operation mode. See your printer’s documentation for details.

- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system, you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the **wall** or **cwall** command to do this.

Caution

If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks.

For more information about adding devices to a system configured as an HP-UX cluster, refer to *Managing Clusters of HP 9000 Computers*, Chapter 12, “Adding Peripherals to a Cluster”.

What You're Going To Do

The following tables contain detailed HP-UX software set up information. If you use SAM to install this device, you will not need all this information. Complete the hardware installation as outlined in the following section, then refer to Chapter 7, "Setting Up HP-UX for Printers Using SAM" for set up instructions.

If you are using commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in the following section. Once the hardware installation is complete, use the information provided in these tables to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 6-11.
HP PaintJet Printers
Connected to an RS-232-C Interface

Device Name	Path Name ¹	File Type	Major Number	Driver Name	Function Number	Minor Number
HP C1602A/45A, C2113A	/dev/ptr_rs232_a ²	c	1	asio0	4 ³	0x204004
HP C1602A/45A, C2113A	/dev/lp1602A ⁴	c	1	asio0	4 ³	0x204004
HP C1602A/45A, C2113A	/dev/ptr_rs232_b ²	c	1	asio0	5 ⁵	0x205004
HP C1602A/45A, C2113A	/dev/lp1602A ⁴	c	1	asio0	5 ⁵	0x205004

¹ Device file naming conventions are described in Chapter 11, "Setting Up Devices Using HP-UX Commands".

² This device file is shipped with your system.

³ Built in RS-232-C interface port a (0).

⁴ Substitute 1645A or 2113A if working with those models.

⁵ Built in RS-232-C interface port b (1).

SAM uses the naming convention `lp_xxxx` for printer device files. If you want to use the device files shipped with your system (`ptr_rs232_a` or `ptr_rs232_b`) you can specify the shipped device file name on the SAM screen for adding a printer.

HP C1602A PaintJet XL
HP C1645A PaintJet XL 300
HP C2113A PaintJet XL 300 Printers

Table 6-12.
HP PaintJet Printers Connected to Built-in Parallel Interface

Device Name	Path Name ¹	File Type	Major Number	Driver Name	Function Number	Minor Number
HP C1602A/45A C2113A Printers	/dev/ptr_parallel ²	c	11	parallel	6 ³	0x206002
HP C1602A/45A or C2113A Printers	/dev/lp1602A ⁴	c	11	parallel	6 ³	0x206002

1 Device file naming conventions are described in Chapter 11, "Setting Up Devices Using HP-UX Commands".

2 This device file is shipped with your system.

3 Built in parallel interface.

4 Substitute 1645A or 2113A if working with those models.

SAM uses the naming convention `lp_xxxx` for device files. If you want to use the device files shipped with your system (`ptr_parallel`) you can specify the shipped device file name on the SAM screen for adding a printer.

Table 6-13. HP PaintJet Printers Connected HP-IB Interface

Device Name	Path Name ¹	File Type	Major Number	Driver Name	Function Number	Minor Number
HP C1602A/45A C2113A Printers	/dev/ptr_hp-ib ²	c	21	hpib	0	0x206002
HP C1602A/45A or C2113A Printers	/dev/lp1602A ³	c	21	hpib	0	0x206002

1 Device file naming conventions are described in Chapter 11, "Setting Up Devices Using HP-UX Commands".

2 This device file is shipped with your system.

3 Substitute 1645A or 2113A if working with those models.

6

Connecting the Printer

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your `/etc/conf/dfile` file.*

Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

HP C1602A PaintJet XL
HP C1645A PaintJet XL 300
HP C2113A PaintJet XL 300 Printers

3. *Determine your interface.*

Table 6-14. Interface Options

Serial Interfaces ¹	Parallel Interfaces	EISA HP-IB
Built-in Core I/O RS-232-C port A	Built-in PARALLEL	HP-IB 25560A
Built-in Core I/O RS-232-C port B		
E/ISA serial I/O interface card		

¹ If you have more than one serial port, make note of the address of the serial port you are using. You will need this information for testing and configuring your device.

Caution

The HP 9000 Series 700 has both parallel and RS-232-C ports. These ports frequently appear identical. The built-in parallel interface should be labeled PARALLEL. Make sure you plug your cable into the correct port or you could damage your device.

6

4. *Ensure all power switches on the device and on the computer are in the OFF position.*

5. *Connect the printer to your computer.*

Connect the printer to your computer following the instructions provided in the hardware installation manual for the device.

6. *Connect the power cord.*

7. *Turn on the device.*

8. *Plug in and power on the computer.*

Hardware installation complete! You can now proceed to the set up procedures in Chapter 7, "Setting Up HP-UX for Printers Using SAM". If you are not using SAM, refer to Chapter 11, "Setting Up Devices Using HP-UX Commands" for instructions on how to configure your system using commands.

HP 2563/64/66/67C Impact Printers

The high-speed, impact line printers discussed in this section replace the previous models with the same model numbers and a “B” suffix. They are used in situations requiring high-volume system printing applications.

The HP 2563C prints at a rate of 420 lines per minute.

The HP 2564C prints at a rate of 840 lines per minute.

The HP 2566C prints at a rate of 1200 lines per minute.

The HP 2567C prints at a rate of 1600 lines per minute.

These printers connect to your computer via a parallel interface.

Before Installing This Device

Before you install this device:

- Refer to your printer’s documentation for instructions on unpacking and preparing your printer for installation. Keep this documentation at hand. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, “Introduction”. It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system, you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks.

For more information about adding devices to a system configured as an HP-UX cluster, refer to *Managing Clusters of HP 9000 Computers*, Chapter 12, “Adding Peripherals to a Cluster”.

HP 2563/64/66/67C Impact Printers

What You're Going To Do

The following table contains detailed HP-UX software set up information. If you use SAM to set up HP-UX to communicate with your newly connected device, you will not need all this information. Complete the hardware installation as outlined in the following section, then refer to Chapter 7, "Setting Up HP-UX for Printers Using SAM" for set up instructions.

If you use -UX commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in the following section. Once the hardware installation is complete, use the information provided in this table to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 6-15.
HP 2563/64/66/67C Impact Printers Connected to Built-in Parallel Interface

Device Name	Path Name ¹	File Type	Major Number	Driver Name	Function Number	Minor Number
HP 256XC Printers	/dev/ptr_parallel ²	c	11	parallel	6 ³	0x206002
HP 256XC Printers	/dev/ptr256xC	c	11	parallel	6 ³	0x206002

1 Device file naming conventions are described in Chapter 11, "Setting Up Devices Using HP-UX Commands".

2 This device file is shipped with your system.

3 Built in parallel interface.

SAM uses the naming convention `lp_xxxx` for device files. If you want to use the device files shipped with your system (`ptr_parallel`), you can specify the shipped device file name on the SAM screen for adding a printer.

Connecting the Printer

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver(s) required for this device is (are) included in your `/etc/conf/dfile` file.* Most of the time the device drivers required for your new device will already be a part of your kernel configuration file, typically the `/etc/conf/dfile`. However, if you have edited your `dfile` you may want to verify that the driver you need is present.

To verify that the necessary drivers, listed in the tables in the previous section, are part of your current kernel configuration file, you can:

- Use SAM for the whole procedure. SAM will check your `dfile` for the necessary device drivers, add any that are missing, and reconfigure the kernel for you at this time. See the chapter on Setting Up HP-UX using SAM that follows this chapter; then go on to step two.

or

- Look in your `dfile` for the drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the drivers are not in the `/etc/conf/dfile`, or are commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. Use the `/etc/config` program to do this. See Chapter 11, "Setting Up Devices Using HP-UX Commands" for detailed information on this procedure.

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

3. *Determine your interface.*

Locate the built-in parallel interface on the back of the computer.

Caution

Many computers have both parallel and RS-232-C ports. Make sure you plug your cable into the correct port or you could damage your device. The parallel port is labeled PARALLEL.

4. *Ensure all power switches on the device and on the computer are in the OFF position.*

5. *Connect the printer to your computer.*

Connect the printer to your computer following the instructions provided in the hardware installation manual for the device.

6. *Connect the power cord.*

7. *Turn on the device.*

8. *Plug in and power on the computer.*

Hardware installation complete! You can now proceed to the set up procedures in Chapter 7, “Setting Up HP-UX for Printers Using SAM”. If you are not using SAM, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands” for instructions on how to configure your system using commands.

Setting Up HP-UX for Printers Using SAM

Gather the necessary information:

- The name you are giving to this printer/plotter.
- The model or interface that the printer will use.
- The name of the device file that the printer/plotter will use.
- The priority for this printer.
- The class to which the printer/plotter will be added (optional).
- Whether or not you wish to make this device your system's default printer.

If you are adding a remote printer/plotter, be sure to have this additional information on hand:

- The name of the remote system to which the printer/plotter is attached.
- The name of the remote printer/plotter.
- The "cancel" model on the remote system (optional).
- The "status" model on the remote system (optional).
- Whether or not you wish to allow any user to cancel any printing request.
- Whether or not the remote printer is on a system using BSD (Berkeley Software Distribution) UNIX.

If you are adding a network-based printer, make a note of the link-level address used by the printer's network interface.

Adding a Local Printer

To configure your printer/plotter:

1. Log on as root.
2. Run SAM:

```
/usr/bin/sam
```
3. Highlight **Peripheral Devices->** and activate **Open**.
4. Highlight **Printers and Plotters->** and activate **Open**.
5. Highlight **Printers/Plotters** and activate **Open**.
6. From the “Actions” menu title in the “Printer/Plotter Manager” window, highlight and choose the appropriate one of the following menu items:
 - **Add a printer/plotter ->**
 - **Add a remote printer/plotter...**
 - **Add a network based printer**
7. If you are adding a local printer, SAM will search for any interfaces to which the printer might be connected. This information appears in an object list within a “Printer/plotter hardware location” window. Highlight and choose the appropriate hardware path.

An “Add printer” dialog box appears. The titling and appearance of the dialog box will vary according to the type of connection you are using.

Adding a Printer Using SAM

8. Type the required information into the fields displayed.

Note Some of the field names in the dialog box may be buttons (`Printer class`, for example). Activate these for information about available choices for entering in the fields.

9. When you have entered all the information into the dialog box, activate `OK`.

SAM will create the device file needed to communicate with the printer. SAM uses the device file naming convention `lp_XXX`, where `XXX` is the name of your printer.

Adding a Network-Based Printer Using SAM

To add a network-based printer or plotter using SAM:

Gather the necessary information:

- The name you are giving to this printer or plotter.
 - The printer node name.
 - The model or interface that the printer will use.
 - The link-level address of the network card installed in the printer.
 - The TCP-IP protocol printer requires an Internet Protocol (IP) address.
 - The priority for this printer.
 - The class to which the printer or plotter will be added (optional).
1. Ensure that the printer is connected to the network according to the installation instructions shipped with the network-based printer or the network interface card for the printer.

2. Run SAM; type:

`/usr/bin/sam`

See Chapter 1, “Introduction to System Administration” for additional information about using SAM.

3. Highlight **Peripheral Devices** and activate the **Open** control button.
4. Highlight **Printers and Plotters** and activate the **Open** control button.
5. Highlight **Printers/Plotters** and activate the **Open** control button.
6. Choose **Add a network-based printer** then **Add TCP-IP protocol printer...** from the “Actions” menu.

7. Fill in the printer interface dialog box fields and turn on and off check box values.

Activating the **Help** button from a dialog or message box gives you information about the attributes and tasks you can perform from the currently displayed window.

Pressing the **f1** key gives you context-sensitive information for the object field at the location of the cursor.

8. Activate the **OK** control button.

SAM provides an on line help system to assist you when you need additional information.

Activating the **Help** button from the SAM main window, a dialog box, or message box gives you information about the attributes and tasks you can perform from the currently displayed window.

From within a functional area, choosing an item from the “Help” menu gives you information about:

- the current functional area
- keyboard navigation within SAM
- using the SAM help system
- displaying the version of SAM you are currently running

From a dialog box (a window displaying fields to be filled in), pressing the **f1** key gives you context-sensitive information for the object at the location of the cursor.

The software SAM needs to configure your network-based printer is shipped separately. Follow the instruction shipped with your printer to load the software.

In an HP-UX cluster, you can run SAM from a cluster client or the cluster server to add a network-based printer. In either case the printer will be available to all computers in the cluster.

Installing Plotters and Graphic Devices

Introduction

This chapter contains installation instructions for the following plotters and graphic devices:

- HP Plotter
- HP 7440A ColorPro Plotter
- HP 7475/7475A Six-Pen Plotter
- HP 7550A/B Plus Plotter
- HP 7570 DraftPro Plotter
- HP 7576A DraftPro EXL Plotter
- HP 7595/96B/C 7599A/B Draftmaster I,II,III
- HP 759XB Draftmaster SX, RX, MX
- HP C1620A Series 7600 Model 355 Electrostatic Plotter
- HP C1625A/27A Series 7600 Models 250 and 255 Plotters
- HP C1633 DesignJet Inkjet Plotter
- HP A1439A CRX-24 Graphics Display Interface card
- HP A1454A CRX-24Z Graphics Accelerator Card
- HP A2269A Dual CRX Single Graphics Controller card
- HP 45911A/C Graphics Tablet
- HP A1471A Standard Graphics Connector Interface card
- HP 98705A/B/C Graphics Display Controllers
- HP 98765/66A Graphics Display Controllers
- HP A2091A Graphics Processor

HP Plotters

HP plotters can connect to your S700 computer using the RS-232 (serial) or parallel interface types. The following table shows the supported interface configurations on your S700 computer. Also, check the documentation that came with your plotter and with your computer system for additional configuration information.

Note Read the documentation that came with your plotter *before* proceeding with the installation. Some plotters *are not* customer installable and attempting to install them could invalidate your warranty. This prohibition will be noted in the documentation that came with your plotter.

Table 8-1. Supported Interface Types for Plotters on S700

HP Plotter Product No.	RS-232 (serial)	Parallel
7550B	Yes ¹	-
1620A	Yes	Yes
1625/27/29/31A	Yes	Yes
7440A	Yes	-
7475A	Yes	-
7570/75/76A	Yes	-
7599A/B	Yes	-

¹ Supports both cavedrop and single mode serial

If you are connecting a plotter that is not specifically mentioned in the preceding table, find the procedure that outlines plotter connection for the interface type you are using section. These generic procedures will apply to most plotters. Always consult the documentation that came with the plotter for specific exceptions and configuration information for that model.

8-2 Installing Plotters and Graphic Devices

Before you Install This Device

- Refer to your plotter's manual(s) for instructions on unpacking and preparing the plotter for installation. Keep this documentation at hand. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, "Introduction". It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead. Installing new peripherals on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `cwall` command to do this.

Caution

If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks.

For more information about adding devices to a system configured as an HP-UX cluster, refer to *Managing Clusters of HP 9000 Computers*, Chapter 12, "Adding Peripherals to a Cluster".

HP Plotters

What You're Going To Do

The following tables contain detailed HP-UX software set up information. If you use SAM to install this device, you will not need this detailed information. Complete the hardware installation as outlined in the following section, then refer to Chapter 9, "Setting Up HP-UX for Plotters Using SAM" for set up instructions.

Note SAM uses the naming convention `lp_XXXXX` for device files, where the `XXXXX` is replaced with the model number of the plotter. If you wish to use the device files shipped with your system (`plt_parallel`) you may specify the shipped device file name on the SAM screen for adding a plotter.

If you are using commands to set up HP-UX to communicate with your device, complete the hardware installation as outlined in this section. Once the hardware installation is complete, use the information provided in these tables to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 8-2.
HP Plotters
Connected to Built-in Parallel Interface

Device Name	Path Name	File Type	Major Number	Driver Name	Function Number	Minor Number
HP Plotter	<code>/dev/lpXXXXX</code> ¹	c	11	parallel	6 ²	0x206002
HP Plotter	<code>/dev/plt_parallel</code> ³	c	11	parallel	6 ²	0x206002

¹ Replace "XXXXX" with the model number of the plotter.

² Built in parallel interface.

³ This device file is shipped with your system.

8-4 Installing Plotters and Graphic Devices

Table 8-3.
HP Plotters
Connected to Built-in RS-232-C Interfaces

Device Name	Path Name	File Type	Major Number	Driver Name	Function Number	Minor Number
HP Plotters	/dev/lpxxxx ¹	c	1	asio0	4 ²	0x204004
HP Plotters	/dev/plt_rs232_b ³	c	1	asio0	5 ⁴	0x205004

- 1 SAM uses this naming convention, **lp_XXXX**, for plotter device files. Replace "XXXX" with the model number of the plotter.
- 2 Built in RS-232-C interface port a(0). This number will be 5 if you are connected to built-in RS-232-C interface port b(1).
- 3 This device file is shipped with your system. If you are connected to built-in RS-232-C interface port a(0), this file will be **plt_rs232_a**.
- 4 Built in RS-232-C interface port b(1). This number will be 4 if you are connected to built-in RS-232-C interface port a(0).



HP Plotters

Connecting Your Plotter to a Parallel Interface

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver required for this plotter is included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

To verify that the necessary driver(s), listed in the set up tables at the beginning of this chapter, is (are) part of your current kernel configuration, you can:

- Use SAM to check your `dfile` for the necessary drivers, add any that are missing and reconfigure the kernel for you at this time. See Chapter 9, “Setting Up HP-UX for Plotters Using SAM”, and then go on to step two.

or

- Look in your `dfile` for the driver(s). If the drivers are in your kernel configuration file, go on to step 2 now.

If the driver(s) is (are) not in the `/etc/conf/dfile`, or is (are) commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. You can use the `/etc/config` program to do this. See Chapter 11, “Setting Up Devices Using HP-UX Commands” for detailed information on this procedure.

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

3. *Determine your interface.*

Locate the built-in parallel interface on the back of the computer. It should be labeled PARALLEL.

4. *Ensure all power switches on the plotter and on the computer are in the OFF position.*5. *Connect the plotter to your computer.*

Connect the plotter to your computer following the instructions provided in the installation manual for the device.

Caution

Many computers have both parallel and RS-232-C ports. Make sure you plug your cable into the port labelled “parallel” or you could damage your plotter.

6. *Connect the power cord to your plotter.*7. *Turn on the device.*8. *Configure the plotter.*

Configure the plotter for operation according to the instructions provided in the plotter’s installation manual.

9. *Plug in and power on the computer.*

Hardware installation complete! You may now proceed to the set up procedures in Chapter 9, “Setting Up HP-UX for Plotters Using SAM”. If you are not using SAM, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands” for instructions on how to configure your system using commands.

HP Plotters

Connecting Your Plotter to an RS-232 Interface

The following summary supplements the procedures outlined in your hardware installation documentation for this device. Read through this summary before proceeding with the installation.

1. *Verify that the driver required for this plotter is included in your current kernel configuration file, usually the `/etc/conf/dfile` file.*

To verify that the necessary driver(s), listed in the set up tables at the beginning of this chapter, is (are) part of your current kernel configuration, you can:

- Use SAM to check your `dfile` for the necessary drivers, add any that are missing and reconfigure the kernel for you at this time. See Chapter 9, “Setting Up HP-UX for Plotters Using SAM”, and then go on to step two.

or

- Look in your `dfile` for the driver(s). If the drivers are in your kernel configuration file, go on to step 2 now.

If the driver(s) is (are) not in the `/etc/conf/dfile`, or is (are) commented out with a comment symbol (such as the `*` sign), edit the `dfile` to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the `dfile` for any reason. You can use the `/etc/config` program to do this. See Chapter 11, “Setting Up Devices Using HP-UX Commands” for detailed information on this procedure.

2. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

3. *Determine your interface.*

Locate the two serial ports on your system, Port A and Port B. Either of these ports can be used.

Note

Make note of which serial port you are using. You will need this information for testing and configuring your device.

Caution

Many computer systems have both parallel and RS-232-C ports. The built-in parallel interface should be labeled PARALLEL and the serial ports are labelled Port A and Port B. Make sure you plug your cable into the correct port or you could damage your device.

4. *Determine the type of connection.*

- standalone
- eavesdrop
- local
- remote

Refer to the plotter's documentation to determine the appropriate configuration settings.

5. *Ensure all power switches on the device and on the computer are in the OFF position.*

HP Plotters

6. *Connect the plotter to your computer.*

Connect the plotter to your computer following the instructions provided in the installation manual for the plotter.

7. *Connect the power cord.*

8. *Turn on the device.*

Configure the following RS-232-C data transmission values.

baud rate	Set to match your computer's baud rate.
parity	Set to match your computer's parity setting.
data length	
handshake	
symbol set	
(character set)	

9. *Plug in and power on the computer.*

Hardware installation complete! You may now proceed to the set up procedures in Chapter 9, "Setting Up HP-UX for Plotters Using SAM" if you are using SAM. If you are not using SAM, refer to Chapter 11, "Setting Up Devices Using HP-UX Commands" for instructions on how to configure your system using commands.

