Service Handbook
Model 745

HEWLETT PACKARD®

Safety and Regulatory Statements

Safety

See the owner's guide that came with your system for safety information.

Regulatory Statements

Emissions Regulations

Federal Communications Commission (FCC) The Federal Communications Commission of the U.S. government regulates the radio frequency energy emanated by computing devices through published regulations. These regulations specify the limits of radio frequency emission to protect radio and television reception. All HP nodes and peripherals have been tested and comply with these limits. The FCC regulations also require that computing devices used in the U.S. display the agency's label and that the related documentation include the following statement:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Department of Communications (CDC) This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the Radio Interference Requirements of the Canadian Department of Communications.

Emissions Regulations Compliance Any third-party I/O device installed in HP system(s) must be in accordance with the requirements set forth in the preceding Emissions Regulations statements.

In the event that a third-party noncompliant I/O device is installed, the customer assumes all responsibility and liability arising therefrom.

Electrostatic Discharge (ESD) Precautions Electrostatic charges can damage the integrated circuits on printed circuit boards. To prevent such damage from occurring, observe the following precautions during board unpacking and installation:

- Stand on a static-free mat.
- Wear a static strap to ensure that any accumulated electrostatic charge is discharged from your body to ground.
- Connect all equipment together, including the static-free mat, static strap, routing nodes, and peripheral units.
- Keep uninstalled printed circuit boards in their protective antistatic bags.
- Handle printed circuit boards by their edges, once you have removed them from their protective antistatic bags.

Contents

1 Product Information

Contents

Contents

Contents

Contents

Contents

6   Diagrams

Contents

7   Reference Documentation

8   Service Notes

Contents

Figures

Contents

Contents

Tables

1

Product Information

This chapter introduces the Model 745 Industrial Controller. Its purpose is to familiarize you with the system features, controls, and indicators.

The major sections within this chapter are:

• Features

• Model 745 Physical Dimensions and Power Requirements

• Board Computer Configurations

• Cables

The Model 745 Industrial Controller

The Model 745 Industrial Contoller provides for a wide variety of PCI or EISA cards. In combination with the Model 744 board computer as the system controller, the Model 745 is exceptionally flexible and responsive, being based on Hewlett-Packard's PA-RISC technology. Figure 1-1, Figure 1-2, and Figure 1-3 show a front view of the Model 745, a rear view, and the front panel of the board computer.

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Figure 1-1   **Model 745 Front View**

Figure 1-2   **Model 745 Rear View**

Figure 1-3   **Board Computer Front Panel**

Features

The Model 745 has the following general features:

- Single-board computer processor:

    132 MHz, or

    165 MHZ

- Input/Output:

    Onboard graphics, with optional

    17-inch 1280x1024 monitor, or

    19-inch 1280x1024 monitor

    2 RS-232C ports

    AUI (LAN) port

    HP parallel port

    Audio I/O ports

    Speaker port

    Single-Ended (SE) SCSI for internal and external devices

- PS/2 keyboard and mouse with mini-DIN connectors

- Slots for up to four user installed cards,

    PCI or

    EISA

- Optional PMC adapters available for 2 or 4 PMC sites added to board computer

    Supports up to 4 HP PMC Graphics cards

    Third party cards are available

- Mass storage bays for up to five devices, with up to two forward or rear facing removable media devices, including:

    4GB single-ended SCSI hard drive

    1.4MB floppy drive

    Fast CD-ROM drive

> DDS-2 tape drive

- One 400 Watt power supply

- Operating system

  > HP-UX 10.20 (or later)
  > - Supports SICL libraries
  > - Supports Rocky Mountain Basic (RMB).

  - User interface

    CDE or HP VUE graphical user interface.

  - Compatibility

    Source and binary code compatible with HP 9000 product family.

Typical External Devices

The Model 745 supports the following external devices:

  - LAN transceiver

    HP A2670A ThinLAN ETHERNET Transceiver
    HP A2671A EtherTWIST Transceiver

  - Speaker; 8 ohm impedance with $1/_8$-inch sub-miniature
    stereo connector.

Only products with Hewlett-Packard approved parts, accessories, peripherals, operating systems, and application programs are supported by Hewlett-Packard. Any product with other than HP approved hardware or software connected or installed must have the non-HP approved hardware and software removed by the customer before on-site repair is conducted.

Physical Dimensions and Power Requirements

Physical dimensions:

- Height: 177 mm (6.97 in.) - 4 EIA Units

- Width: 425.45 mm (16.75 in.)

- Depth: 412.77 mm (16.25 in.)

Power requirements:

- Input voltage: 100-240 Vac

- Input frequency:50 to 60 Hz

- Input power: 700W maximum

- Input current: RMS 7 A - 3.5 A maximum @ 100-240 Vac

The power supply for the Model 745 provides sufficient power to all devices and option slots, within specifications for those options. No power budgeting is required for options.