HP A1439A CRX-24 Color Card

HP A2269A Dual CRX Graphics Card

The HP A1439A CRX-24 Color Graphics card is inserted into an HP 9000 Series 700 SGC slot and provides RGB color output for a color monitor.

The HP A2269A Dual CRX Graphics card provides connectivity for two graphics displays on a single card.

Before Installing This Device

Before you install this graphics card:

- If you have not added this type of device to your system before, read the material in Chapter 1, “Introduction”. It provides interface and cabling guidelines to follow when adding devices to your system.
- Have the documentation that came with the interface card handy. You will need to refer to it during this procedure.
- Plan ahead.

Installing graphics cards on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks.

For more information about adding devices to a system configured as an HP-UX cluster, refer to *Managing Clusters of HP 9000 Computers*, Chapter 12, “Adding Peripherals to a Cluster”.

HP A1439A and A2269A Graphics Cards

Connecting the HP A1439A/A2269A Graphics Cards

The following summary supplements the procedures outlined in your installation documentation for these interface cards. Read through this summary before proceeding with the installation.

1. *Verify that the **frambuf** device driver is included in your current kernel configuration file, usually the **/etc/conf/dfile** file.*

To verify that the **frambuf** driver is part of your current kernel configuration, you can:

- Use SAM to check your **dfile** for the **frambuf** driver, add it if necessary and reconfigure the kernel for you at this time. See Chapter 12, “Setting Up HP-UX for Plotters Using SAM”, and then go on to step two.

or

- Look in your **dfile** for the necessary drivers. If the drivers are in your kernel configuration file, go on to step 2 now.

If the necessary drivers are not in the **/etc/conf/dfile**, or are commented out with a comment symbol (such as the ***** sign), edit the **dfile** to either add the driver or remove the comment marks. You must reconfigure the kernel if you edit the **dfile** for any reason. You can use the **/etc/config** program to do this. See Chapter 11, “Setting Up Devices Using HP-UX Commands” for detailed information on this procedure.

HP A1439A and A2269A Graphics Cards

2. *Play it safe*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.
- c. If you have a monitor connected to your computer, turn it off, unplug the monitor's power cord, and disconnect the video cables from the computer and monitor.
- d. Remove the graphics display card from its envelope, being careful to handle the card only by its edges. The card may be easily damaged by electrostatic discharge (static zap).
- e. Place the card on the envelope.

3. *Insert the graphics card in your computer.*

Insert the card, component side up, into an empty I/O slot. Refer to the documentation that came with the card for detailed instructions on installing the card.

4. *Ensure all power switches on the monitor and on the computer are in the OFF position.*
5. *Plug in the and power on the monitor.*
6. *Plug in and power on the computer.*

Hardware Installation Complete!

HP A1454A CRX-24Z Graphics Accelerator Card

The HP A1454A CRX-24Z Graphics Accelerator card is an add-on option for the HP A1439A CRX-24 Color Graphics card. The CRX-24Z card connects directly to the CRX-24 card, “piggy-back” style. The board pair fits into one slot in the computer.

Installing the HP A1454A CRX-24Z Graphics Accelerator Card

1. *Play it safe.*
 - a. Shut down and halt the system using the `/etc/shutdown -h` command.
If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.
 - b. TURN OFF the computer and unplug the power cord.
 - c. Remove the card from its envelope, being careful to handle the card only by its non-connector edges. The card may be easily damaged by electrostatic discharge (static zap).
 - d. Place the card on its envelope, or use a static-free workstation, HP part number 9300-0933.
2. *Attach the Graphics Accelerator onto the connector on the A1439A graphics display interface card.*

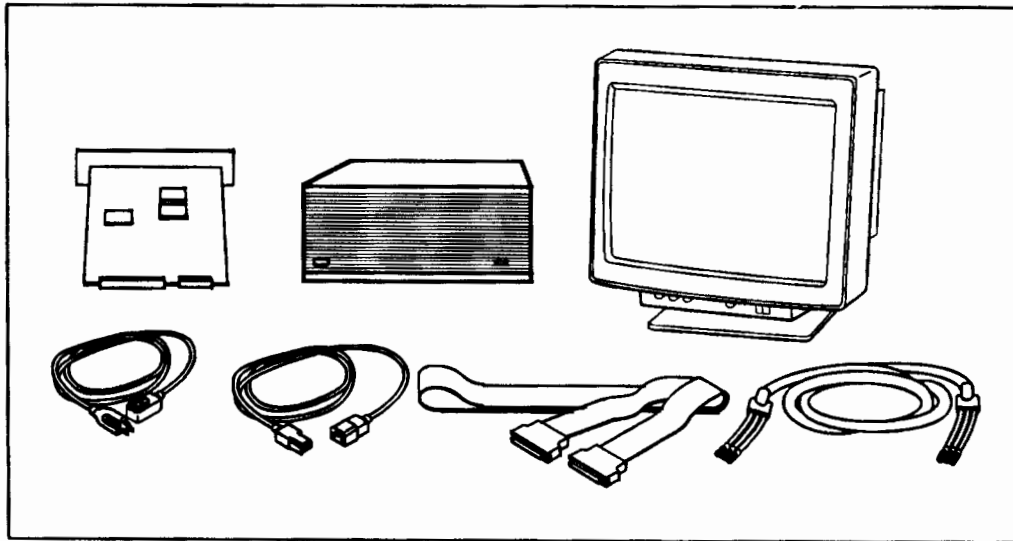
Refer to the documentation that came with the accelerator card for complete instructions on connecting the card.
3. *Install the board pair into the computer.*

Make sure it is firmly seated into the connector.
4. *Ensure all power switches are in the OFF position.*
5. *Connect the power cord to the computer.*
6. *Turn on the monitor.*
7. *Turn on the computer.*

Hardware Installation Complete!

HP 98705A/B/C and 98765/66A Graphics Display Controllers

The HP 98705A/B/C and HP 98765/66A Graphics Display Controllers connect to your system via the HP A1471A Standard Graphics Connect interface.



LG200171_054

Figure 8-1. HP Graphics Display Controller Inventory

HP 98705A/B/C Graphics Display Controllers

Before Installing This Device

Before you install:

- Refer to the documentation that came with the graphics display controller to unpack the devices and check the voltage setting. Keep this documentation at hand. You will need to refer to it during this procedure.
- If you have not added this type of device to your system before, read the material in Chapter 1, “Introduction”. It provides interface and cabling guidelines to follow when adding devices to your system.
- Plan ahead.

Installing new devices on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks.

For more information about adding devices to a system configured as an HP-UX cluster, refer to *Managing Clusters of HP 9000 Computers*, Chapter 12, “Adding Peripherals to a Cluster”.

What You're Going To Do

The following table contains detailed HP-UX software set up information. Complete the hardware installation as outlined in the following section. Once the hardware installation is complete, use the information provided in this table to complete the software set up as outlined in Chapter 11, "Setting Up Devices Using HP-UX Commands".

Table 8-4.
HP 98705A/B/C and 98765/66A Graphics Controller HP-UX Setup Values

Device Name	Path Name ¹	File Type	Major Number	Device Driver	Minor Number
HP 98705	/dev/crt	b	12	framebuf	0x100000
HP 98765/66	/dev/crt	b	12	framebuf	0x100000

¹ device file naming conventions are described in Chapter 11, "Setting Up Devices Using HP-UX Commands".

HP 98705A/B/C, 98765/66A Graphics Display Controllers

Installing the HP 98705A/B/C, 98765/66A Graphics Display Controllers

1. *Play it safe.*

- a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.

2. *Locate the Graphics Display Controller near the computer and the monitor.*

Ensure air flow is not restricted at the front or rear of the Graphics Processor.

3. Install the HP A1471A Standard Graphics Interconnect Interface

The A1471A Standard Graphics Connect (SGC) Interface provides the connection between your computer and an HP 98705A, B, or C Graphics Display Controller. Refer to the documentation that came with the card for detailed instructions.

- a. Remove the HP A1471A from its envelope, being careful to handle the card by its edges and metal end plate. The card may be easily damaged by electrostatic discharge (static zap).
- b. Place the card on its envelope.
- c. Insert the interface card in your computer.

Insert the card, component side up, into an empty I/O slot. Tighten the thumb screws on the metal end plate until the end plate is flush with the back of the computer or expander.

HP 98705A/B/C, 98765/66A Graphics Display Controllers

4. *Connect the Graphics Address and Data (GAD) bus cable.*
 - a. Connect the GAD bus cable to the HP A1471A GAD bus interface connector.
 - b. Connect the other end of the GAD bus cable to the graphics display controller. Ensure that the connector locks into position.
5. *Connect the RGB cable.*
 - a. Connect the RGB (Red Green Blue) cable to the monitor: red to red, green to green, and blue to blue connectors.
 - b. Connect the other end of the RGB cable to the HP 98705A/B/C in the same manner.
6. *Ensure that the power switches are in the OFF position.*
7. *Connect all power cords.*
8. *Turn on the monitor.*
9. *Turn on the graphics display controller.*
10. *Turn on the computer.*

HP 98705A/B/C, 98765/66A Graphics Display Controllers

11. *Verify installation.*

Compare the console screen to Figure 8-2.

```
Copyright 1990,  
Hewlett-Packard Company.  
All Rights Reserved.  
  
Processor Dependent Code (PDC) revision 1.0  
  
Console path      = graphics  
Keyboard path     = hil  
Primary boot path = scsi.6.0  
Alternate boot path = scsi.5.0  
  
16MB of memory configured and tested.  
Autosearch for boot path enabled.  
To override, press any key within 10 seconds.  
  
Boot from primary boot path (Y or N)?
```

Figure 8-2. Display Showing Boot Up Sequence with HP 98705B as Console

Hardware Installation Complete! Refer to Chapter 11, "Setting Up Devices Using HP-UX Commands" for software configuration instructions.

HP A2091A Graphics Processor

The HP A2091A Graphics Processor connects to your system via a Standard Graphics Connect interface card.

The HP A2091A Graphic Display Controller consists of an interface board that plugs into the SGC bus on the SPU; an I/O cable assembly connecting the interface board to the graphics processor assembly; the HP 2091A Graphics Processor Assembly; and an RGB cable that connects the graphics processor assembly to the monitor.

Before Installing This Device

Before you install:

- If you have not added this type of device to your system before, read the material in Chapter 1, “Introduction”. It provides interface and cabling guidelines to follow when adding devices to your system.
- Have the documentation that came with the controller handy. You will need to refer to it during this procedure.
- Plan ahead.

Installing new devices on your system requires that you shut down and power off the system. On a multiuser or clustered system you will want to warn users and cluster clients in advance that the system (server) will be coming down. Use the `wall` or `cwall` command to do this.

Caution

If you are adding this device to a cluster-node, you must be logged into that node to do HP-UX configuration tasks.

For more information about adding devices to a system configured as an HP-UX cluster, refer to *Managing Clusters of HP 9000 Computers*, Chapter 12, “Adding Peripherals to a Cluster”.

HP A2091A Graphics Display Controller

Installing the HP A2091A Graphics Display Controller

Refer to the documentation that came with the A2091A to unpack the HP A2091A.

1. *Play it safe.*
 - a. Shut down and halt the system using the `/etc/shutdown -h` command.

If you are operating in a diskless cluster, see *Managing Clusters of HP 9000 Computers* for additional information on shutting down the system.

- b. TURN OFF the computer and unplug the power cord.
2. *Locate the Graphics Processor near the computer and the monitor.*

Ensure air flow is not restricted at the front or rear of the Graphics Processor.

3. *Install the interface card in your computer.*

Follow the instructions that came with your interface card to install it in your computer.

4. *Connect the I/O interface cable.*
 - a. Connect the cable to the interface card connector.
 - b. Connect the other end of the cable to the HP A2091A. Ensure that the connector locks into position.
5. *Connect the RGB cable.*
 - a. Connect the RGB (Red Green Blue) cable to the monitor: red to red, green to green, and blue to blue connectors.
 - b. Connect the other end of the RGB cable to the HP A2091A in the same manner.

HP A2091A Graphics Display Controller

6. *Ensure that the power switches are in the OFF position.*
7. *Connect all power cords.*
8. *Turn on the monitor.*
9. *Turn on the HP A2091A.*
10. *Turn on the computer.*

HP A2091A Graphics Display Controller

11. *Verify installation.*

Compare the console screen to Figure 8-3.

```
Copyright 1999,  
Hewlett-Packard Company.  
All Rights Reserved.  
  
Processor Dependent Code (PDC) revision 1.0  
  
Console path      = graphics  
Keyboard path     = hil  
Primary boot path = scsi.6.0  
Alternate boot path = scsi.5.0  
  
16MB of memory configured and tested.  
Autosearch for boot path enabled.  
To override, press any key within 10 seconds.  
  
Boot from primary boot path (Y or N)?
```

Figure 8-3. Display Showing Boot Up Sequence with HP A2091A as Console

Hardware Installation Complete! Refer to Chapter 11, "Setting Up Devices Using HP-UX Commands" for software configuration instructions.

Setting Up HP-UX for Plotters Using SAM

This chapter describes how to setup HP-UX to communicate with your plotter or graphics device. SAM supports adding a plotter but does not support adding graphics products. For these products, refer to Chapter 11, “Setting Up Devices Using HP-UX Commands” for instructions on setting up HP-UX to communicate with these devices.

SAM will create the device file needed to communicate with the plotter. SAM uses the device file naming convention `lp_xxxx`, where `xxxx` is the name of your plotter.

Gather the necessary information:

- The name you are giving to this printer/plotter.
- The model or interface that the printer will use.
- The name of the device file that the printer/plotter will use.
- The priority for this printer.
- The class to which the printer/plotter will be added (optional).
- Whether or not you wish to make this device your system's default printer.

If you are adding a remote printer/plotter, be sure to have this additional information on hand:

- The name of the remote system to which the printer/plotter is attached.
- The name of the remote printer/plotter.
- The “cancel” model on the remote system (optional).
- The “status” model on the remote system (optional).
- Whether or not you wish to allow any user to cancel any printing request.
- Whether or not the remote printer is on a system using BSD (Berkeley Software Distribution) UNIX.

If you are adding a network-based printer, make a note of the link-level address used by the printer's network interface.

To configure your printer/plotter:

1. Log on as **root**.
2. Run SAM:

```
/usr/bin/sam
```
3. Highlight **Peripheral Devices->** and activate **Open**.
4. Highlight **Printers and Plotters->** and activate **Open**.
5. Highlight **Printers/Plotters** and activate **Open**.
6. From the “Actions” menu title in the “Printer/Plotter Manager” window, highlight and choose the appropriate one of the following menu items:
 - **Add a printer/plotter ->**
 - **Add a remote printer/plotter...**
 - **Add a network based printer**
7. If you are adding a local printer, SAM will search for any interfaces to which the printer might be connected. This information appears in an object list within a “Printer/plotter hardware location” window. Highlight and choose the appropriate hardware path.

An “Add printer” dialog box appears. The titling and appearance of the dialog box will vary according to the type of connection you are using.
8. Type the required information into the fields displayed.

Note Some of the field names in the dialog box may be buttons ((**Printer class**), for example). Activate these for information about available choices for entering in the fields.

9. When you have entered all the information into the dialog box, activate **OK**.

10

Installing Computer Accessories

This chapter contains the installation and configuration procedures for the following HP-HIL peripherals:

- HP Keyboards
- HP Two and Three-Button Mouse
- HP 46080A Extension Module
- HP 46081A Extension/Speaker Module
- HP 46082A/B Remote Extension Module
- HP 46083A Rotary Control Knob
- HP 46084A ID Module
- HP 46085A Control Dials Module
- HP 46086A Button Box
- HP 46088/90/91C Digitizers

Introduction

HP-HIL, the Hewlett-Packard Human Interface Link, is the HP standard bus for interfacing a personal computer, terminal, or workstation to its input devices. The bus is controlled by the `hil(7)` device driver, which is an integrated part of the HP-UX operating system kernel.

On request from the HP-UX operating system or an application program, `hil` queries the HP-HIL bus, identifies each connected device, and dynamically associates each device it finds with a device file, in the order it is found on the bus.

HP-HIL Device Constraints

Keep the following limitations in mind when you revise HP-HIL devices on your system.

- The HP-HIL devices connected to your computer can use no more than seven device addresses, corresponding to the seven device files with major number 24. The number of files used by each device is shown in Table 10-1. Some devices use no addresses, most use one, and one uses three.
- The power requirements of all connected HIL devices must not exceed 750 milliamps (mA). To make sure you do not exceed this requirement, total up the typical power required by each of your HP-HIL devices as shown in Table 10-1. If the total exceeds 750 mA, you must remove one or more devices.
- HP-HIL devices can be added to or removed from the HP-HIL interface while the system is running without necessarily affecting the HP-UX operating system or some application programs, since the `hil` driver can identify modifications dynamically.

However, if your running application uses a particular device, and you remove the device from the link (even temporarily), or insert another device in front of it, your application may fail to recognize the change and may not work as expected.

When possible, reboot your computer or restart the application program after you modify the HP-HIL devices on the link.

Hardware Overview

HP-HIL devices can be added to or removed from the HP-HIL interface without affecting the HP-UX operating system. However, it is preferable to reboot the computer whenever any hardware change is made on the HP-HIL bus.

HP-HIL devices are connected in a daisy-chain fashion from the HP-HIL bus connector on the Human Interface Board on the back panel of the computer. This socket is marked with two dots (●●) and can also be labeled HP-HIL, KYBD, or KEYBOARD.

Cables of various lengths with HP-HIL plugs and marked at one end with one dot (●) and at the other with two dots (●●) plug into sockets with the same number of dots on the devices and interface. The cable ends are not interchangeable. A plug with two dots must be inserted only in a socket with two dots. A plug with one dot must be inserted only in a socket with one dot.

Caution

To avoid damage to your computer or peripheral hardware:

- DO NOT insert the one-dot end of an HP-HIL cable into a two-dot socket.
 - DO NOT insert the two-dot end of an HP-HIL cable into a one-dot socket.
 - DO NOT connect any HP-HIL cable plug or socket to a telephone system.
-

Further restrictions are described below in “HP-HIL Device Constraints”.

For installation details, consult the hardware installation documentation for the specific device.

Software Installation

Up to eight device files are needed to run the driver and communicate with HP-HIL devices:

- One device file for the driver with major device number 23 and minor device number 0x000000.
- Up to seven device files for the HP-HIL devices with major number 24 and minor numbers 0x000010 to 0x000070.

These eight files should already exist on your system in the `/dev` directory. Type the following:

```
ll /dev | grep -E ' 23 | 24 '
```

to show directory entries like these:

```
crw-rw-rw-  1 root    other    24 0x000010 May  8 16:55 hil1
crw-rw-rw-  1 root    other    24 0x000020 May  8 16:55 hil2
crw-rw-rw-  1 root    other    24 0x000030 May  8 16:55 hil3
crw-rw-rw-  1 root    other    24 0x000040 May  8 16:55 hil4
crw-rw-rw-  1 root    other    24 0x000050 May  8 16:55 hil5
crw-rw-rw-  1 root    other    24 0x000060 May  8 16:55 hil6
crw-rw-rw-  1 root    other    24 0x000070 May  8 16:55 hil7
crw-rw-rw-  1 root    other    23 0x000000 May  8 16:55 rhil
```

The device type and permissions (`crw-rw-rw-`) and the major (23, 24) and minor (`0x0000n0`) device numbers should all be as shown. The file names can be arbitrarily different.

If any entry is missing or in error, you can replace it (as superuser) by executing the corresponding `mknod(1M)` command from the following group.

```
mknod rhil c 23 0x000000
mknod hil1 c 24 0x000010
mknod hil2 c 24 0x000020
mknod hil3 c 24 0x000030
mknod hil4 c 24 0x000040
mknod hil5 c 24 0x000050
mknod hil6 c 24 0x000060
mknod hil7 c 24 0x000070
```

Summary of HP-HIL Devices

Table 10-1. HP-HIL Device Requirements

Device Name	Connection Restrictions	Files Used ¹	Power Used ²
HP 46020/21 Keyboard	None.	1	67 mA
HP 46060A/B Two/Three-Button Mouse	Must be connected after all other devices.	1	133 mA
HP 46080A Extension Module	None.	0	17 mA
HP 46081A Extension/Speaker Module	Must be connected directly to HP-HIL (KYBD) socket on computer chassis.	0	17 mA
HP 46082A/B Remote Extension Module	Must be connected directly to HP-HIL (KYBD) socket on computer chassis.	0	33 mA
HP 46083A Rotary Control Knob	None.	1	73 mA
HP 46084A ID Module	None.	1	40 mA
HP 46085A Control Dials Module	None.	3	213 mA
HP 46086A Button Box	None.	1	53 mA
HP 46088C/90C/91C Digitizers	None.	1	133 mA

¹ The total device files (addresses) used by all HP-HIL devices on a link cannot exceed seven.

² The total power used by all HP-HIL devices on a link must not exceed 750 mA.

Refer to Chapter 11, "Setting Up Devices Using HP-UX Commands" for additional software configuration information for HP-HIL devices.

10-6 Installing Computer Accessories

Summary of HP-HIL Devices

HP 46060A/B HP-HIL Two/Three-Button Mouse

The HP 46060A Mouse has two buttons; the HP 46060B Mouse has three buttons. If installed, the mouse must be the last in the HP-HIL device sequence.

HP 46080A HP-HIL Extension Module

The HP 46080A Extension Module extends the distance between HP-HIL devices.

HP 46081A HP-HIL Extension/Speaker Module

The HP 46081A Extension/Speaker Module extends the distance between HP-HIL devices and includes an audio speaker on a separate circuit, with a 2.4m audio cable. It must be the first in the sequence of devices connected to the HP-HIL interface.

HP 46082A/B HP-HIL Remote Extension Module

The HP 46082A/B Remote Extension Modules extend the distance between HP-HIL devices and between monitors and their video interfaces. It must be the first in the sequence of devices connected to the HP-HIL interface.

HP 46083A HP-HIL Rotary Control Knob

The HP 46083A Rotary Control Knob provides two-axis relative cursor positioning via a rotary knob and a two-axis toggle button. It is best suited for text editing and spreadsheet applications.

HP 46084A HP-HIL ID Module

The HP 46084A ID Module contains a unique, machine-readable serial number that is required by software that uses the HP Codeword Delivery security scheme or software that is customized to an HP 46084A.

HP 46085A HP-HIL Control Dials Module

The HP 46085A Control Dials Module provides nine graphics positioning devices, implemented as three 3-axis devices. The control dials module is commonly used in graphics display applications to provide 3-axis attitude, 3-axis translation, scaling, and other attribute functions. It uses three HP-HIL device files.

HP 46086A HP-HIL Button Box

The HP 46086A Button Box provides 32 user-definable buttons for menu selection, and one user-programmable LED. Buttons can be labeled with defined functions, freeing the display for other uses. It includes one pre-printed and two blank overlays.

HP 46088C/90C/91C Digitizers

The HP 46088/90/91C Digitizers are low-cost, high-resolution digitizers suitable for menu/object picking, free-hand graphics entry, and digitizing.

Setting Up Devices Using HP-UX Commands

Introduction

After you have connected your device, you must set up HP-UX to communicate with your newly connected device. Setting up HP-UX to communicate with devices consists of two steps:

- Creating the device file or verifying that the correct device file already exists for communication with the device.
- Ensuring that the appropriate HP-UX device driver is part of the current kernel configuration.

These tasks can be performed in any order. This chapter focuses on these two tasks.

Ensuring the Device Driver is Part of the Kernel

The `/etc/conf/dfile` is typically used as input to generate a kernel. Look in `/etc/conf/dfile` to see if your kernel includes the appropriate kernel driver for the peripheral you want to add to your system.

Caution Your `/etc/conf/dfile` reflects the current kernel configuration if it was used to generate your current kernel. It is possible that the currently executing kernel was generated from a template other than `/etc/conf/dfile`. In this case, `/etc/conf/dfile` may not reflect the configuration found in the currently executing kernel.

If the `dfile` does not contain the driver you need to operate your peripheral, you must add the driver to `/etc/conf/dfile` and remake the kernel (this involves a reboot of the system). Regenerating the kernel is discussed in the following sections.

The following table lists the drivers that must be present for specific peripheral types.

Table 11-1. Device Drivers

Driver Name	Character Major Number	Block Major Number	Used For:
asio0	1	-	Printers, plotters, terminals and modems on built-in RS-232 (serial) interfaces
CharDrv	11	-	Printers and plotters on built-in parallel interface
cs80	4	0	mass storage devices, including cartridge tape drives (included in all sample configuration files). Must also have hshpib .
eisa	64	-	Required for EISA and ISA boards
framebuf	12	-	Graphics displays
hil	24	-	Hil devices such as keyboards. Must also have r8042 , major number 23.
hpib	21	-	Printers and plotters using EISA HP-IB interface. Must also have eisa driver.
scsi	47	7	SCSI direct access storage devices
scsitape	121	-	SCSI tape drives
autoch autox	55	10	Optical autochanger drivers (require scsi driver)
srm	-	-	Shared Resource Manager (SRM)
rje	-	-	Remote Job Execution (RJE)
ptymas ptyslv	-	-	pseudo terminal drivers (required for HP Windows/9000, Xwindows, and other software). Included in all sample configuration files.

Adding Device Drivers to the Kernel Using HP-UX Commands

If you have checked your kernel configuration file, usually the `/etc/conf/dfile`, and found that the device driver you need for your new peripheral or interface is missing, or it is commented out with comment marks (usually `*`) you will have to edit your kernel configuration file and regenerate the kernel. If you do not intend to use SAM to do this, follow the instructions in the next section. If the driver you need is present in the kernel and you do not have to edit the kernel configuration file, proceed to the “Creating Device Files” section of this chapter to learn how to create device files for your new peripheral device using HP-UX commands.

In the context of the following instructions, the term “standalone machine” refers to a machine that is *not* part of an HP-UX cluster. Adding new drivers to your kernel requires that you reconfigure the kernel. Instructions differ when reconfiguring a standalone machine, cluster server, or cluster client kernel.

Before You Begin

Adding a device driver and reconfiguring the kernel requires that you reboot your system. Note, however, the impact on other users *before* you shut down and reboot your system, especially the following:

- If others are logged into your system, rebooting it interrupts their work. If you have a small number of users or clients on your system, it is best to notify your users in person of the impending system shutdown. It is possible that users can be using an application and not be aware of the message sent by the `shutdown` command.
- If your system is a cluster server, or a swap server for other clients in a cluster, rebooting your system brings down the associated clients. See *Managing Clusters of HP 9000 Computers* for details.
- If your system is a file server in a cluster, rebooting it makes any file systems mounted to the file server unavailable to clients. Again, see *Managing Clusters of HP 9000 Computers* for details.
- If your system is an Internet Protocol router, rebooting it affects any IP traffic routed through your system.

11-4 Setting Up Devices Using HP-UX Commands

The Procedure

To add HP drivers using HP-UX commands:

1. Ensure that you have superuser capabilities.
2. In an HP-UX cluster, ensure you are logged onto the machine for which a new kernel is being generated, client or server. This sets the correct context for creating the `/hp-ux` context-dependent file and editing the `/etc/conf/dfile` context-dependent kernel configuration file. You can log in at the cluster node console or remotely log in to the cluster node from another location by using the `rlogin` command. See the *Managing Clusters of HP 9000 Computers* manual for additional cluster information.
3. Change your directory to `/etc/conf`:

```
cd /etc/conf
```

Caution

You *must* get out of the root directory because you will be creating a new kernel. Otherwise, you will overwrite the currently executing kernel.

4. Make a backup copy of your current configuration description file (which is most commonly the `/etc/conf/dfile`).

Enter the following command for a standalone machine:

```
cp /etc/conf/dfile /etc/conf/dfile.old
```

Enter the following command for an HP-UX cluster server or client:

```
cp /etc/conf/dfile /etc/conf/dfile.cluster_node_name
```

where `cluster_node_name` is the name displayed by the `getcontext` command or an abbreviated name to represent the hostname.

We highly recommend the use of `/etc/conf/dfile` as the kernel configuration file so it remains up to date with the executing kernel, `hp-ux`. Some system software depends on `/etc/conf/dfile` representing the currently executing kernel.

Note

In a cluster, `/etc/conf/dfile` is a CDF and should be used to recreate the kernel. See Chapter 11, “Reconfiguring the Kernel for a Cluster Node”, in *Managing Clusters of HP 9000 Computers* for more information.

5. Edit `/etc/conf/dfile` to add the peripheral device driver:
 - a. Find the line containing `* DEVICE DRIVERS`.
 - b. Below this line, add the peripheral device driver. If an asterisk (“*”) appears before the driver name, remove the asterisk.

11-6 Setting Up Devices Using HP-UX Commands

6. Make a copy of the existing kernel.

Caution

- *DO NOT* perform this step if your system is booted from the /SYSBACKUP backup kernel. If you do, you could overwrite the only bootable kernel for your system.
- If you are creating a new cluster client kernel, do not copy /hp-ux to /SYSBACKUP. If you do, you will overwrite the cluster server's backup kernel.

If your system is a standalone or an HP-UX cluster server, enter:

```
cp /hp-ux /SYSBACKUP
```

If your system is an HP-UX cluster client, enter:

```
cp /hp-ux /SYSBACKUP.cluster_node_name
```

where *cluster_node_name* is the client nodename displayed by the `getcontext` command.

Write down the filename of the backup kernel.

7. Run `config` on the configuration description file you edited:

```
/etc/config config_file
```

where:

config_file is the configuration description file, for example, `/etc/conf/dfile`.

Executing `config` creates the files `conf.c` and `config.mk`. Be sure you have the correct version of these files by typing `ll` (that is “el, el”) from the `/etc/conf` directory and verifying the last modified date and time.

Refer to `config(1M)` in *HP-UX Reference* for additional information.

8. Create the new HP-UX kernel (the file `hp-ux`) in the current directory (`/etc/conf`):

```
make -f config.mk
```

As it is executing, `config.mk` displays the following two lines:

```
Compiling conf.c ...  
Loading hp-ux ...
```

9. Bring the system into single-user mode using the `shutdown` command:

```
cd /  
shutdown grace_period
```

See `shutdown(1M)` in *HP-UX Reference*.

where `grace_period` is the number of seconds the system will wait before shutting down. Specifying a grace period is optional; the default is 60 seconds. The `shutdown` command sends all users currently logged into the system a warning message that the system is shutting down. You can rely on the system default message, or you can customize the message.

Caution	Shutting down a cluster server causes all clients of the server to reboot.
----------------	--

10. Wait for the system to tell you it is in single-user mode.
11. Copy the new kernel to the `/` (root) directory:

```
cd /etc/conf  
cp hp-ux /hp-ux
```

12. Halt the system:

```
reboot -h
```

13. Turn off the computer. Install interface cards or peripheral devices. Refer to the documents shipped with the products being installed and the appropriate chapters of this manual for specific instructions.

11-8 Setting Up Devices Using HP-UX Commands

Warning	Be sure to follow the ESD (Electrostatic Discharge) precautions when handling cards and devices. ESD precautions are described in the hardware installation and configuration guides.
----------------	--

14. Turn on the power. The system will boot from the new kernel.

If the new kernel fails to boot, boot the system from the backup kernel and repeat the process of creating a new kernel. See “Booting the Standalone or Cluster Server Backup Kernel Using the Boot ROM”.

You can boot a cluster client backup kernel by restoring the backup kernel to `/hp-ux`. See the “Restoring the Cluster Client Backup Kernel” section for details.

Once you have successfully reconfigured and booted your system, and connected your new peripheral device, you need to create device files for your new peripheral. Proceed to the “Creating Device Files” section for detailed information.

Booting the Standalone or Cluster Server Backup Kernel Using the Boot ROM

If your system is a standalone or cluster server and the new kernel fails to boot, select the backup kernel using the boot ROM:

1. Turn off the power to the computer, wait a few seconds, then turn the power back on.
2. Press the **(ESC)** key. In a few seconds, this message appears:

```
Terminating selection process.
```

A short time later, this message appears:

```
Searching for potential boot devices.
To terminate search, press and hold the ESCAPE key.
```

```
Device Selection Device Path Device Type and Utilities
```

Your computer is now searching for devices that *might* hold file systems from which it can boot HP-UX. As they are found, they appear in a list. A list of devices might look like this:

P0	scsi.6.0	QUANTUM PD210S
P1	scsi.5.0	QUANTUM PD210S
P2	scsi.4.0	DDS_tape_drive_identifier
P3	scsi.3.0	TOSHIBA CD-ROM DRIVE:XM
P4	lan.123456-789abc	homebase

This process can take several minutes. When the search ends, this list of actions appears:

```
b) Boot from specified device
s) Search for bootable devices
a) Enter boot administration mode
x) Exit and continue boot sequence
?) Help
```

Select from menu:

11-10 Setting Up Devices Using HP-UX Commands

- If *no* devices are listed, there is a problem:

- Check for duplicate SCSI bus addresses or loose connections.
- Check and verify that the power switch is ON for all peripherals.

If you have performed the address, connection, and power checks, and still no devices are listed, the problem is serious. Contact your service representative for assistance.

- If no disk devices are listed, and your system is equipped with disk drives, your workstation is failing to communicate with its disks. Recheck the SCSI connectors, terminators, and hardware addresses and try again.

Of course, if your computer is a member of a cluster that shares the file system of a host by means of a network connection, there might be no disks listed because your computer has no disks directly attached to it.

3. Enter the command to boot from a particular device, using the ISL interface to select a kernel other than `/hp-ux`. To specify boot enter `boot` or `b` followed by the index to the left of the hardware address (for example `P0` or `P1`), followed by `isl` to specify the ISL interface to select a kernel to boot. For example,

Select from menu: b P0 isl

The ISL prompt, `ISL>`, should be displayed.



4. To list the available standalone or cluster server kernels to boot from in the root (/) directory, or any directory in the root file system, use the **ls** option to the **hpux** command.

Listing cluster client files from the cluster client ISL is not supported.

The output is similar to the **ls -alFH** command, except the owner, group, and date information is not displayed. Bootable kernels are those entries with an appended asterisk (*).

For example,

```
ISL> hpux ls disk(;)/. 
```

```
Secondary Loader 9000/700
Revision 1.1
```

```
drwxr-xr-x    9      2048 ./
drwxr-xr-x    6      2048 ../
drwxr-xr-x    2     4096 lost+found/
-rw-rw-r--    1        746 .profile
drwxrwxr-x    2     1024 bin/
drwxr-xr-x   12     1024 dev/
drwxrwxr-x    5     1024 etc/
drwxrwxrwx    2        64 tmp/
drwxrwxr-x    3     1024 usr/
Hrwxrwxr-x    3     1024 foo+
-rwxr-xr-x    1    884736 hp-ux*
-rwxr-xr-x    1    884736 SYSBCKUP*
-rwxr-xr-x    1   1032192 hp-ux.test*
```

In this example there are three available kernels to boot: **/hp-ux**, **/hp-ux.test**, and **/SYSBCKUP**.

For more information on the **hpux** command refer to *hpux_700(1M)* in the *HP-UX Reference* manual.

11-12 Setting Up Devices Using HP-UX Commands

5. Enter the `hpux` command to boot your backup operating system.

To boot a standalone machine or cluster server from the internal disk drive at SCSI address 6, type:

```
ISL > hpux boot disk( SCSI.6;0)/SYSBACKUP
```

To boot a cluster client from the internal LAN interface, type:

```
ISL > hpux boot lan(;0)/SYSBACKUP.cluster_node_name_abr
```

For a cluster clients the backup kernel should be `SYSBACKUP.cluster_node_name_abr`. If you named the backup kernel something other than `/SYSBACKUP` or `SYSBACKUP.cluster_node_name_abr`, use that name instead.

Note Booting a cluster client from a cluster server through an E/ISA LAN interface is not supported. You must use the internal LAN connection.

The backup kernel will begin to boot. When it displays the login prompt, login again and try to reconfigure the kernel again.

Caution When you reconfigure the kernel for the second time using the steps described in “The Procedure”. *Do not* create a backup of the current kernel. Since you are currently booted from the backup kernel, copying `/hp-ux` to a backup kernel might overwrite the only bootable kernel on your system!

If your computer still fails to boot, there is something wrong with either the file system or the hardware. If you suspect a file system failure, or if you think that something is wrong with the hardware, refer to your owner’s guide.

Restoring the Cluster Client Backup Kernel

If your system is a cluster client and the new kernel fails to boot:

1. Log into the cluster server from another client or the server console.
2. Ensure that you have superuser capabilities.
3. Move the client's backup kernel to the `/hp-ux` context-dependent file. For example:

```
mv /SYSBACKUP.cluster_node_name /hp-ux+/c_node_name
```

where

cluster_node_name is the client's full hostname as displayed by the `hostname` command

4. Reboot the cluster client by cycling the power.

The client's backup kernel will begin to boot. When you are given the login prompt, login again and try to reconfigure the kernel again.

Caution If you reconfigure the kernel for the second time using the steps described in the previous section, **DO NOT** create a backup of the current kernel. Since you are currently booted from the backup kernel, copying `/hp-ux` to a backup kernel could overwrite the only bootable kernel on your system!

Creating Device Files

Device files (special files) must be created for every device connected to your system. Interface cards are an exception. The interface card itself does not require a device file associated with it, but the device that is connected to the interface card does need a device file. For interface cards you only need to ensure that the device driver for the interface card is part of the kernel configuration. (See the section entitled “Ensuring the Device Driver is Part of the Kernel” later in this chapter for more information.) Adding a device driver to the current kernel configuration is discussed later in this chapter.

This section contains the following information:

- The `mknod(1M)` command syntax and examples.
- Viewing device file characteristics.
- Disk drive information and examples.
- Tape drive information and examples.
- Terminal and modem information and examples.
- Psuedo terminal information and examples.
- Plotter information and examples.
- Printer information and examples.
- Graphics device information and examples.
- HP-HIL device information and examples.

Using the mknod Command

The *mknod*(1M) command is used to create device files. The *mknod*(1M) command has the following syntax:

```
/etc/mknod path_name file_type major minor
```

where:

<i>path_name</i>	The pathname of the device file to be created. Select a name for the device file that easily identifies the associated peripheral. The following sections describe the naming conventions for device files. Use these naming conventions to make your system easier to support and maintain. Put all device files into the <i>/dev</i> directory (or appropriate subdirectory); many commands expect to find device files there and will fail if the required device file is not present.
<i>file_type</i>	File type is represented by a single character: b (block), c (character), n (network) or p (pipe). Refer to the <i>mknod</i> (1M) man page in the <i>HP-UX Reference</i> for information on networking and pipe file types. Disks need both block and character device file entries. Any cartridge tape or flexible disk drives that will have mounted file systems need entries for both block and character device files. All other devices should have character device file entries only. Character mode of device access is also referred to as raw mode, thus the naming of the device file directories <i>/dev/dsk</i> and <i>/dev/rdsk</i> .
<i>major</i>	The major number is a pointer to the kernel device driver used to communicate with the peripheral. For devices needing both a character and a block device file, there are different device drivers and therefore different major numbers for block and character device files for the same peripheral.

minor The minor number specifies the hardware address (location on the I/O bus). It is made up of the system bus module, slot number, function number, bus address or port number, and other driver specific information. It is a 24-bit value represented in hexadecimal on the command line.

The following examples show the syntax of the **mknod** command:

```
% mknod /dev/rmt/0mn c 121 0x201003 <-- SCSI DDS-format drive
% mknod /dev/ac/1a   b 10 0x201001 <-- SCSI optical autochanger
% mknod /dev/crt     c 12 0x000001 <-- Graphics System Console
```

If you make a mistake while creating a device file, delete the device file you want to change and re-create it with **mknod**.

Viewing the Device File Characteristics

To see device file characteristics execute an `ll` command from the directory containing your device file. For example, `ll /dev/console` would result in the following output:

```
crw--w--w- 1 root  other    0 0x000000 May 20 09:30 console
```

where the first character in the entry tells you whether the device file is a character (c) or block (b) device and the next series of characters represent the file's access permissions. The major and minor numbers are located in the fifth and sixth fields, respectively (where the size is displayed for a regular file). In this case, the major number is 0 and the minor number is 0x000000.

Permissions for File Systems

You must have restricted access permission on all device files that are associated with mountable file systems, giving read/write permission to the owner (root) only. This prevents someone from mounting unauthorized media on your system, and prevents everyone on the system from accidentally overwriting a file system residing on the device associated with this device file.

For example:

```
chown root /dev/dsk/c201d1s0 /dev/rdisk/c201d1s0
chmod 600 /dev/dsk/c2011s0
chmod 600 /dev/rdisk/c2011s0
```

Disk Drives

There are three kinds of disk drives:

- Hard Disks
- Flexible Disks
- Optical Disks

You can use your hard disk as part of your swap space, part of the HP-UX file system, or both.

You can use your flexible disk for data interchange with other computers, as part of the file system or as miscellaneous storage space (for example, for backups). Flexible (floppy) disks come in two sizes: 5.25 inch and 3.5 inch. The 3.5 inch flexible disks are more common with an HP-UX system than the 5.25, but they are treated in the same manner.

You can use your optical disk setup, standalone or autochanger, as part of the file system or as secondary storage (for example, backups, archives). Additionally, the standalone optical disk drive can be used as part of your swap space.

This section contains the following information:

- Device file location and naming conventions.
- Block and character device file requirements and recommendations.
- Major number.
- Minor number format.
- Other information.
- Examples of creating device file for the following devices:
 - SCSI Hard Disk Drives
 - 650/A Optical Disk Drive
 - Optical Library System

What To Do Next

After you create the device files for your new peripheral device, as outlined in the following sections, refer to the documentation that came with the device for information on initializing your disk or media. Refer to the *System Administration Tasks* manual for instructions on using the `mount` command to mount the device on your system.

Device File Naming Conventions for Disk Drives

Device files for disk drives should reside in the `/dev` directory. Disk drives require both character and block device files. Disks use the `/dev/rdisk` directory for the character device files and the `/dev/dsk` directory for the block device files.

Disk device file names are in the following format:

```
/dev/[r]dsk/[r]c#d#[l#]s#
```

where:

- r** the first **r** indicates a raw (character) interface to the disk; the second **r** is reserved for future use and should not be used.
- c#d** specifies the controller number. This is a two or three character number which specifies the following:
Where **#** is *SC[F]* as shown here:
 - S* is the system bus module.
2 = core I/O (the default)
4 = EISA
 - C* is the slot number. Always 0 for core I/O; 4 for EISA.
 - F* is the function number. This identifies the location on the core I/O bus. For example, 201 is the single-ended SCSI interface. When *F* is 0, as in EISA addressing, it is omitted.
- #[l#]** The first **#** specifies the bus (target) address, a value set on the device. The **l** stands for **lun** and is followed by the (**#**) **lun** number. This is used to designate specific devices in disk arrays.

Optical disk libraries are named somewhat differently. Device files for optical disks are placed in the `/dev/rac` or `/dev/ac` directories. The first `#` is followed by an underscore and a number that designates the disk; which is followed by an `a` for side `a`, or a `b` for side `b`. For example, `/dev/rac/c201d1_1a` is a device file for disk one, side `a`.

s# The **s#** stands for section number. This is typically zero, except when using software disk striping. Refer to the *System Administration Tasks* manual for information on software disk striping.

Additional information about disks can be found in *disk(7)* in the *HP-UX Reference*.

Note A wide differential (16-bit) SCSI interface will be connected to the system card on some Series 700 models using the function number 7 and addressing will begin 207 (replace the `#` sign in `c#d` with 207) for these devices. This option is not available at release introduction. Consult your *Owner's Guide* for your model 700 for specific information on wide differential SCSI connectivity.

Minor Number Format for Disk Drives

Minor number format is related to the system bus structure. See Chapter 1, “Introduction” for a diagram of the system bus structure.

The minor number format for disk drives is as follows:

`0xSCFTZZ`

where:

`0x` specifies format is in hexadecimal.

`SCF` is defined as shown below:

S is the system bus module.

2 = core I/O (the default)

4 = EISA

C is the slot number. Always 0 for core I/O; 4 for EISA.

F is the function number. This identifies the connection on the core I/O bus. For example, 1 is the single-ended SCSI interface of the core I/O bus module. *F* is always 0 in EISA addressing.

T is a single hexadecimal representation of the bus (target) address (4 bit value). Note that for Optical Disk libraries, *T* is a single hexadecimal representation of the target (bus) address, multiplied by two (a 3 bit value).

ZZ is 00 except in disk arrays and optical disk libraries. See the documentation that came with your array for specific configuration information. See the next section for details about optical disk libraries.

For example, a disk attached to EISA slot 1 with a SCSI target address of 6 would have a minor number of `0x410600`.

11-22 Setting Up Devices Using HP-UX Commands

mknod Example: SCSI Disk Attached to CORE I/O

If you have a SCSI disk drive at connected to the core I/O with a target (bus) address 2, use the following **mknod** command lines:

```
mknod /dev/dsk/c201d2s0 b 47 0x201200
mknod /dev/rdisk/c201d2s0 c 7 0x201200
```

mknod Example: SCSI Disk Attached to EISA

If you have a SCSI disk drive at connected to the EISA interface slot 1 with a bus (target) address 3, use the following **mknod** command lines:

```
mknod /dev/dsk/c41d3s0 b 47 0x410300
mknod /dev/rdisk/c41d3s0 c 7 0x410300
```

Minor Number Format for Optical Library System

Minor number format is related to the system bus structure. See Chapter 1, “Introduction” for a diagram of the system bus structure.

For the Optical Library System, the minor number format changes to address the many surfaces available for data storage. The minor number for the Optical Library System has the following format:

0xSCFTSur

where:

0x specifies format is in hexadecimal.

SCF is as shown below:

S is the system bus module.

2 = core I/O (the default)

4 = EISA

C is the slot number. Always 0 for core I/O; 4 for EISA.

F is the function number. This identifies the location on the core I/O bus. For example, 1 is the single-ended SCSI interface. When *F* is 0, as in EISA addressing, it is omitted.

T specifies the bus (target) address, multiplied by two.

Sur specifies the surface.

mknod Examples: Optical Disk Library

The command method for creating device files for optical disk libraries is impractical. As the following example shows, in the instance where your library contained 32 disks with 64 surfaces; you would need 2 device files per surface, and 1 ioctl setup; totalling 129 **mknod** commands. Therefore, use SAM to create the necessary device files for your optical disk library. If you do not have SAM on your system, use the scripts that came with your Optical Disk Library to set up your device.

For a SCSI optical autochanger at function number one of the core I/O bus module, with a bus (target) address 3, you need one device file for the autochanger and 129 device files for the disks and surfaces. The autochanger device file will follow this format:

```
mknod /dev/ract/ioctl c 33 0x2013000
```

The format for the **mknod** command lines for one disk, both sides would be as follows:

```
mknod /dev/ac/c201d3_1a b 10 0x2016001 <-- Side 1a/disk surface 1 - block
mknod /dev/rac/c201d3_1a c 55 0x2016001 <-- Side 1a/disk surface 1 - character
mknod /dev/ac/c201d3_1b b 10 0x2016002 <-- Side 1b/disk surface 2 - block
mknod /dev/rac/c201d3_1b c 55 0x2016002 <-- Side 1b/disk surface 2 - character
```

You would then continue with the **mknod** commands until you are done. For thirty-two disks, the **mknod** command for the thirty-second disk, both sides, would be:

```
mknod /dev/ac/c201d3_32a b 10 0x201603f <-- Side 32a/disk 32 surface 63 - block
mknod /dev/rac/c201d3_32a c 55 0x201603f <-- Side 32a/disk 32 surface 63 - character
mknod /dev/ac/c201d3_32b b 10 0x2016040 <-- Side 32b/disk 32 surface 64 - block
mknod /dev/rac/c201d3_32b c 55 0x2016040 <-- Side 32b/disk 32 surface 64 - character
```


Tape Drives

There are three kinds of tape drives:

- 9-track Magnetic Tape
- Cartridge Tape
- DDS-Format Tape (DAT)

This section contains the following information:

- Device file location and naming conventions.
- Block and character device file requirements and recommendations.
- Major number.
- Minor number format.
- Other information.
- Examples of creating device file for the following devices:
 - 9-track Magnetic Tape
 - Cartridge Tape
 - DDS-Format Tape (DAT)

9-track magnetic tapes are 1/2 -inch tapes on reels. You can use your magnetic tape for miscellaneous storage space (for example, backups).

Cartridge tapes, such as HP 9144 and HP 9145, are the 1/4 -inch tapes in plastic cartridges. Do not confuse this family of devices with DDS drives; they are quite different. HP-IB cartridge tape drives use the **cs80** kernel disk driver and are supported on the EISA HP-IB interface. You can use your cartridge tape for miscellaneous storage space (for example, for backups).

DDS-format drives and 9-track magnetic tape drives are logically very similar. Both belong to the family of streaming tape drives. Most HP-UX commands that are typically associated with 9-track tapes, such as backups, can be used without modification with DDS drives.

DDS-Format tapes are based on Digital Audio Tape (DAT) technology. DAT uses an advanced form of helical scan recording to store data on a DDS cassette, approximately the size of a credit card. The tape drive provides for high-capacity, unattended backups. Some DDS tape drives can read and/or write in compressed mode.

A sixty meter (60m) DDS cassettes can hold up to 1.3 gigabytes (1300 megabytes) of uncompressed data. In compressed mode, a 60m DDS cassette can hold approximately 5.2 gigabytes (5200 megabytes) of data. A ninety meter (90m) DDS cassettes can hold up to 2.0 gigabytes (2000 megabytes) of uncompressed data. In compressed mode, a 90m DDS cassette can hold approximately 8.0 gigabytes (8000 megabytes) of data.

Note

- Data storage rate and capacity, especially in compressed mode, is dependent upon the computer's capacity to keep up with the device and the type of data being stored.
 - Use only HP labeled DDS-format tapes in HP DDS-format tape drives. HP 92283A contains five (60m) HP labeled DDS-format tapes; and HP 92283B contains five (90m) HP labeled DDS-format tapes.
-

Device files for tape drives should reside in the `/dev` directory. 9-track Magnetic and the DDS-Format tape drives use the `/dev/rmt` directory for the device file, and cartridge tape drives use the `/dev/rct` directory for the device file.

The following dedicated sections (magnetic tape, cartridge tape, and DDS-format tape), contain the device file naming conventions for each type of tape drive.

What To Do Next

After you create the device files for your new peripheral device, as outlined in the following sections, refer to the documentation that came with the device for information on tape drive start up and operating instructions.

Device File Naming Conventions: 9-Track Magnetic Tape Drive

The following naming convention is recommended for magnetic tape devices because it connects most of the mode flags with the device name:

```
/dev/[r]mt/c#d#[hml][c][n]
```

where:

r	indicates a raw (character) device
c#d	indicates the controller number (optionally specified by the system administrator)
#	is the device number
hml	indicates the density: ■ h (high) for 6250 bpi ■ m (medium) for 1600 bpi ■ l (low) for 800 bpi
c	indicates data compression
n	indicates no rewind on close

For example, /dev/rmt/2mn is raw device 2 at 1600 bpi with no rewind and no compression.

Additional information about 9-track magnetic tape is available in *mt(7)* of the *HP-UX Reference*.

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Minor Number Format for 9-Track Magnetic Tape Drives

Minor number format is related to the system bus structure. See Chapter 1, "Introduction" for a diagram of the system bus structure.

For the 9-track magnetic tape drives, the minor number format changes to address the different recording densities: 800 bpi, 1600 bpi, 6250 bpi, and compressed 6250 bpi. The minor number format for the 9-track magnetic tape is as follows:

`0xSCFTzD`

where:

0x specifies format is in hexadecimal.

SCF is as shown below:

S is the bus module (four bit value).

2 = core I/O (the default)

4 = EISA

C is the slot number (four bit value). Always 0 for core I/O; 4 for EISA.

F is the function number. This identifies the location on the core I/O bus. For example, 1 is the single-ended SCSI interface. When *F* is 0, as in EISA addressing, it is omitted.

T specifies the bus (target) address (four bit value).

Z is always 0 (four bits).

D A single hexadecimal number, (four bit value). Bits 3 and 2 set the density and bits 1 and 0 set operation characteristics, as shown in Table 11-2.

Table 11-2. Tape Density and Operation Bit Settings

bit 3	bit 2	bit 1	bit 0	Hex Value	Selects
1	1	0	0	c	Bits 3 and 2 set indicate density = 6250 bpi compressed(HP 7980XC and HP 7980SX). Bit 1 unset indicates AT&T-style compatibility mode and bit 0 unset indicates rewind on close.
1	0	0	0	8	Bit 3 set and bit 2 unset indicates density = 6250 bpi (HP 7980A and HP 7980S). Bit 1 unset indicates AT&T-style compatibility mode and bit 0 unset indicates rewind on close.
0	1	0	0	4	Bit 3 unset and bit 2 set indicates density = 1600 bpi (All mag tapes). Bit 1 unset indicates AT&T-style compatibility mode and bit 0 unset indicates rewind on close.
1	1	0	1	d	Bits 3 and 2 set indicate density = 6250 bpi compressed(HP 7980XC and HP 7980SX). Bit 1 unset indicates AT&T-style compatibility mode and bit 0 set indicates no rewind.
1	0	0	1	9	Bit 3 set and bit 2 unset indicates density = 6250 bpi (HP 7980A and HP 7980S). Bit 1 unset indicates AT&T-style compatibility mode and bit 0 set indicates no rewind.
0	1	0	1	5	Bit 3 unset and bit 2 set indicates density = 1600 bpi (All mag tapes). Bit 1 unset indicates AT&T-style compatibility mode and bit 0 set indicates no rewind.

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Table 11-2. Tape Density and Operation Bit Settings (continued)

bit 3	bit 2	bit 1	bit 0	Hex Value	Selects
1	1	1	0	e	Bits 3 and 2 set indicate density = 6250 bpi compressed(HP 7980XC and HP 7980SX). Bit 1 unset indicates Berkeley-style compatibility mode and bit 0 unset indicates rewind on close.
1	0	1	0	a	Bit 3 set and bit 2 unset indicates density = 6250 bpi (HP 7980A and HP 7980S). Bit 1 unset indicates Berkeley-style compatibility mode and bit 0 unset indicates rewind on close.
0	1	1	0	6	Bit 3 unset and bit 2 set indicates density = 1600 bpi (All mag tapes). Bit 1 unset indicates Berkeley-style compatibility mode and bit 0 unset indicates rewind on close.
1	1	1	1	f	Bits 3 and 2 set indicate density = 6250 bpi compressed(HP 7980XC and HP 7980SX). Bit 1 unset indicates Berkeley-style compatibility mode and bit 0 set indicates no rewind.
1	0	1	1	b	Bit 3 set and bit 2 unset indicates density = 6250 bpi (HP 7980A and HP 7980S). Bit 1 unset indicates Berkeley-style compatibility mode and bit 0 set indicates no rewind.
0	1	1	1	7	Bit 3 unset and bit 2 set indicates density = 1600 bpi (All mag tapes). Bit 1 unset indicates Berkeley-style compatibility mode and bit 0 set indicates no rewind.

mknod Examples for 9-Track Tape Drives

Sample **mknod** commands for a SCSI 9-track magnetic tape connected to the core I/O with a bus (target) address 3 would be:

```
mknod /dev/rmt/Omn c 9 0x201307 1600 bpi, Berkeley-close, no rewind
mknod /dev/rmt/0h c 9 0x201308 6250 bpi, AT&T-close, autorewind
```

You could also use the **mt** command to do various positioning operations on the tape without having to provide a device name because **mt** uses the default device **/dev/rmt/Omn**. Since **tar** defaults to **/dev/rmt/0m**, you may also want to create this file.

Device File Naming Convention for Cartridge Tape Drives

Cartridge tape device file names have the following format:

```
/dev/[r]ct/[r]c#d#[l#][s#]
```

where:

- r** indicates a raw interface to the cartridge tape; the second r is reserved to indicate that this cartridge tape is on a remote system.
- c#d** specifies the controller number. This is a two or three character number which specifies the following:
Where # is *SS[F]* as shown below:
 - S* is the system bus module.
2 = core I/O (the default)
4 = EISA
 - C* is the slot number. Always 0 for core I/O; 4 for EISA.
 - F* is the function number. This identifies the location on the core I/O bus. For example, 1 is the single-ended SCSI interface. When *F* is 0, as in EISA addressing, it is omitted.
- #[l#]** The first # specifies the bus (target) address. The l stands for lun and is followed by the (#) lun number. This is used to designate specific devices in integrated devices.
- s#** optionally indicates a section number. This is typically 0.

Additional information about cartridge tapes is in *ct(7)* of the *HP-UX Reference*.

Minor Number Format for Cartridge Tape Drives

Minor number format is related to the system bus structure. See Chapter 1, “Introduction” for a diagram of the system bus structure.

The minor number format for cartridge tape drives is as follows:

`0xSCFTZZ`

where:

`0x` specifies format is in hexadecimal.

`SCF` is as follows:

`S` is the bus module (four bit value).

2 = core I/O (the default)

4 = EISA

`C` is the slot number (four bit value). Always 0 for core I/O; 4 for EISA.

`F` is the function number. This identifies the location on the core I/O bus. For example, 1 is the single-ended SCSI interface. When `F` is 0, as in EISA addressing, it is omitted.

`T` specifies the SCSI bus (target) address (4 bit value).

`ZZ` is 00 (eight bits).

If you have a CS80 cartridge tape drive at EISA slot number 1, with an HP-IB bus address of 1, your `mknod` command line would be:

```
mknod /dev/rct/c41d1s0 c 4 0x410100
```

Device File Naming Conventions for DDS-Format Tape Drives (DAT)

The following naming convention is recommended for DDS-format tape drives:

```
/dev/rmt/c#d#[hm][c][n]
```

where:

c#d	specifies the controller number. This is a two or three character number which specifies the following: Where # is $SC[F]$ as shown below: <table> <tr> <td><i>S</i></td><td>is the system bus module. 2 = core I/O (the default) 4 = EISA</td></tr> <tr> <td><i>C</i></td><td>is the slot number. Always 0 for core I/O; 4 for EISA.</td></tr> <tr> <td><i>F</i></td><td>is the function number. This identifies the location on the core I/O bus. For example, 1 is the single-ended SCSI interface. When <i>F</i> is 0, as in EISA addressing, it is omitted.</td></tr> </table>	<i>S</i>	is the system bus module. 2 = core I/O (the default) 4 = EISA	<i>C</i>	is the slot number. Always 0 for core I/O; 4 for EISA.	<i>F</i>	is the function number. This identifies the location on the core I/O bus. For example, 1 is the single-ended SCSI interface. When <i>F</i> is 0, as in EISA addressing, it is omitted.
<i>S</i>	is the system bus module. 2 = core I/O (the default) 4 = EISA						
<i>C</i>	is the slot number. Always 0 for core I/O; 4 for EISA.						
<i>F</i>	is the function number. This identifies the location on the core I/O bus. For example, 1 is the single-ended SCSI interface. When <i>F</i> is 0, as in EISA addressing, it is omitted.						
h m c	indicates density with h meaning high density, m meaning standard DDS format and c meaning data compression.						
n	indicates no rewind.						

Additional information about DDS tapes can be found in *mt(7)* of the *HP-UX Reference*.

Minor Number Format for DDS-Format Tape Drives

Minor number format is related to the system bus structure. See Chapter 1, “Introduction” for a diagram of the system bus structure.

Encoded in the minor number of the DDS-Format Tape Drive (DAT) are its various modes of operation. The minor number for the DDS-Format Drive has the following format:

$0xSCFTDO$

where:

0x specifies format is in hexadecimal.

SCF is as shown below:

S is the system bus module (four bit value).
 2 = core I/O (the default)
 4 = EISA

C is the slot number (four bit value). Always 0 for core I/O; 4 for EISA.

F is the function number. This identifies the location on the core I/O bus. For example, 1 is the single-ended SCSI interface. When *F* is 0, as in EISA addressing, it is omitted.

T specifies the bus (target) address (4 bit value).

- D bits 7 and 6 set specify compressed mode; uncompressed mode is specified with bit 7 unset and bit 6 set. Bit 5 is reserved and bit 4 selects partition 1 when set, otherwise partition 0 is selected.

DDS Tape Bits 4 - 7

Value being Set	Bit 7	Bit 6	Bit 5	Bit 4	Result	Hex. Equivalent
Uncompressed\Select Partition 0	0	1	0	0	0100	4
Uncompressed\Select Partition 1	0	1	0	1	0101	5
Compressed\Select Partition 0	1	1	0	0	1100	c
Compressed\Select Partition 1	1	1	0	1	1101	d

- 0 specifies operation characteristics (4-bit value) as shown below:

DDS Tape Operation Bits 0 - 3

Bit	Clear(0)	Set(1)
3	Disable fixed length records	Enable fixed length records
2	Immediate Report on	Immediate Report off
1	AT&T-style close	Berkeley-style close
0(lsb)	Rewind on close	No rewind on close

Examples of Possible Settings

For Example:	Result	Hex. Equiv.
Fix record length enabled, immediate reporting on, Berkeley style close, autorewind	1010	a
Fix record length disabled, immediate reporting on, Berkeley style close, no rewind	0011	3
Fix record length disabled, immediate reporting off, AT&T-style close, no rewind	0101	5

mknod Examples for DDS-Format Tape Drives

Some example `mknod` commands are:

<code>mknod /dev/rmt/0hc c 54 0x2013c3</code>	<i>IR on, Berkeley-close, no rewind, compressed</i>
<code>mknod /dev/rmt/0hc c 54 0x2013c2</code>	<i>IR on, Berkeley-close, autorewind, compressed</i>
<code>mknod /dev/rmt/0mn c 54 0x201343</code>	<i>IR on, Berkeley-close, no rewind, uncompressed</i>
<code>mknod /dev/rmt/0m c 54 0x201342</code>	<i>IR on, Berkeley-close, autorewind, uncompressed</i>

These `mknod` examples above show a SCSI DDS-format drive, connected to the Core I/O SCSI disk interface on your system, with the tape drive's bus address at 3. Partition 0 is selected and fixed record length is disabled.

11-38 Setting Up Devices Using HP-UX Commands

Terminals and Modems

This section contains the following terminal and modem information:

- Process overview for setting up HP-UX to communicate with terminals and modems.
- Device file location and naming conventions.
- Block and character device file requirements and recommendations.
- Major number
- Minor number format.
- Examples of creating device files.
- Other information.

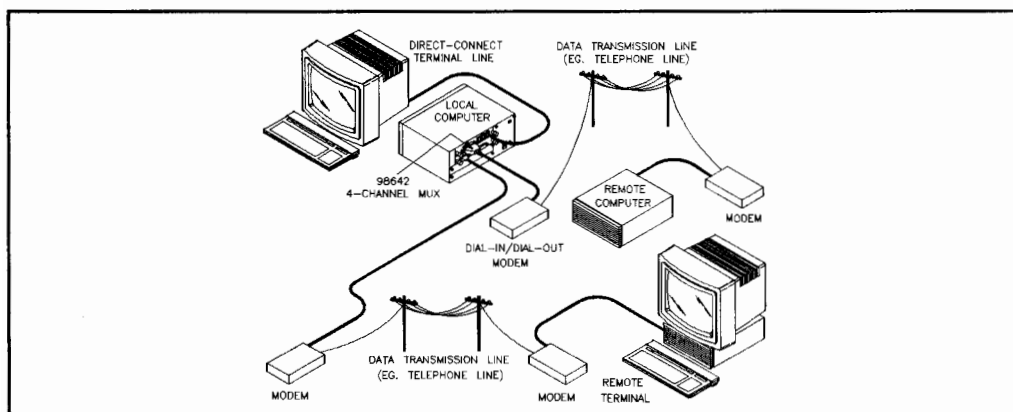


Figure 11-1. Terminal and Modem Connections

You should already have the terminal and modem physically connected to your system as in Figure 11-1. If you do not have the terminal and/or modem connected to your system, refer to Chapter 2, “Installing Terminals and Modems”.

Device File Naming Conventions for Terminals and Modems

Communication ports (user terminals as well as modems) need to be identified by one or more device file, depending on the intended use of the port. Device file naming conventions vary, depending on the device's use. Terminal (**tty**) files are required for terminals (hard-wired ports). Ports that receive incoming signals ("dial in" modems) require a special naming convention, **tttyd**, for device files. Ports that transmit signals ("dial out") require both **cua** and **cul** device files.

Use the following procedure to set up a terminal or a modem.

1. Create the device files required. If the terminal uses both dial-in and dial-out access, you will need three files.
2. Add the necessary **getty** entries to the **/etc/inittab** file.
3. Type **/etc/telinit q** to activate the updated **/etc/inittab** file.
4. Add the necessary entries to the **/etc/ttytype** file.
5. When using the terminal, set the **TERM** environment variable and execute the **tset** command.

Note

If you are on an HP-UX cluster, **/dev** is a context-dependent file. This means you must create the device file from the cnode where the terminal is located.

Minor Number Format for Terminals and Modems

Minor number format is related to the system bus structure. See Chapter 1, “Introduction” for a diagram of the system bus structure.

Terminals and modems use the `asio0`, character mode major number 1, device driver.

The minor number format for terminals and modems is as follows:

`0xSCFZCA`

where:

- 0x** indicates the number is hexadecimal.
- SC** indicates a serial connection off the core I/O. This is always 20.
- F** is the function number. Function number 4 is for port A; 5 is for port B.
- Z** specifies the value 0 in hexadecimal (four bits).
- C** specifies FIFO control. The range is 0x0 to 0xf. This bit specifies the trigger level for receive FIFO and transmit limit for transmit FIFO. See the `termio(7)` manpage for details.
- A** This is a hexadecimal representation that specifies the hardware flow control state and access type as shown in the table that follows.

Bit	Value
3	RTS/CTS hardware flow control. 0 = OFF, 1 = ON.
2	1=direct connect, 0=modem
1	1=CCITT protocol (Europe), 0=Simple protocol (U.S.)
0	1=dialout modem, 0 (lsb)=dial-in modem

Table 11-3 shows a general **mknod** template for ports where *xx* is a two-digit decimal line identifier in the device file name:

Table 11-3. General Template for Ports

Device	Notes
ttyxx	hardwired ports (terminals)
ttydxx	dial-in modems
cuaxx	autodial-out ports
culxx	dial-out ports

Modems require two device files and possibly three. The “dial-in modems” device file **ttydxx** and the “dial-out ports” device file **culxx** are required. If you are using a non-HoneyDanBear **uucp**, the system dials its connection using **/usr/lib/dialit.c**, which requires you to create a third modem device file **cuaxx** with the same minor number as the **culxx** device file.

Assume that you want to create device files for a modem connected to RS-232-C port A and a terminal connected to port B. Because the modem will be used as a dial-in and dial-out port, the **A** term of the minor number on the **cua** and **cul** files must be 1, and on the **ttyd** file must be 0. The following **mknod** command lines are needed:

```

mknod /dev/cua00 c 1 0x204001 Port A
mknod /dev/cul00 c 1 0x204001 Port A
mknod /dev/ttyd00 c 1 0x204000 Port A
mknod /dev/tty01 c 1 0x205004 Port B

```

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Adding an Entry to the `/etc/ttytype` File

The `/etc/ttytype` file is a data base that contains the terminal type of the terminal associated with each port on the system. It is used by the `tset` and `login` commands. Based on the information in this file, `tset` will perform terminal-dependent processing, such as setting erase and kill characters, setting or resetting delays, and sending sequences needed to properly initialize the terminal. `login` uses this file to set the `TERM` variable.

The `/etc/ttytype` entries have the form:

model_number location

where:

<i>model_number</i>	is the product number of the terminal or computer (as defined in <code>/usr/lib/terminfo</code>). For more information on the model number to use here, refer to the <i>terminfo(4)</i> entry in the <i>HP-UX Reference</i>
<i>location</i>	is the device file associated with the terminal/computer and contained in the <code>/dev</code> directory (not the full path name, just the file name).

Here is a sample `/etc/ttytype` file:

```
300h    console    # Jane's (administrator) system console
2622    tty00      # Bill's terminal
2622    tty01      # Greg's terminal
2623    tty02      # Sally's terminal
dialup  ttyd03     # Saruman's dialup modem
```

The *model_number* for dial-up ports should be `dialup`. This causes `tset` to request the proper terminal type during the login sequence.

Note If you are on an HP-UX cluster, this file is a context-dependent file. There must be one subfile for each cluster node.

Adding an Entry to the `/etc/inittab` File

The `/etc/inittab` file is described in Chapter 3, “Starting and Stopping HP-UX” of the *System Administration Tasks* manual. For terminals, `/etc/inittab` entries contain the `/etc/getty` command. This section discusses entries specific to terminals.

Most `/etc/inittab` entries for terminals have the form:

```
id:rstate:respawn:/etc/getty -t xxx device_file_name N # comment field
```

where:

id	is a unique two-character string. The value of the two-character string is arbitrary but must be unique for each entry. It is used to refer to the same entry/process in other states.
rstate	indicates the getty run-levels. This field typically equals two, meaning the terminal can be used in run-level two only.
respawn	Specifies that the command in the command field (such as getty) is re-invoked once the process terminates (typically, when a user logs off the system).
/etc/getty	This is the command to execute. The fields of the <code>/etc/getty</code> command are described below.

The fourth field, the **process** field, must contain the `/etc/getty` command; it is immediately followed by three parameters for a **getty** command, as follows:

-t xxx	is the optional time-out option for use with modems.
device_file_name	is the file name (tty04)—not the complete path name (/dev/tty04)—of the terminal’s or modem’s character device file. The named file must reside in the /dev directory.
N	specifies a speed indicator for getty . A value of H is common for “hardwired” (9600 baud terminal) lines; a value of three is common for dial-up (300/1200 baud modem) lines.

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For more information, refer to the *getty(1M)* and *gettydef(4)* entries in the *HP-UX Reference*.

On a multi-user system, each terminal connected to the system must have an entry in */etc/inittab*. For example, to add a terminal on */dev/tty04* for run-level 2 the */etc/inittab* is the following:

```
04:2:respawn:/etc/getty tty04 H #terminal at rob's desk
```

Note that the *id* field *04* corresponds to the last two digits of the terminal's device file (*tty04*). This convention is often used with "continuous" (respawn) *getty* processes that get killed in the single-user run-level but is *not* required syntax: any two-character string will suffice. After a user logs out, *getty* is "respawned", and the "login:" prompt is redisplayed. Refer to the *getty(1M)*, *gettydef(4)*, and *inittab(4)* entries in the *HP-UX Reference* for further details.

If you are on an HP-UX cluster, this file is a context-dependent file. There must be one subfile for each cluster node.

Activate the updated */etc/inittab* file by typing */etc/telini q*.

Removing A Terminal

Note Removing the system console is not supported.

If you remove a remote terminal from your system, you must clean up your system by performing the following steps:

1. Find the system's name for the terminal. If you have been receiving messages on your console that are similar to:

```
Unable to access ttyxx
```

then you know the system's name for the terminal is the `ttyxx` name.

If you do not receive the message, determine the name of the remote terminal by the following method:

- a. type `cd /dev`
- b. type `ls -l tty*`

You will see lines similar to:

```
crw--w--w- 1 ryk   axe      1 0x000000 1986   /dev/ttyxx
```

If you have only one `tty` file, that is the terminal you are removing.

If you have several, determine which one to remove by using the information you used to set up the terminal.

2. Edit the file `/etc/inittab`.

Delete the line that has a field with the words:

```
id:rstate:respawn:/etc/getty ttyxx
```

where `ttyxx` is the port you identified in Step 1.

3. Notify the `init` process that `/etc/inittab` has changed by typing:

```
telinit q
```

4. Remove the device file associated with the terminal you removed.

Pseudo Terminals

This section contains the following information:

- Process overview for setting up HP-UX to communicate with pseudo terminals.
- Device file location and naming conventions.
- Block and character device file requirements and recommendations.
- Major number.
- Minor number format.
- Other information.
- Examples of creating device files.

Some applications need a form of software support that enables them to act as though they are connected to a terminal. This implementation is called a **pseudo terminal**. A pseudo terminal is a pair of character devices: a **master** device and a **slave** device.

The pseudo terminal is structured so that output from either process acts as input to the other. The slave device interacts with the application process. It provides processes (in this case, user applications) and an interface identical to that described in *termio(4)* of the *HP-UX Reference*. The master device interacts with the server process controlling the application process. It interacts through the device as though it were a hardware terminal interface.

The difference between an HP-UX pseudo terminal and the interface described in *termio* is that the latter always has a hardware device behind it—like an HP 2623 terminal. A slave device has another process manipulating it through the master half of the pseudo terminal. Anything written on the master device is given to the slave device as input, and anything written on the slave device is presented as input on the master device.

According to HP-UX naming conventions, all pseudo terminal devices are located in the directories `/dev/pty` (slaves), and `/dev/ptym` (masters). The master device file should be called `/dev/ptym/ptyXX`, and the slave side `/dev/pty/ttyXX`, where *XX* is an identifying letter from p to w, and a hexadecimal digit. *Do not change these naming conventions because some programs depend on them.*

For example, `/dev/ptym/ptyp0` (master) and `/dev/pty/ttyp0` (slave) would be the lowest numbered pseudo terminal pair; `/dev/ptym/ptywf` and `/dev/pty/ttywf` would be the highest ordered pair.

All pseudo terminals must be character device files.

The master pseudo terminal device driver must have a major number of 16. The slave pseudo terminal device driver must have a major number of 17.

The minor number for both master and slave pseudo terminal device files is:

`0x00YYYY`

where `YYYY` is a unique hexadecimal value, in the range of 0 to `npty-1`, where `npty` is a configurable system parameter. (Refer to Chapter 2, “Constructing an HP-UX System” and to Appendix A, “System Parameters” in the *System Administration Tasks* manual. This value is used to identify the relationship between master and slave.

Using the lowest numbered pair, a sample `mknod` command would be:

```
mknod /dev/ptym/ptyp0 c 16 0x000000
mknod /dev/pty/ttyp0 c 17 0x000000
```

These commands would create a master and slave pair called `ptyp0` and `ttyp0`. The minor numbers, shown above as zeros, must be in the range of 0 to `npty-1` where `npty` is a configurable system parameter.

Your application’s documentation will tell you how many pseudo terminals you need. For example, HP Windows/9000 needs three master/slave pairs per window.

For more information on pseudo terminals, refer to both the *termio*(5) and *pty*(5) sections of the *HP-UX Reference*.

Graphic Displays

The device files for graphics displays should be located in the `/dev` directory. Device file naming conventions use `/dev/graphics` or `/dev/crt` for graphics displays. To address overlay planes of a graphics display, precede the device file name with the letter “o”; for example, `/dev/graphics` and `/dev/ographics`, and `/dev/crt` and `/dev/ocrt`. If your graphics display is to be your system console, name the device file `/dev/console`.

Graphic display devices are accessed in character mode.

The device driver name for graphics displays is `framebuf` and the major number is 12.

The minor number format for graphic devices is:

`0xSOFXXX`

where each letter represents a hexadecimal digit, as follows:

<code>0x</code>	indicates a hexadecimal number
<code>S</code>	specifies the system bus module number
<code>0</code>	is the value 0
<code>F</code>	specifies the function number (0)
<code>XXX</code>	is zero or contains device-specific information as defined in the appropriate Starbase Device Drivers Library

The `/dev/crt` device file is already resident on your system.

Additional information about graphics can be found in *graphics(7)* of the *HP-UX Reference*.

HP-HIL Devices

HP-HIL devices include the HP Touch Bezel, keyboards, mouse, digitizers, and control knobs. To communicate with HP-HIL devices, the system needs one device file with a major number 23. For each HP-HIL device, a device file with major number 24 must exist. These eight device files already exist on your system, one for major number of 23 and seven for devices with major number 24.

HP-HIL devices require character device files.

The HP-HIL driver name is `hil` and has a major number of 24. The raw HP-HIL driver name is `r8042` and has a major number of 23.

The minor number format is as follows:

`0xSEFOBO`

where each letter represents a single hexadecimal digit, as follows:

<code>Ox</code>	indicates a hexadecimal number
<code>S</code>	specifies the system bus module number
<code>C</code>	specifies the slot number; this value is zero if your device is connected to a Core I/O interface; EISA is always 4.
<code>F</code>	specifies the function number
<code>0</code>	is the value 0
<code>B</code>	specifies the position on the HP-HIL bus
<code>0</code>	is the value 0

mknod Examples for HP-HIL Devices

The following **mknod** commands create the necessary device file with major number 23 and HP-HIL device files with major number 24 for the HP-HIL devices. You can use these commands to recreate the default device files if you accidentally delete them.

```
mknod /dev/rhil c 23 0x203000
mknod /dev/hil1 c 24 0x203010
mknod /dev/hil2 c 24 0x203020
mknod /dev/hil3 c 24 0x203030
mknod /dev/hil4 c 24 0x203040
mknod /dev/hil5 c 24 0x203050
mknod /dev/hil6 c 24 0x203060
mknod /dev/hil7 c 24 0x203070
```

Additional information on the HP-HIL interface can be found in *hil(7)* of the *HP-UX Reference*.

Printers, Plotters and Scanners

The device files for printers, plotters and scanners should be located in the `/dev` directory. The convention for naming device files for printers is `ptr_XXXXX`, for plotters is `plt_XXXX`, and for scanners is `scn_XXXXX`. Replace the `XXXXX` with the model of printer, plotter or scanner. There are three types of interfaces for printers, plotters and scanners: RS-232-C (serial), parallel and HP-IB.

Printers, plotters and scanners are character-mode devices.

The RS-232-C driver name is `asio0` and the major number is 1. The parallel driver name is `CharDrv` and the major number is 11. The HP-IB driver name is `hpib` and the major number is 21.

For printers and plotters, the last four bits of the minor number determine the mode of operation as shown in the next section.

What To Do Next

After you create the device files for your printer or plotter, as outlined in the following sections, refer to “Managing Printers and Printer Output” in the *System Administration Tasks* manual for instructions on adding this device to the line printer spooling system.

Minor Number Format on an RS-232-C Interface

Minor number format is related to the system bus structure. See Chapter 1, "Introduction" for a diagram of the system bus structure.

The RS-232-C serial interface minor number has the following format:

`0xZZF0CA`

where each letter represents a single hexadecimal digit, as follows:

0x indicates a hexadecimal number
ZZ Replace with 20 which indicates a serial connection off the core I/O.
F specifies the function number. Function number 4 is for port A; 5 is for port B.
0 is the value 0 in two hexadecimal digits
C specifies FIFO control. The range is 0x0 to 0xf. This bit specifies the trigger level for receive FIFO and transmit limit for transmit FIFO. See the *termio(7)* manpage for details.
A This is a hexadecimal representation that specifies the hardware flow control state and access type as shown in the following table:

Bit	Value
3	RTS/CTS hardware flow control. 0 = OFF, 1 = ON.
2	1=direct connect, 0=modem
1	1=CCITT protocol (Europe), 0=Simple protocol (U.S.)
0	1=dialout modem, 0=dial-in modem

There are four RS-232-C serial device files for printers and plotters shipped with your system. The following list shows the device files shipped with your system, and their associated minor numbers.

Device File	Minor Number
/dev/ptr_rs232_a	0x204004
/dev/plr_rs232_a	0x204004
/dev/ptr_rs232_b	0x205004
/dev/plr_rs232_b	0x205004

The `_a` or `_b` part of the device file specifies the port. The RS-232-C serial ports are labeled A and B near the RS-232-C connectors.

You can use these files or create your own with the `mknod` command.

Minor Number Format on a Parallel Interface

Minor number format is related to the system bus structure. See Chapter 1, “Introduction” for a diagram of the system bus structure.

The parallel interface minor number has the following format:

0xSCFZZA

where each letter represents a single hexadecimal digit, as follows:

0x	indicates a hexadecimal number
S	specifies the system bus module number
C	specifies the slot number; this value is zero if your device is connected to a Core I/O interface; EISA is always 4
F	specifies the function number
ZZ	replace with 00 which is the value 0 in two hexadecimal digits
A	specifies the access type:

Bit	Value
3	Always 0
2	1=direct connect, 0=modem

Three parallel device files are shipped with your system: one for printers, one for plotters and one for scanners. The following list shows the minor numbers associated with each of these device files.

Device File	Minor Number
/dev/ptr_parallel	0x206002
/dev/plt_parallel	0x206002
/dev/scn_parallel	0x206003

You may use these files or create your own with the **mknod** command.

Minor Number Format on an E/ISA HP-IB Interface

Minor number format is related to the system bus structure. See Chapter 1, “Introduction” for a diagram of the system bus structure.

The HP-IB interface minor number has the following format:

`0xSCFBUV`

where each letter represents a single hexadecimal digit, as follows:

Ox	indicates a hexadecimal number
S	specifies the system bus module number
C	specifies the slot number (always 4 for EISA HP-IB)
F	specifies the function number (always 0 for EISA HP-IB)
B	specifies the bus address
U	specifies the unit number (typically 0).
V	specifies the volume number (typically 0).

If you have a printer connected to your EISA interface, with HP-IB bus address 1, the correct `mknod` command line is:

```
mknod /dev/dil c 21 0x430100
```

E/ISA Configuration

Introduction to E/ISA Board Configuration

This appendix explains how to configure EISA and ISA I/O boards on Hewlett-Packard Series 700 workstations containing EISA backplanes. (ISA stands for Industry Standard Architecture. EISA stands for Extended Industry Standard Architecture. E/ISA stands for both architectures.)

E/ISA boards cannot be used until they have been configured with the `eisa_config` program. `eisa_config` has two modes: **automatic mode**, which executes automatically each time you reboot the system, and **interactive mode**, which you can execute from the command line.

- If you are adding, moving, or removing EISA boards, the automatic mode of `eisa_config` can usually configure the boards without any user intervention.
- If you are adding, moving, or removing ISA boards, you must run `eisa_config` in interactive mode. ISA boards do not have readable ID registers and thus cannot be automatically detected by `eisa_config`.

How to Use this Appendix

This appendix contains the following sections:

- “Introduction to E/ISA Board Configuration” provides a conceptual overview of the two modes of `eisa_config`. Use this section to understand the use of `eisa_config`. It covers the following topics:
 - Introduction.
 - How `eisa_config` works.

- “Configuring EISA Boards Using Automatic Mode” explains how to use the automatic mode of `eisa_config`. Use this section to configure HP and non-HP EISA boards. It covers the following topics:
 - Adding an EISA board using SAM (recommended).
 - Adding an EISA board using HP-UX commands.
 - Adding an HP EISA board
 - Adding a non-HP EISA board
 - Moving an EISA board.
 - Removing an EISA board.
 - Using `eisa_config` in automatic mode.
- “Configuring E/ISA Boards Using Interactive Mode”, explains how to use the interactive mode of `eisa_config`, and provides step-by-step instructions for specific tasks using interactive mode. Use this section to configure ISA boards, and to change choices for board functions. It covers the following topics:
 - Using `eisa_config` in interactive mode.
 - Adding an E/ISA board.
 - Moving an E/ISA board.
 - Removing an E/ISA board.
 - Changing choices for board functions.
 - Example interactive `eisa_config` session.
- “Troubleshooting E/ISA Board Configuration”, explains how to troubleshoot E/ISA board configuration problems.

Note

This appendix does not explain how to write a device driver. If you are writing your own device driver, refer to *HP-UX Driver Development Guide*.

Introduction

Both the automatic and interactive modes of the `eisa_config` program help you create a conflict-free configuration for E/ISA boards.

Each E/ISA board in a backplane can use one or more system resources, such as direct memory access channels, interrupt lines, register addresses, and memory. However, a given board may be able to use only some of the choices available for a resource. For example, 11 interrupt lines are available, but a board may be able to use only lines 3, 5, and 6. Hence, there needs to be a way to tell the board which resources to use. The `eisa_config` program can suggest resource assignments for ISA boards and automatically assign resources for EISA boards.

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ISA Boards

For ISA boards, a set of physical **switches** or **jumpers** on the board determines which resources the board will use, to what address range the board will respond, and other board-specific options and modes. The board manufacturer tells you how to set these switches and jumpers. Unfortunately, there are few conventions for switch and jumper usage among ISA boards, and it is easy to inadvertently assign the same resource to two different boards by setting a switch incorrectly. Symptoms of such conflicts vary depending on the type of board and conflict, and are often difficult to diagnose.

EISA Boards

EISA boards usually do not have physical switches or jumpers for resource assignment. Instead, each EISA board has a configuration file (`cfg` file) that describes how the board can be used and which resources it needs. The `eisa_config` program then uses these `cfg` files to develop a conflict-free configuration.

cfg Files

All EISA boards have corresponding `cfg` files. ISA boards used in HP-UX workstations must also have corresponding `cfg` files. Using the `cfg` file, `eisa_config` can automatically configure an EISA board. Although it cannot automatically configure an ISA board, it can tell you how to set the switches or jumpers on the board so that no resource conflicts occur. However, you should be aware that some configurations are simply not possible; for instance, two boards from different manufacturers may both require the same resource. If this happens, only one of the boards can be used.

The following list describes `cfg` file considerations:

- Each E/ISA board that will be connected to the workstation must have a `cfg` file in the `/etc/eisa` directory.
- Do not remove the `cfg` files after `eisa_config` has been run. These files are needed every time you reboot the system.
- Do not change the file names of these files.

`cfg` file names have the following format:

`rXXXnnnn.cfg`

where:

<code>r</code>	is usually ! (or a hex digit).
<code>XXX</code>	is a three-letter abbreviation for the board manufacturer's name.
<code>nnnn</code>	is four digits. The first three digits represent the product ID and the fourth is the revision level.

The `eisa_config` program relies on this file name format to automatically match a board with its `cfg` file.

The `cfg` files use a specific grammar that describes the following attributes for each board:

- Board-level information. This includes board ID, manufacturer, ASCII text that describes the board's capabilities, information on what type of slot the board can go in, and other attributes.

Each board can also contain lists of board-wide resources, such as I/O registers, switches, and jumpers, and information on how they should be initialized.

- Function-level information. A board is made up of a set of one or more **functions**, each of which represents one possible use of the board. For example, a board may have a serial port and a parallel printer port. Each function has a separate block in the `cfg` file that specifies the function's name, type, and the set of choices for how it can be configured.
- Choice-level information. Each function has a set of **choices**. Each choice block has a name and a set of attributes. These attributes specify which resources the choice will use and whether the function is enabled or disabled with this choice. Each choice also specifies any initialization requirements, such as high-speed for HP-IB.

When `eisa_config` adds a board, it selects a choice for each function. Generally, the first choice for each function is selected (the default). If the default choice for a function would create a conflict with another board, `eisa_config` automatically selects another choice. If the default function needs to be changed, refer to "Changing Choices for Board Functions Using Interactive Mode" for selecting a board function.

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Swapping to an E/ISA Device

If you are adding a device to your system that you plan to use as a primary swap device, and the device will be connected to an E/ISA card, you *must* perform the task in the following order:

- Shut down the system without changing the kernel (still swapping to the original swap device).
- Add the E/ISA board and connect the new device.
- Boot the system, which is still swapping to the original swap device.
- Configure the kernel to swap to the new E/ISA device.
- Reboot the system.
- If the new swap device is connected to an EISA card, it will be configured automatically by `eisa_config`. If it is connected to an ISA card, you must run `eisa_config` manually to configure the new swap device.

How eisa_config Works

The `eisa_config` program has two modes:

- Automatic mode, which runs automatically each time you boot the system.
- Interactive mode, which you run from the command line.

In either mode, after a conflict-free board configuration has been built, the configuration is saved in **EISA non-volatile memory (NVM)**. (Non-volatile memory is located on the system board and is not erased if the computer's power supply is turned off.) When `eisa_config` saves a configuration in NVM, it also writes that configuration to the **system configuration information (sci)** file, `/etc/eisa/system.sci`, so that the `sci` file and NVM are identical.

`eisa_config` can initialize a configuration from the `sci` file. You can copy one configuration to many machines. For details, refer to "Saving the Configuration and Exiting Using Interactive Mode".

Automatic Mode

Each time you boot the system, `eisa_config` executes automatically from `/etc/bcheckrc` after the root file system has been mounted, but before any other file systems or swap areas are in use.

`eisa_config` compares the current board configuration to the configuration recorded in NVM. If the current configuration and the NVM configuration do not match, `eisa_config` compares the current configuration to the configuration recorded in `/etc/eisa/system.sci`. In most cases, the current configuration and one of the recorded configurations match, and the boot process continues. Refer to "Configuring EISA Boards Using Automatic Mode".

If the actual and recorded configurations do not match, `eisa_config` attempts to generate a new configuration. If it cannot, you still may be able to generate a correct configuration by using `eisa_config` interactively. Refer to "Configuring E/ISA Boards Using Interactive Mode".

Interactive Mode

The interactive mode of `eisa_config` allows you to add, move, and remove ISA boards. It also allows you to view information about E/ISA boards in the configuration and to change currently selected choices for functions.

You must use the interactive mode of `eisa_config` in three cases:

- You need to add, move, or remove an ISA board.
- Automatic mode was unable to generate an error-free board configuration. Fixing the error may require adding an EISA board interactively or changing a function choice. The error message will explain how to fix the error.
- You want to change the choice that `eisa_config` automatically selected for a given board function (for instance, you may want to specify low-speed for HP-IB).

Refer to “Configuring E/ISA Boards Using Interactive Mode”.

Adding Device Drivers to the Kernel

The E/ISA board device driver must be part of the kernel before you can run `eisa_config`. HP supports both HP and non-HP E/ISA boards. The manufacturer of the non-HP board must provide a driver and additional information to create device files. The `eisa` driver is required for all (HP and non-HP) E/ISA boards. Additionally, peripheral device drivers must be part of the kernel before you can access them. Peripheral device drivers and the board driver can be added at the same time. This saves time by regenerating the kernel and rebooting your system only once. This section describes the following tasks:

- Adding HP Drivers to the kernel using SAM
- Adding HP Drivers to the kernel using HP-UX Commands
- Adding Non-HP Drivers to the kernel using HP-UX Commands

Adding HP Drivers to the Kernel Using SAM

To add HP drivers using SAM:

1. Ensure that you have superuser capabilities.
2. Ensure you are logged onto the machine to which the EISA board will physically reside, client or server. See *Managing Clusters of HP 9000 Computers* for additional cluster information. You can log in either physically on the correct cluster node or remotely by using the `rlogin` command.
3. Warn all users to get off the system. Use `cwall` in a cluster environment and `wall` in a standalone environment.

```
/etc/cwall or /etc/wall  
Shutdown for configuration changes in one minute.  
Please log off now.  
^C
```

See `cwall(1)` and `wall(1)` in *HP-UX Reference*.



4. Shut down the system and switch to single-user mode with the **shutdown** command:

shutdown

See *shutdown(1M)* in *HP-UX Reference*.

Wait for the system to switch to single-user mode (you will see a shell prompt).

5. To add the **eisa** and peripheral drivers to the kernel using SAM, enter:

sam

For information on using SAM, refer to the *System Administration Tasks* manual.

6. Highlight **Kernel Configuration** and activate the **Open** control button.

7. Highlight **Drivers** and activate the **OK** control button.

A list of drivers, their current status, and their pending status appears. *Current status* shows whether a driver is in or out of (not in) the currently executing kernel. *Pending status* shows whether a driver will be added (in) or removed (out) when you next regenerate the kernel.

While you are adding the **eisa** driver, you can also add any drivers required by the peripherals at the same time. The peripheral drivers are specified elsewhere in this manual.

8. For each driver you wish to add, highlight the driver name and choose **Add Driver to Kernel** from the “Actions” menu.

The “Pending State” column entry for the driver changes to “In”.

You must recreate the kernel and install it to implement the change.

9. Choose **Create a New Kernel...** from the “Actions” menu.
10. Activate the **Yes** control button to confirm that you want to reconfigure the kernel now.
11. Choose one of the following:
 - **Create a new kernel now**

This requires a reboot of your system. SAM prompts you to continue.
 - **Defer kernel creation until later**

SAM preserves the request to reconfigure the kernel. If you attempt to exit SAM before you have reconfigured the kernel, SAM prompts you to reconfigure the kernel or cancel your reconfiguration request.
 - **Cancel all kernel modifications**
12. Follow the prompts to regenerate and reinstall the new kernel. After SAM generates a new kernel, choose one of the following actions and activate the **OK** control button:
 - **Move the kernel into place and reboot the system now**
 - **Move the kernel into place but do not reboot the system**
 - **Exit without moving the kernel into place**

There is an option to enable or disable overwriting the kernel configuration file `/etc/conf/dfile`.

If you *enable* overwriting the kernel configuration file, SAM moves `/etc/conf/dfile.SAM` to `/etc/conf/dfile`, and you will lose any comments you have added to `dfile`.

If you *disable* overwriting the kernel configuration file, `/etc/conf/dfile` will not represent your current kernel (`/hp-ux`) when you reboot your system, but `/etc/conf/dfile.SAM` will.

We highly recommend the use of `/etc/conf/dfile` for the kernel configuration file so that it remains up to date with the executing kernel, `/hp-ux`. Some system software depends on `/etc/conf/dfile` representing the currently executing kernel.

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If you do not want SAM to overwrite `/etc/conf/dfile`, because of comments you want to retain, do the following:

- a. Choose the SAM option to disable overwriting the kernel configuration file.
- b. Move the kernel into place (optionally rebooting the system).
- c. Copy your comments from `/etc/conf/dfile` to `/etc/conf/dfile.SAM`. Be careful to add only your comments to the file. At this stage, you want `/etc/conf/dfile.SAM` to reflect your current kernel configuration.
- d. Copy or save `/etc/conf/dfile.SAM` to `/etc/conf/dfile`.

The kernel configuration file `/etc/conf/dfile` now represents the current `/hp-ux` kernel.

13. Exit SAM. Follow the prompts to regenerate and reinstall the kernel. SAM will prompt you to reboot the system. Answer YES to reboot the system.

Adding HP Drivers to the Kernel Using HP-UX Commands

The driver you need to add to your kernel configuration file to configure devices on your E/ISA board is the `eisa` device driver. Follow the instructions given in Chapter 11, “Setting Up Devices Using HP-UX Commands” for adding a driver to your kernel using commands.

Where you are instructed to edit the `/etc/conf/dfile` to add the necessary device drivers:

- Find the line containing `* DEVICE DRIVERS`.
- Below this line, add the `eisa` driver and the peripheral device driver. If an asterisk (“*”) appears before the driver name, remove the asterisk.

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Adding Non-HP Drivers to the Kernel Using HP-UX Commands

1. Ensure that you have superuser capabilities.
2. Ensure that you are logged onto the machine where the EISA board will physically reside, client or server. See *Managing Clusters of HP 9000 Computers*, for additional cluster information. You can log in either physically on the correct cluster node or remotely by using the `rlogin` command.
3. Load the board's drivers into the `/etc/conf` directory.
4. If you have the object code for the non-HP board driver, skip this step. If you have only the source code for the non-HP board driver, you need to compile it with the following steps:
 - a. Type the following commands. If provided, use the compilation command supplied by the board manufacturer. *non-HP-driver* stands for the name of the driver as supplied by the board manufacturer.

```
cd /etc/conf
cc -c +M +01 -DKERNEL -D_KERNEL -Dhp9000s800 -D_WSI0 \
-I/etc/conf/h -I/etc/conf/machine -I/usr/include/sys \
non-HP-driver.c
```

This command tells the compiler to look for include files in `/etc/conf/h`, `/etc/conf/machine`, and `/usr/include/sys`. The `+M` option prevents inline floating point code, which will cause a panic in kernel mode. The `+01` option performs level 1 (local) code optimization; the `0` is the letter `O`, not a zero. You can also check `/etc/config.mk` for the compile flags that were used to build your kernel.

- b. If the compilation succeeds, `/etc/conf` should contain a file named *non-HP-driver.o*. If the compilation fails, remove the `+01` option and try to compile the source code again.
5. Add the non-HP drivers to the HP-UX kernel by copying them into a standard library:

```
cd /etc/conf
ar -r libusrdrv.a non-HP-driver.o
```

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6. Make a backup copy of the `/etc/master` file:

```
cp /etc/master /etc/master.old
```

The `/etc/master` file lists all the device drivers.

7. Edit `/etc/master` to include the drivers. Note that you may need to make more than one entry for the board driver and device drivers. Find the lines shown below. The first line indicates the six information fields that must be supplied for your drivers.

```
*name    handle   type    mask    blk    char
*
```

where:

name	is the name of this driver in the <code>dfile</code> .
handle	is the name prefixed to the name of the driver entry points.
type	is a bit mask indicating whether the device is character, block, or both.
mask	is a bit mask specifying the functions performed by the device.
blk	is the major number if it is a block device.
char	is the major number if it is a character device.

Add a line containing these six fields for each driver. The board manufacturer should supply the lines you need to add. Refer to *master(4)* in the *HP-UX Reference* manual.

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Configuring EISA Boards Using Automatic Mode

This section explains how to add, move, or remove an EISA board using the automatic mode of `eisa_config`. If you need to add, move, or remove an ISA board, refer to “Configuring E/ISA Boards Using Interactive Mode”.

This section includes the following information:

- Using `eisa_config` in automatic mode.
- Setting switches and jumpers.
- Adding an EISA board using SAM (recommended).
- Adding an EISA board using HP-UX commands.
 - Adding an HP EISA board
 - Adding a non-HP EISA board
- Moving an EISA board.
- Removing an EISA board.

Using `eisa_config` in Automatic Mode

After you have added, moved, or removed an EISA board and booted your system, `eisa_config` executes automatically. It compares the current board configuration to the configuration recorded in NVM.

1. If the current configuration matches the configuration recorded in NVM, `eisa_config` exits without messages, and the boot process continues.
2. If the current configuration does *not* match the configuration recorded in NVM, `eisa_config` checks to see if it matches the configuration saved in `/etc/eisa/system.sci`.
 - a. If the current configuration matches the configuration saved in `/etc/eisa/system.sci`, `eisa_config` initializes from `system.sci`. NVM is updated to match the current configuration and `/etc/eisa/system.sci`.

Because `eisa_config` can initialize a configuration from the `sci` file, you can copy one configuration to many machines. For details, refer to “Saving the Configuration and Exiting Using Interactive Mode”.

- b. If the current configuration does *not* match neither NVM nor `/etc/eisa/system.sci`, `eisa_config` tries to generate a new configuration with all of the boards currently in the backplane.
- i. If a new configuration can be generated, a message is displayed and the boot process continues. If necessary, `eisa_config` automatically reboots the system. NVM and `/etc/eisa/system.sci` are updated to reflect the new configuration.

For new boards, `eisa_config` automatically selects choices for board functions. However, it will not change an existing board's choices. After the boot process finishes, check `/etc/eisa/config.log` to see what choices were selected. If any are unacceptable, refer to "Changing Choices for Board Functions Using Interactive Mode".

- ii. If a new configuration *cannot* be generated, an error message is displayed and also logged to the file `/etc/eisa/config.err`.

When the system has finished booting, you can fix the error. Fixing the error may require one or more of the following:

- 1) Adding the `eisa` driver to the kernel.
- 2) Putting the required `cfg` file into `/etc/eisa`.
- 3) Running `eisa_config` interactively to add a board that had a resource conflict or to change a choice for a new board. Refer to "Configuring E/ISA Boards Using Interactive Mode".
- 4) Replacing hardware (if NVM is broken).

For more information about `eisa_config` configuration problems, refer to "Troubleshooting E/ISA Board Configuration".

If the system cannot proceed because switches may need to be set, `eisa_config` will show you what the switches should look like and ask you if the switches on the boards are correct. If they are not, `eisa_config` will halt the system so that you can set the switches if necessary.

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Setting Switches and Jumpers Using Automatic Mode

If you need to set switches or jumpers:

1. Be sure to record the required switch settings (displayed on your screen).
2. After `eisa_config` halts the system, turn off the power.
3. Set the switches or jumpers.
4. Turn on the power and boot the system.

The following example shows a typical display for required switch settings. The picture represents the actual switches and jumpers on the board and their labels (if any).

```
Slot 2
XYZ Networking Board
Switch Name: I/O Base Address

Switches 1 through 3 select the I/O Base Address,
switch 4 is not applicable.
NOTE: 'off' in the diagram below corresponds to 'OPEN' on board
switches.

Default setting
  1  0  0  1
Required setting
  1  0  0  1
+-x-+-+---+---+x-+on
|  |  |  |  |
+---+x-+-x-+---+off
  1  2  3  4
```

Default setting indicates the manufacturer's default setting, if one exists.

Required setting indicates the setting required for a conflict-free configuration. 1 means "on" and 0 means "off."

Adding an EISA Board Using SAM and Automatic Mode

Use this section to add HP-supplied EISA boards. To add a non-HP-supplied EISA board to your system refer to “Adding an EISA Board Using HP-UX Commands and Automatic Mode”.

To use E/ISA boards, you must have the **eisa** driver configured into the kernel. This driver is a part of the default HP-UX kernel configuration. To add an HP EISA board using SAM:

1. Ensure that you have superuser capabilities.
2. Ensure you are logged onto the client or server machine where the EISA board will physically reside. See *Managing Clusters of HP 9000 Computers*, for additional cluster information. You can log in either physically on the correct cluster node or remotely by using the **rlogin** command.
3. Ensure that the board's **cfg** file is in the **/etc/eisa** directory. If the **cfg** file is provided on media with the card, load the board's **cfg** file from the supplied media into the **/etc/eisa** directory.
4. Ensure that the **eisa** and peripherals device drivers are configured into your kernel. See “Adding HP Drivers to the Kernel Using SAM”.
5. Warn all users to get off the system. Use **cwall** in a cluster environment and **wall** in a standalone environment.

```
/etc/cwall or /etc/wall  
Shutdown for hardware changes in one minute.  
Please log off now.  
^C
```

See *cwall(1)* and *wall(1)* in *HP-UX Reference*.

6. Halt the system with the **shutdown** command:

```
shutdown -h
```

See *shutdown(1M)* in *HP-UX Reference*.

7. Once the system is halted, turn off the power.

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- A**
8. Install the EISA boards. If you are connecting a peripheral device to this board, connect the device as described elsewhere in this manual and turn it on.
 9. Turn on the computer. The HP-UX kernel boots and `eisa_config` runs automatically attempting to create a new configuration.

Adding an EISA Board Using HP-UX Commands and Automatic Mode

This section describes two ways to add an EISA board to your system. To add a non-HP-supplied EISA board, use “Adding a Non-HP EISA Board Using HP-UX Commands and Automatic Mode” below. To add an HP-supplied EISA board without using SAM for kernel configuration, use “Adding an HP EISA Board Using HP-UX Commands and Automatic Mode” below.

To use E/ISA boards, you must have the `eisa` driver configured into the kernel. This driver is a part of the default kernel configuration.

Adding an HP EISA Board Using HP-UX Commands and Automatic Mode

To add an HP EISA board:

1. Ensure that you have superuser capabilities.
2. Ensure you are logged onto the client or server machine where the EISA board will physically reside. See *Managing Clusters of HP 9000 Computers*, for additional cluster information. You can log in either physically on the correct cluster node or remotely by using the `rlogin` command.
3. Ensure that the board's `cfg` file is in the `/etc/eisa` directory. If the `cfg` file is provided on media with the card, load the board's `cfg` file into the `/etc/eisa` directory. See “`cfg` Files” for `cfg` file naming conventions.
4. Ensure that the `eisa` and peripherals drivers are part of the kernel. See “Adding HP Drivers to the Kernel Using HP-UX Commands”.
5. Create the device files for the board and the peripherals with the `mknod` command. Refer to `mknod(1M)` in *HP-UX Reference* and to Chapter 11, “Setting Up Devices Using HP-UX Commands”.

6. Warn all users to get off the system. Use `cwall` in a cluster environment and `wall` in a standalone environment.

```
/etc/cwall or /etc/wall  
Shutdown for hardware changes in one minute.  
Please log off now.  
^C
```

See `cwall(1)` and `wall(1)` in *HP-UX Reference*.

7. Halt the system with the `shutdown` command:

```
shutdown -h
```

See `shutdown(1M)` in *HP-UX Reference*.

8. Once the system is shut down, turn off the power.
9. Physically install the EISA boards.
10. Turn on the computer. The HP-UX kernel boots and `eisa_config` runs automatically attempting to create a new configuration. Refer to “Using eisa“ config in Automatic Mode”.

Note

If you are moving a network board, you need to boot the computer again. Enter:

```
shutdown -r
```

A

Adding a Non-HP EISA Board Using HP-UX Commands and Automatic Mode

For non-HP-supplied boards, the `cfg` files and drivers will be shipped on separate media with the board.

A

1. Ensure you are logged onto the machine to which the EISA board is physically residing, client or server. See *Managing Clusters of HP 9000 Computers*, for additional cluster information. You can log in either physically on the cluster node in question or remotely by using the `rlogin` command.
2. Ensure that you have superuser capabilities.
3. Load the board's `cfg` file into the `/etc/eisa` directory. `cfg` files should never be removed from this directory. See "cfg Files" for `cfg` file naming conventions.
4. Ensure that the `eisa` and peripherals drivers are part of the kernel, see "Adding HP Drivers to the Kernel Using HP-UX Commands".
5. Create the device files for the board and the peripherals with the `mknod` command. Refer to `mknod(1M)` in *HP-UX Reference* and to Chapter 11, "Setting Up Devices Using HP-UX Commands".
6. Warn all users to get off the system. Use `cwall` in a cluster environment and `wall` in a standalone environment.

/etc/cwall or /etc/wall

Shutdown for hardware changes in one minute.

Please log off now.

^C

See `cwall(1)` and `wall(1)` in *HP-UX Reference*.

7. Halt the system with the `shutdown` command:

`shutdown -h`

See *shutdown(1M)* in *HP-UX Reference*.

8. Once the system is shut down, turn off the power.
9. Physically install the EISA boards.
10. Turn on the computer. The HP-UX kernel boots and `eisa_config` runs automatically attempting to create a new configuration. Refer to “Using `eisa`config` in Automatic Mode”.

Note

If you are moving a network board, you need to boot the computer again. Enter:

`shutdown -r`

A

Moving an EISA Board Using Automatic Mode

Follow the steps in this section to move an EISA board from one slot to another.

A

1. Ensure that you have superuser capabilities.
2. Remove the old device files for the board with the **rm** command.
3. Use the **mknod** command to create a new device file using the new slot number. Refer to *mknod(1M)* in *HP-UX Reference* and to Chapter 11, “Setting Up Devices Using HP-UX Commands”.

For non-HP-supplied boards and peripherals, the board manufacturer should provide the major number block or character type definition and any driver-specific minor number information you need to create the device files.

4. Warn all users to get off the system. Use **cwall** in a cluster environment and **wall** in a standalone environment.

```
/etc/cwall or /etc/wall  
Shutdown for hardware changes in one minute.  
Please log off now.  
^C
```

See *cwall(1)* and *wall(1)* in *HP-UX Reference*.

5. Halt the system with the **shutdown** command:

```
shutdown -h
```

See *shutdown(1M)* in *HP-UX Reference*.

6. Once the system is shut down, turn off the power.
7. Physically move the EISA boards.
8. Turn on the computer. The HP-UX kernel boots and **eisa_config** runs automatically attempting to create a new configuration. Refer to “Using eisa” config in Automatic Mode”.

Note

If you are moving a network board, you need to boot the computer again. Enter:

shutdown -r

A

Removing an EISA Board Using Automatic Mode

Use the steps in this section to remove an EISA board.

1. Ensure that you have superuser capabilities.
2. Warn all users to get off the system. Use **cwall** in a cluster environment and **wall** in a standalone environment.

/etc/cwall or /etc/wall

Shutdown for hardware changes in one minute.

Please log off now.

^C

See *cwall(1)* and *wall(1)* in *HP-UX Reference*.

3. Halt the system with the **shutdown** command:

shutdown -h

See *shutdown(1M)* in *HP-UX Reference*.

4. Once the system is shut down, turn off the power.
5. Physically remove the EISA boards.
6. Turn on the computer. The HP-UX kernel boot and **eisa_config** runs automatically attempting to create a new configuration. Refer to “Using eisa” config in Automatic Mode”.

If your system no longer has any EISA or ISA boards, the kernel can be reconfigured to remove the **eisa** driver.

Configuring E/ISA Boards Using Interactive Mode

This section explains how to use the `eisa_config` program interactively. Use `eisa_config` interactively only if you meet one or more of the following conditions:

- You need to add, remove, or move an ISA board. ISA boards do not have readable ID registers and thus are not automatically recognized by `eisa_config`.
- `eisa_config` exited from automatic mode with an error message requiring you to change the choice for a function. See “Changing Choices for Board Functions Using Interactive Mode”.
- You want to change the choice that `eisa_config` automatically selected for a function. See “Using `eisa_config` in Interactive Mode”.
- `eisa_config` exited from automatic mode with an error message requiring you to add a board interactively. See “Using `eisa_config` in Interactive Mode” and “Adding an E/ISA Board Using Interactive Mode”.

This section includes the following information:

- Using `eisa_config` in interactive mode.
- Adding an E/ISA board interactively.
- Moving an E/ISA board interactively.
- Removing an E/ISA board interactively.
- Changing choices for board functions interactively.
- Example interactive `eisa_config` session.

Using `eisa_config` in Interactive Mode

`eisa_config` must be run interactively when you need to change the ISA board configuration in any way, or when you need to change the choice for a board function.

`eisa_config` requires the `eisa` driver for NVM. This driver is a part of the default HP-UX kernel configuration. If you have removed this driver, you must add it again when you add other required drivers. Refer to “Adding Device Drivers to the Kernel”.

Always run `eisa_config` interactively *before* physically changing the configuration.

This section explains how to do the following tasks:

- Starting `eisa_config` interactively.
- Getting online help.
- Viewing board information.
- Displaying board configuration.
- Initializing the configuration.
- Saving the configuration and exiting.

Starting in Interactive Mode

You must be superuser to use `eisa_config` interactively.

To start the `eisa_config` program, type the following command:

```
/etc/eisa_config [-c cfgfile] [-n scifile]
```

Normally you will use the above command without options. However, two options are available:

- The `-c` option allows you to check the specified `cfg` file for correctness. It verifies that the file follows the correct grammar and that `eisa_config` will be able to use it. This option is useful only for diagnosing errors in a particular `cfg` file. You cannot change the configuration with this option.
- The `-n` option allows you to initialize the E/ISA configuration from a particular `sci` file instead of from NVM.

sci files are useful if your site has several identically configured workstations. You can run **eisa_config** on one workstation to build an optimal configuration, use the **save** command to save it to a new **sci** file, and copy the file to the other workstations (as **/etc/eisa/system.sci**).

A

When you boot the other workstations, **eisa_config** will run automatically and initialize the configuration from **/etc/eisa/system.sci** (if the contents of NVM do not already match the current configuration).

Otherwise, you can run **eisa_config** interactively on each workstation with the **-n** option and specify the new **sci** file. After starting **eisa_config** with the **-n** option, you must use the **save** command to write the configuration to NVM, then reboot so that each workstation will have the new configuration. When you start **eisa_config**, you will see a display similar to that in Figure A-1. The display shows the boards currently configured in each slot, followed by the **EISA:** prompt.

```
HP-UX E/ISA CONFIGURATION UTILITY

Type q or quit to leave eisa_config.
Type ? or help for help.

Slot      CFG File      Contents
0          !HWPC010      HP Series 700 EISA System Board
1          !XYZ1401      XYZ SCSI Controller
2          ** EMPTY **
3          !XYZ1702      XYZ Centronics Interface
4          ** EMPTY **

EISA:
```

Figure A-1. eisa_config Display

Table A-1 lists the basic **eisa_config** commands. The following sections provide more detail on these commands and their options.

Table A-1. Basic Commands

Command	Description
add <i>cfgfile slotnum</i>	Adds the specified board to the specified slot.
cfgfiles	Lists the cfg files currently in /etc/eisa .
cfgtypes	Lists and explains the types of boards that have cfg files in /etc/eisa . For example, NET is a network board.
change <i>slotnum functionnum choicenum</i>	Changes the choice used for a given board function.
comment	Displays any comments or help supplied by a board manufacturer in the cfg file.
help or ?	Lists and explains eisa_config commands.
init [<i>filename</i>]	Deletes all changes in this session of eisa_config by initializing the configuration.
move <i>curslotnum newslotnum</i>	Moves a board from one slot to another.
quit or q	Exits eisa_config .
remove <i>slotnum</i>	Removes a board from the specified slot.
save [<i>filename</i>]	Saves the current configuration.
show	Displays working configuration. Shows a list of all slots and whether they are empty or occupied by a particular board.

A

Getting Online Help Using Interactive Mode

Online help is available that lists and explains the `eisa_config` interactive commands.

Table A-2 describes the available `help` commands.

Table A-2. Help Commands

Command Syntax	Description
<code>help</code> or <code>?</code>	Displays help for all valid <code>eisa_config</code> commands.
<code>help command</code>	Displays help for a particular <code>eisa_config</code> command. For instance, to see help for the <code>add</code> command, type <code>help add</code> .

Viewing Board Information Using Interactive Mode

You can use `comment` commands to display any available help and comments about the E/ISA board itself. This help is provided by the board manufacturer in the `cfg` file. If the manufacturer did not provide help or comments, you will get a message saying “No help or comments were supplied.”

Note that all of the `comment` command parameters (except the type of comment requested) are optional. If you do not specify a particular `cfg` file or slot number, you will see any comments available for that type for all of the boards in the working configuration.

The following list gives examples:

- `comment board` displays any help and comments available for all of the currently configured boards.
- `comment board 1` displays any help and comments available for the board currently configured in slot 1.
- `comment board !XYZ1401` displays any help and comments available for the board corresponding to the `!XYZ1401.cfg` file, even if the board is not part of the current board configuration.

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Table A-3 describes the available `comment` commands.

Table A-3. Comment Commands

Command Syntax	Description
<code>comment board [<i>cfgfile</i> <i>slotnum</i>]</code>	Displays board level help and comments that describe what the board can be used for.
<code>comment function [<i>cfgfile</i> <i>slotnum</i>]</code>	Displays function level help and comments.
<code>comment choice [<i>cfgfile</i> <i>slotnum</i>]</code>	Displays choice level help and comments.
<code>comment switch [<i>cfgfile</i> <i>slotnum</i>]</code>	Displays help and comments for switches and jumpers.

Displaying Board Configuration Using Interactive Mode

You can display information on your working E/ISA configuration and on the `cfg` files.

Table A-4 describes the available display commands.

Table A-4. Display Commands

Command Syntax	Description
show	Shows a list of all the slots and whether they are empty or occupied by a particular board.
show slots <i>cfgfile</i>	Shows a list of the slots that can accept the board corresponding to the cfg file.
show board [<i>cfgfile</i> <i>slotnum</i>]	Shows a list of basic attributes for the selected boards, including all functions and choices. If the board is part of the working configuration, this command also indicates the currently selected choice for each function. If you do not specify either a cfg file name or a slot number, information is displayed for all of the boards in the system.
show switch [<i>changed</i>] [<i>slotnum</i>]	Shows any switch and jumper settings (both default and required) for the boards in the configuration. If you use the keyword changed, only those switches and jumpers that have changed since eisa_config was invoked are displayed. If you specify a slot number, only switches and jumpers on the board in that slot are displayed. Note that you can use all combinations of the changed and <i>slotnum</i> parameters. This command displays a graphical representation of the switches and jumpers on the board, and indicates the default and required settings.

Table A-5 explains the available `cfg` file commands.

Table A-5. `cfg` File Commands

Command Syntax	Description
<code>cfgtypes</code>	Lists the types of boards that have <code>cfg</code> files in the <code>/etc/eisa</code> directory. For each board type, also lists the number of associated <code>cfg</code> files in <code>/etc/eisa</code> .
<code>cfgfiles [type]</code>	Lists the <code>cfg</code> files currently in the <code>/etc/eisa</code> directory. If you specify a board type such as <code>NET</code> , only <code>cfg</code> files of that type will be displayed.

A 

Initializing the Configuration Using Interactive Mode

If you have made changes in the configuration that are incorrect, you can delete all changes in this session of `eisa_config` and return to the original configuration by using the `init` command.

Type the following command:

```
init [ filename ]
```

If you specify an `sci` file name, the initial configuration is retrieved from that file. Otherwise, it is retrieved from NVM.

Saving the Configuration and Exiting Using Interactive Mode

To exit `eisa_config`, type `quit` or `q`. If the configuration has changed since the last time it was saved to NVM, you will be asked if you want to save the configuration.

When the configuration is saved to NVM, the file `/etc/eisa/config.log` is created. This file describes the new configuration and is overwritten each time you save the configuration by exiting `eisa_config` or using the `save` command. The log file contains information on the boards currently configured in each slot, the attributes of each board, the currently selected choice for each

function, and any required switch and jumper settings. You can print this file for reference.

eisa_config also displays the switch and jumper settings that have changed in this session before exiting. You must ensure that all switches and jumpers match what **eisa_config** has specified before you reboot the system.

You can save the current configuration without exiting by using the **save** [*filename*] command.

This command writes the new configuration to NVM and to **/etc/eisa/system.sci**. If the current configuration is not conflict free, **eisa_config** notifies you and does not save the configuration.

If you specify a file name, **eisa_config** does not write the configuration to NVM. Instead, it creates a new **sci** file. This is useful if your site has several identically configured workstations. You can run **eisa_config** on one workstation to build an optimal configuration, use the **save** command to save it to a new **sci** file, and then copy the file to each of the other workstations (as **/etc/eisa/system.sci**).

When you boot the other workstations, **eisa_config** will run automatically and initialize the configuration from **/etc/eisa/system.sci** (if the contents of NVM do not already match the current configuration).

Otherwise, you can run **eisa_config** on each workstation with the **-n** option and specify the new **sci** file.

Setting Switches and Jumpers Using Interactive Mode

When you exit `eisa_config` or use the `show switch changed` command, you see a graphical representation of the switch and jumper settings that have changed in this session of `eisa_config`. The file `/etc/eisa/config.log` also shows all required switch and jumper settings for each board in your working configuration.

After you have shut down your system and turned it off, you must set these switches and jumpers to their required settings. Then reboot the system. The following example shows a typical display for required switch settings.

- Default setting** indicates the manufacturer’s default setting, if one exists.
- Required** indicates the setting required for a conflict-free configuration. 1 means “on” and 0 means “off.” The picture represents the actual switches and jumpers on the board and their labels (if any).

```
Slot 2
XYZ Networking Board
Switch Name: I/O Base Address

Switches 1 through 3 select the I/O Base Address,
switch 4 is not applicable.
NOTE: 'off' in the diagram below corresponds to 'OPEN' on board
switches.

Default setting
  1  0  0  1
Required setting
  1  0  0  1
+-x-+-+--+x-on
|  |  |  |  |
+---+x--+x--+off
      1  2  3  4
```

Adding an E/ISA Board Using Interactive Mode

To add an E/ISA board to your system interactively, follow the steps in this section.

A

1. Ensure that you have superuser capabilities.
2. Ensure that the board's `cfg` file is in the `/etc/eisa` directory. If the `cfg` file is provided on media with the card, load the board's `cfg` file into the `/etc/eisa` directory. See "cfg Files" for `cfg` file naming conventions.
3. Use the `mknod` command to create the necessary device files for the board's driver and the peripherals that will be connected to the board. The device file supplies information about the major device type (the device driver number) and device location. The slot number in which you plan to add a board will be a component of the device file. The manufacturer should provide the specific information you need to create the device files. Refer to `mknod(1M)` in the *HP-UX Reference* manual.
4. Ensure that the `eisa` and peripherals drivers are part of the kernel, see "Adding HP Drivers to the Kernel Using HP-UX Commands".
5. Type the following command:

```
/etc/eisa_config
```

The current board configuration will be displayed. Board slots are numbered from top to bottom starting with "1". Slot "0" is reserved for the system board.

6. At the EISA: prompt, type the following command:

add *cfgfile slotnum*

where:

cfgfile is the name of the **cfg** file corresponding to the board you want to add.

slotnum is the number of the slot in which you want to add the board.

To see the **cfg** file name corresponding to each board, use the **cfgfiles** command. **cfg** file names have the following format:

rXXXnnnn.cfg

where:

r is usually ! (or a hex digit).

XXX is a three-letter abbreviation for the board manufacturer's name.

nnnn is four digits. The first three digits of *nnnn* represent the product ID and the fourth is the revision level.

You need to type only the *rXXXnnnn* portion of the name.

7. After adding all desired boards within **eisa_config**, exit the enter **q** to exit the program.

Before it exits, the program will display the switch and jumper settings (if any) that have changed during this session of **eisa_config**. Settings may have changed on existing boards as well. Refer to the file **/etc/eisa/config.log** for a summary of the new configuration, including the required settings.



8. Warn all users to get off the system. Use `cwall` in a cluster environment and `wall` in a standalone environment.

/etc/cwall or /etc/wall

Shutdown for hardware changes in one minute.

Please log off now.

^C

See `cwall(1)` and `wall(1)` in *HP-UX Reference*.

9. Halt the system with the `shutdown` command:

`shutdown -h`

See `shutdown(1M)` in *HP-UX Reference*.

10. Once the system is shut down, turn off the power.
11. Set any physical switches and jumpers according to `eisa_config` requirements. Refer to “Setting Switches and Jumpers Using Interactive Mode”.
12. Physically add the board. If you are also installing a peripheral device with this board, connect the device and turn it on.
13. Turn the power on and boot the system. When it boots, the contents of NVM will match the E/ISA boards that are present and you will be able to use the boards.

Moving an E/ISA Board Using Interactive Mode

To move a currently configured E/ISA board, follow the steps in this section.

1. Ensure that you have superuser capabilities.
2. Type the following command:

/etc/eisa_config

3. At the EISA: prompt, type the following command:

move curslotnum newslotnum

where:

curslotnum is the number of the slot in which the board is currently installed.

newslotnum is the number of the slot to which the board is to be moved.

4. After moving all desired boards within **eisa_config**, enter **q** to exit the program.

Before it exits, the program will display the switch and jumper settings (if any) that have changed during this session of **eisa_config**. Refer to the **/etc/eisa/config.log** file for a summary of the new configuration, including the required settings.

5. Remove the old device file for the board with the **rm** command.
6. As superuser, use the **mknod** command to create a new device file using the new slot number for the board.
 - a. For HP-supplied boards, look up instructions on creating device files for the board in the appropriate interface section of this manual.
 - b. For non-HP-supplied boards, the board manufacturer should provide the specific information you need to create the device files.



A

7. Warn all users to get off the system. Use `cwall` in a cluster environment and `wall` in a standalone environment.

```
/etc/cwall or /etc/wall  
Shutdown for hardware changes in one minute.  
Please log off now.  
^C
```

See `cwall(1)` and `wall(1)` in *HP-UX Reference*.

8. Halt the system with the `shutdown` command:

```
shutdown -h
```

See `shutdown(1M)` in *HP-UX Reference*.

9. Once the system is shut down, turn off the power.
10. Set any physical switches and jumpers according to `eisa_config` requirements. Refer to “Setting Switches and Jumpers Using Interactive Mode”.
11. Physically move the boards.
12. Turn the power on and boot the system. When it boots, the contents of NVM will match the E/ISA boards that are present and you will be able to use the boards.

Removing an E/ISA Board Using Interactive Mode

To remove a currently configured E/ISA board, follow the steps in this section.

1. Ensure that you have superuser capabilities.
2. Type the following command:

```
/etc/eisa_config
```

3. At the EISA: prompt, type the following command:

```
remove slotnum
```

where:

slotnum is the number of the slot from which you want to remove a board.

4. After removing all boards desired within `eisa_config`, enter `q` to exit the program.
5. Warn all users to get off the system. Use `cwall` in a cluster environment and `wall` in a standalone environment.

```
/etc/cwall or /etc/wall  
Shutdown for hardware changes in one minute.  
Please log off now.  
^C
```

See `cwall(1)` and `wall(1)` in *HP-UX Reference*.

6. Halt the system with the `shutdown` command:

```
shutdown -h
```

See `shutdown(1M)` in *HP-UX Reference*.

7. Once the system is shut down, turn off the power.
8. Physically remove the boards.
9. Turn the power on and boot the system. When it boots, the contents of NVM will match the E/ISA boards that are present and you will be able to use the boards.

A

Changing Choices for Board Functions Using Interactive Mode

You can use the **change** command to specify which choice is used for a particular function on a board (for instance, if **eisa_config** cannot automatically generate a new configuration with the currently selected choices). Note that a board must already be part of the configuration before you can use the **change** command on it. When you use the **change** command to specify a choice for a particular function, **eisa_config** will always use that choice. It will not select a different choice, even to resolve a conflict.

To change which choice is used for a given function, follow these steps.

1. Ensure that you have superuser capabilities.
2. Type the following command:

```
/etc/eisa_config
```

3. At the EISA: prompt, type the following command:

```
change slotnum functionnum choicenum
```

You must specify the slot number, the function number, and the new choice number for that function. To see function and choice numbers, use the **show board slotnum** command. Function numbers have the format **Fnum** and choice numbers have the format **CHnum**.

4. After making all desired changes within **eisa_config**, enter **q** to exit the program.

Before it exits, the program will display the switch and jumper settings (if any) that have changed during this session of **eisa_config**. Refer to the **/etc/eisa/config.log** file for a summary of the new configuration, including the required settings.

5. Warn all users to get off the system. Use **cwall** in a cluster environment and **wall** in a standalone environment.

```
/etc/cwall or /etc/wall  
Shutdown for hardware changes in one minute.  
Please log off now.  
^C
```

See **cwall(1)** and **wall(1)** in *HP-UX Reference*.

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6. Halt the system with the **shutdown** command:

shutdown -h

See *shutdown(1M)* in *HP-UX Reference*.

7. Once the system is shut down, turn off the power.
8. Set any physical switches and jumpers according to **eisa_config** requirements. Refer to “Setting Switches and Jumpers Using Interactive Mode”.
9. Turn the power on and boot the system. When it boots, the contents of NVM will match the E/ISA boards that are present and you will be able to use the boards.

A

Sample Interactive Session

The following example shows a sample `eisa_config` interactive session.

A

Starting `eisa_config`

The user invokes `eisa_config`. `eisa_config` begins by displaying the current board configuration.

```
/etc/eisa_config
```

```
HP-UX E/ISA CONFIGURATION UTILITY
```

```
Type q or quit to leave eisa_config.
```

```
Type ? or help for help on eisa_config commands.
```

Slot	CFG File	Contents
0	!HWPC010	HP Series 700 EISA System Board
1	!XYZ1401	XYZ SCSI Controller
2		** EMPTY **
3	!XYZ1702	XYZ Centronics Interface
4		** EMPTY **

Displaying cfg Files

The user types the `cfgfiles` command, which displays the `cfg` files currently in the `/etc/eisa` directory. Note that the `cfgtypes` command lists and explains each board type. For instance, `NET` is a network board.

A

```
EISA: cfgfiles
```

Filename	Board Type	Board Name
!HWPC010	SYS	HP Series 700 EISA System Board
!XYZ1401	MSD	XYZ SCSI Controller
!XYZ1702	PAR	XYZ Centronics Interface
!XYZ1802	NET	XYZ Networking Board
!XYZ2276	VID	XYZ Video Board

Adding a Board

The user types a `show slot` command to see in which slots the `!XYZ1802` board can be installed. The user then types the `add` command to add the board to slot 2. `eisa_config` displays the new configuration.

```
EISA: show slot !XYZ1802
```

```
Valid slots for this board: 2 4
```

```
EISA: add !XYZ1802 2
```

```
Added board: XYZ Networking Board
```

```
Comments: The XYZ Networking board is an IEEE 802.3 local area networking  
board for use with twisted-pair cabling.
```

Slot	CFG File	Contents
0	!HWPC010	HP Series 700 EISA System Board
1	!XYZ1401	XYZ SCSI Controller
2	!XYZ1802	XYZ Networking Board
3	!XYZ1702	XYZ Centronics Interface
4		** EMPTY **

Displaying Board Information

The user types a `show` command to ask for information on the board in slot 2. `eisa_config` displays the board's basic attributes and indicates the currently selected choice for each function.

A

```
EISA: show board 2
```

```
XYZ Networking Board  
CFG file: !XYZ1802.cfg  
Slot 2
```

The XYZ Networking board is an IEEE 802.3 local area networking board for use with twisted-pair cabling.

```
Manufacturer ..... XYZ Computer Corp.  
ID ..... XYZ1802  
Board type ..... NET (Network Board)  
Board slot type ..... ISA 8 Bit  
Readable ID ..... No  
Skirt ..... No  
Length ..... 330 millimeters
```

Function names and possible choices:

StarLAN 10 PC LAN Adapter

F1: I/O Base Address

```
CH1: 300h [** current **]  
CH2: 340h  
CH3: 240h
```

F2: Loopback Mode

```
CH1: Normal operation [** current **]  
CH2: Test mode
```

F3: Interrupt Channel (IRQ)

```
CH1: 3  
CH2: 4  
CH3: 5 [** current **]  
CH4: 7
```

Exiting eisa_config

The user exits `eisa_config`. The configuration has changed, so `eisa_config` prompts the user to save the changes and exit, exit without saving changes, or abort the exit. The user types `s` to save the changes. `eisa_config` displays a reminder about necessary steps after exiting.

A

EISA: quit

A description of the configuration was saved in `/etc/eisa/config.log`.

If `eisa_config` was run per the instructions of a specific product installation manual, refer to that manual for specifics on device file creation and I/O drivers.

Step 4 may apply if other cards were affected.

Otherwise, the following is a list of generally required steps:

- (1) Make any necessary device files. If you have moved a board you may also need to make new device files.
- (2) Ensure that all appropriate software I/O drivers are present in the kernel.
- (3) Shut down the system with the `"/etc/shutdown -h"` command.
- (4) Once the system is shut down, turn the power off. Then set any physical switches and jumpers correctly. The switches and jumpers that have changed since `eisa_config` was invoked are listed below. The file `/etc/eisa/config.log` contains a summary of the new configuration, including required switch and jumper settings.
- (5) Physically add, move, or remove boards as needed.
- (6) Turn the power on and boot the system.

Refer to the "E/ISA Configuration Documentation" for specific instructions.

Displaying Switch and Jumper Settings

After the user presses the q key to quit, `eisa_config` displays the switch and jumper settings that have changed since the program was invoked. The file `/etc/eisa/config.log` also contains this information, along with a summary of the new configuration. After exiting, the user is returned to the HP-UX prompt.

```
Slot 2
XYZ Networking Board
Switch Name: I/O Base Address

Switches 1 through 3 select the I/O Base Address,
switch 4 is not applicable.
NOTE: 'off' in the diagram below corresponds to 'OPEN' on board
switches.

Default setting
  1  0  0  1
Required setting
  1  0  0  1
+-x-+---+---+x-+on
|  |  |  |  |
+---+x-+x-+---+off
    1  2  3  4
```

```
Slot 2
XYZ Networking Board
Switch Name: Loopback Mode

      Default      Required  on  off
      +---+
      0            0        |  x    4
      +---+
      0            0        |  x    3
      +---+
      0            0        |  x    2
      +---+
      0            0        |  x    1
      +---+
```

Exiting eisa_config.

\$

Troubleshooting E/ISA Board Configuration

This section explains how to diagnose and fix common E/ISA board configuration errors.

As a general rule, look at the system messages using the `dmesg` command. The E/ISA powerup-specific messages are displayed after the line “EISA Expander Initialized”. The E/ISA initialization messages are displayed after the line “EISA Initialization”. These messages, causes, and recommended actions are described in “E/ISA Board Power Up Messages”.

A

Added Board Does Not Work

If you added a board and the board does not work, check the following in order:

1. If you added the board interactively, did you save the new configuration before exiting `eisa_config`? If not, you must run `eisa_config` again, add the board again, and then save the configuration. See “Saving the Configuration and Exiting Using Interactive Mode”.
2. Did you add the required drivers to the HP-UX kernel? If not, do one of the following:
 - a. For HP-supplied boards, see “Adding HP Drivers to the Kernel Using SAM” or “Adding HP Drivers to the Kernel Using HP-UX Commands”.
 - b. For non-HP-supplied boards, see “Adding Non-HP Drivers to the Kernel Using HP-UX Commands”.
3. Did you create the necessary device files correctly? If not, do one of the following:
 - a. For HP-supplied boards, refer to the appropriate section of this manual.
 - b. For non-HP-supplied boards, refer to the documentation shipped with your board as well as the appropriate section of this manual.
4. Did you reboot the system after changing the configuration interactively? If not, reboot the system.

5. Warn all users to get off the system. Use `cwall` in a cluster environment and `wall` in a standalone environment.

/etc/cwall or /etc/wall

Reboot for configuration changes in one minute.

Please log off now.

^C

See `cwall(1)` and `wall(1)` in *HP-UX Reference*.

6. Shut down the system and automatically reboot with the `shutdown` command:

shutdown -r

See `shutdown(1M)` in *HP-UX Reference*.

7. If you added the board using automatic mode, check `/etc/eisa/config.err` for error messages.
8. Ensure that switch and jumper settings match the settings specified in `/etc/eisa/config.log`.

Moved Board Does Not Work

If you moved a board and the board does not work, check the following in order:

1. Did you save the new configuration before exiting interactive `eisa_config`?
If not, you must run `eisa_config` again and then save the configuration.
See “Saving the Configuration and Exiting Using Interactive Mode”.
2. Did you create the necessary device files correctly? If not, refer to “Moving an EISA Board Using Automatic Mode” and “Moving an E/ISA Board Using Interactive Mode”.
3. Did you reboot the system after changing the configuration interactively? If not, reboot the system.
4. Warn all users to get off the system. Use `cwall` in a cluster environment and `wall` in a standalone environment.

```
/etc/cwall or /etc/wall  
Reboot for configuration changes in one minute.  
Please log off now.  
^C
```

See `cwall(1)` and `wall(1)` in *HP-UX Reference*.

5. Shut down the system and automatically reboot with the `shutdown` command:

```
shutdown -r
```

See `shutdown(1M)` in *HP-UX Reference*.

6. If you moved the board using automatic mode, check `/etc/eisa/config.err` for error messages.
7. Ensure that switch and jumper settings match the settings specified in `/etc/eisa/config.log`.

A

Board Stops Working

If a board that was working suddenly stops working, the kernel may have been recently modified either manually or with SAM. If so, you will need to relink the E/ISA board drivers to the kernel.

- For HP-supplied boards, see “Adding HP Drivers to the Kernel Using SAM” or “Adding HP Drivers to the Kernel Using HP-UX Commands”.
- For non-HP-supplied boards, see “Adding Non-HP Drivers to the Kernel Using HP-UX Commands”.

Board Configuration Conflicts

E/ISA boards use four types of resources: interrupt lines, DMA channels, register addresses, and memory. If the automatic mode of `eisa_config` cannot configure a board due to resource conflicts, you may still be able to use `eisa_config` interactively to add a board that had a conflict or to change choices for a new board. Refer to “Using `eisa_config` in Interactive Mode”.

If your desired board configuration still causes conflicts, you may not be able to use certain boards together. Some configurations are simply not possible; for instance, two boards from different manufacturers may both require the same resource. If this happens, only one of the boards can be used.

No NVM Driver

If you attempt to use `eisa_config` and get a message saying that the NVM driver cannot be used, ensure that the `eisa` driver has not been removed from the kernel. If it has been removed, do one of the following:

- For HP-supplied boards, see “Adding HP Drivers to the Kernel Using SAM” or “Adding HP Drivers to the Kernel Using HP-UX Commands”.
- For non-HP-supplied boards, see “Adding Non-HP Drivers to the Kernel Using HP-UX Commands”.

Two cfg Files Have the Same Name

If you want to load a `cfg` file into the `/etc/eisa` directory that has the same name as a file in that directory, follow these steps:

1. Load the new `cfg` file from media into a temporary directory.
2. Rename the `cfg` file. `cfg` file names have the following format:

`rXXXnnnn.cfg`

where:

<code>r</code>	is usually ! (or a hex digit).
<code>XXX</code>	is a three-letter abbreviation for the board manufacturer's name.
<code>nnnn</code>	is four digits. The first three digits of <code>nnnn</code> represent the product ID and the fourth is the revision level.

The first character in the `cfg` file's old name was probably !. The first character in the new name can be any hex digit (1 to F). The rest of the name should remain the same.

In the temporary directory, type the following command:

`mv oldname newname`

3. Move the renamed `cfg` file to the `/etc/eisa` directory. Type the following command:

`mv -i newname /etc/eisa`

Boards that have duplicate `cfg` file names must be added using `eisa_config` interactively.



E/ISA Board Power Up Messages

This section contains a listing of E/ISA board power up messages, their potential cause, and action you can take to correct the problem. There are several messages displayed that are information only. They indicate a successful operation completed.

Message: No EEPROM Data -> EISA Card ID: *eisa_id*

Cause: For this particular slot, an EISA card IDed itself, but there is no configuration data in NVM.

Action: Run `eisa_config` to update NVM.

Message: Cannot read EISA card ID

Cause: Have NVM information saying card exists, but cannot read its ID.

Action: If a card is present, then there is a hardware problem. Replace the card. If a card is not present, ignore the message.

Message: Board ID: *eisa_id* inconsistent with NVM ID: *eisa_id*

Cause: The ID read from the card does not match the card ID information stored in NVM.

Action: If board has been moved, run `eisa_config` in automatic mode. If board has been removed, ignore the message. If this message persists after running `eisa_config` and updating NVM, replace the board.

Message: Bad eeprom data for board *eisa_id*

Cause: An attempt to read the NVM configuration information failed. This represents a system problem.

Action: Call your HP representative.

Message: Error initializing board *eisa_id*

Cause: An attempt to initialize the card with the stored NVM initialization data failed.

Action: Check `cfg` file for inaccuracies. Suspect a hardware problem.

Message: EISA Board ID: *eisa_id* ignored
Board not present or driver not configured into kernel.

Cause: One of the following two situations have occurred:

1. An ISA card is present, but not its driver
2. The driver is present, but the card is not.

Since ISA cards do not ID, only the cards driver can verify its existence. The ID displayed was obtained from NVM, not the card.

Action: Ensure the card is installed and verify that the driver is configured into the kernel.

Message: EISA Board ID: *eisa_id* ignored, driver not configured into kernel

Cause: A driver could not be found which would accept this card, but since it is an EISA card, the system found it.

Action: Ensure that the driver is configured into the kernel.

Message: EISA Board ID: *eisa_id* ignored, error initializing board

Cause: A driver accepted this card, but then indicated a failure to initialize it correctly.

Action: This is probably a defective card.

Message: EISA: *eisa_last_attach* not called, bad driver in kernel.

Cause: If a driver does return correctly from its attach routine, this will panic the kernel. Assuming that the drivers installed are working, this message should never appear.

Action: If you are using a non-HP card and driver, remove both the card and driver and try again. If error does not recur, the non-HP driver is bad. If the error recurs, call your HP representative.



A

Message: EISA WARNING: mapping in system board failed

Cause: Indicates system problem in creating virtual to physical mappings of the EISA system board registers. If this message appears, EISA cards will not be recognized although the system will boot up (assuming you are not booting from EISA SCSI, in which case system will not come up).

Action: Call your HP representative.

Message: EISA WARNING: mapping in I/O map entries failed

Cause: A system board resource could not be initialized. If this message appears, EISA cards will not be recognized although the system will boot up (assuming you are not booting from EISA SCSI, in which case system will not come up).

Action: Call your HP representative.

Message: *slot_num* Slot EISA Expander Initialized: *eisa_id*

Cause: This is the message which indicates that the system board (that is, the bus adapter that sits between the EISA bus and the host system bus) was initialized properly. It also indicates how many slots the kernel is configured to recognize.

Action: None.

Message: EISA SLOT *slot_num*

Cause: This is a header indicating which slot is currently attempting to be initialized. If successfully initialized, the individual drivers generally print out their own initialization message. For example:

EISA SLOT 1: *driver_specific_message*

Action: None.

Message: Successfully Initialized EISA Boot Device

Cause: This message indicates that the system recognized a special case.

If the system boots from EISA SCSI *before* EISA SCSI configuration information is stored in NVM, then the PDC uses “default” configuration data that can conflict with other EISA cards in the system. To handle this, the system ignores all cards except the boot EISA SCSI during the first power up and continues a limited boot.

If `eisa_config` (run in `/etc/bcheckrc`) can create a safe configuration, the new configuration is recorded in NVM and the `system.sci` file, and the system is automatically rebooted. If a safe configuration cannot be created, `eisa_config` issues an appropriate message, the system comes up with the other cards unusable, and you can run `eisa_config` interactively to fix the configuration and to reboot manually.

Action: None.

Message: -- Skipping

Cause: Indicates that either the slot is empty both physically and indicated so by NVM (or has an ISA card, but no EEPROM data), or was skipped because of one of the reasons above and is preceded by one of the above messages.

Action: None.

Message: EISA card id *eisa_id* in slot *slot_num* had fatal error

Cause: This message indicates that an EISA card asserted the IOCHK line indicating a fatal error. An expansion card might do this if there was a parity error on a memory card. (Not all cards assert IOCHK.)

Action: Replace the card.



A

Messages: EISA_WARNING: unable to allocate eeprom_geninfo
EISA_WARNING: unable to allocate eeprom_slot_info for slot 0
EISA_WARNING: unable to allocate eeprom_slot_info
EISA_WARNING: unable to allocate: func_data
EISA_WARNING: unable to allocate eeprom_cfg_header
EISA_WARNING: unable to allocate eeprom
WARNING: unable to map eeprom registers
EISA_WARNING: unable to map eeprom

Cause: All of these indicate a system problem when attempting to allocate resources necessary for EISA initialization. EISA will not be initialized, but the system should come up (with the exception of a boot from an EISA device).

Action: Call your HP representative.

Message: EISA_WARNING: NVM checksum invalid, clearing eeprom

Cause: A checksum was performed on NVM at power up and it failed. The only safe course of action is to erase its contents. As EISA comes up, it will complain that NVM data is missing for cards which ID themselves. When `eisa_config` runs from `/etc/bcheckrc`, it will automatically generate data for and reconfigure the EISA cards that are present. ISA cards will need to be reconfigured using `eisa_config` in interactive mode.

Action: Follow instructions for adding ISA cards.

The following worksheets are provided for your convenience in documenting the peripheral configuration of your system.

A 

Copy these work sheets as many times as you need for the devices on your system.

A

Mass Storage Devices

Device Name	Path Name	File Type	Major Number	Minor Number	Bus Address	Slot Nbr

A



Printers

Device Name	Path Name	File Type	Major Number	Minor Number	Port #/ Bus Address

Copy these work sheets as many times as you need for the devices on your system.

A

Plotters

Device Name	Path Name	File Type	Major Number	Minor Number	Port #/ Bus Address



Terminals and Modems

Device Name	Path Name	Port Number	Minor Number

HP-HIL Devices

Device Name	Path Name	File Type	Major Number	Minor Number	Power Req.	Bus Address

Copy these work sheets as many times as you need for the devices on your system.



A

Mass Storage Devices

Device Name	Path Name	File Type	Major Number	Minor Number	Bus Address	Slot Nbr

A



Printers

Device Name	Path Name	File Type	Major Number	Minor Number	Port #/ Bus Address

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**A**

Plotters

Device Name	Path Name	File Type	Major Number	Minor Number	Port #/ Bus Address

A

Terminals and Modems

Device Name	Path Name	Port Number	Minor Number

HP-HIL Devices

Device Name	Path Name	File Type	Major Number	Minor Number	Power Req.	Bus Address

Copy these work sheets as many times as you need for the devices on your system.

**A**

Mass Storage Devices

Device Name	Path Name	File Type	Major Number	Minor Number	Bus Address	Slot Nbr

A 

Printers

Device Name	Path Name	File Type	Major Number	Minor Number	Port #/ Bus Address

Copy these work sheets as many times as you need for the devices on your system.

A

Plotters

Device Name	Path Name	File Type	Major Number	Minor Number	Port #/ Bus Address

A 

Terminals and Modems

Device Name	Path Name	Port Number	Minor Number

HP-HIL Devices

Device Name	Path Name	File Type	Major Number	Minor Number	Power Req.	Bus Address

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