Board Computer Configurations

The Model 745 Industrial Controller incorporates the Model 744 single-board compter (SBC) as its processor. The Model 744 is a high-performance Precision Architecture board computer based on the Hewlett-Packard PA-RISC 7300LC technology. It contains the following key features:

- Model type:

    Model 744/132L
        Primary internal cache - 128 KB: 64 KB instruction, 64KB data
    Model 744/165L
        Primary internal cache - 128 KB: 64 KB instruction, 64KB data
        Secondary external cache - 512 KB

- Clocks

    Battery-backed real-time clock
    Interval timers (One 32 bit, Two 16 bit)
    Watchdog timer

- Main Memory

    Up to four RAM cards may be installed.
    When mixing memory card capacities that include 128MB or 256MBcards, the 128MB and 256MB card(s) must be installed into the lowest memory slots before adding cards of other capacities.

NOTE: HP-UX requires a minimum of 32 MB RAM.

Cables

Cables needed to connect to the ports of the Model 745 industrial controller are provided with the system.

The high-density I/O connectors for the board computer require conversions to standard cabling. These cables are 75 cm (30 in.) long.

See Table 1-1 for details of the cable included with the system.

Table 1-1 **Cabling**

Cable Number	Description
HP A4300A	HP Parallel: High Density 25-pin to standard 25-pin (female)
HP A4301A	RS-232C: High Density 9-pin to standard 9-pin (male)
HP A4302A	Audio: High Density 9-pin to three mini jacks
HP A4303A	LAN: High Density 15-pin to 15-pin AUI
HP A4305A	Video for EVC monitors: High Density 15-pin to EVC 35-pin connector (female)
HP A4223A	Video: High Density 15-pin to standard 15-pin (female)
HP C2955A	SCSI: High Density 50-pin to High Density 50-pin, .5m (male)
HP K2291	SCSI: High Density 50-pin terminator
HP A4199A	Power cord (if no localization kit was ordered)

Standard interface cables are available and may be required to connect to the cable listed above.

Operating System Overview

The Model 744 uses the standard HP-UX 10.20 or later operating system, a highly versatile system for multitasking, running your application programs, and performing a variety of development tasks. Refer to *HP-UX System Administration Tasks* for detailed installation and operation procedures for HP-UX.

When systems are configured at the factory, a specific HP-UX kernel configuration is chosen. If you reload HP-UX after receiving you system, you must reconfigure the kernel according to include the **vme2** driver.

Manuals for System Information

HP-UX

After you have completed the installation procedures in this book, you may consult the following sources for further information:

- For HP-UX administration information, see HP-UX *System Administration Tasks.*

- For a quick reference to commonly-used HP-UX commands, see the appendix in *Using HP-UX.*

- HP VUE or CDE is the default interface for HP-UX. At some point, you may want to interact with the Model 744 using CDE or HP VUE via the LAN, with an X Window System display. As a simpler window alternative, you can also use the X Window System by itself. All interfaces are included in HP-UX. For further information, refer to *Using the X Window System*, *Using HP-UX, CDE User's Guide,* or *HP VUE User's Guide*.

The following manuals are also useful:

- If you have not yet installed your HP-UX OS, see *Installing HP-UX*.

- For troubleshooting HP-UX, see the manual *Solving HP-UX Problems*.

HP VUE

For information on using and configuring the HP VUE interface with HP-UX, see *HP VUE User's Guide*. For information on installing HP VUE, refer to *HP VUE Installation Guide*.

HP CDE

For information on using and configuring the CDE interface with HP-UX, see *CDE User's Guide*. For information on installing CDE, refer to *CDE Installation Guide*.

Online Sources of Information

HP-UX is designed so that you can access many sources of information without leaving your system. Most of these information sources are accessible through the shell command line on a character terminal.

- Man pages: The HP-UX information found in *HP-UX Reference* is online and accessible by clicking on the Toolbox button at the right of your Front Panel, or by entering **man** *command* on a command line, where *command* is the name of the HP-UX command or routine you want to get information on. If you're not sure of the command name, you can enter **man -k** *keyword*, where *keyword* is a likely topic word to search on. This results in a display listing commands having the keyword in their description.

There are also a variety of files which contain version-specific information. These will be useful in administering and configuring cards and devices for your version of HP-UX. Among these files are the following:

- Release Notes: This is the online version of the Release Notes which come with your system. It contains all the latest information, undocumented changes, and bug fixes for your release of HP-UX. It also contains information on the current version of HP VUE. The Release Notes document resides in the **/usr/share/doc** directory, named by its release number; for example, **10.20RelNotes** for HP-UX 10.20.

- HP-UX and HP VUE Help. For graphics displays, extensive help information on the operating system and the visual interface is included with HP VUE.

- Newconfig: The directory **/usr/newconfig/etc** contains information and new versions of HP-UX product configuration files, as well as shell scripts which may have been customized on your system. The contents of this directory will vary depending on which products you have loaded onto your system. In most cases, old versions of these files, in their regular locations in the file system, are not overwritten by the update process.

Audio

HP-UX includes audio software comprising an audio editor, Audio Application Program Interface (AAPI), and some sample programs. Audio output is available through the audio port on the front panel of the Model 745. For highest quality audio, an external headphone set or speaker is recommended.

Audio is implemented using a CODEC (coder-decoder) combining CD-quality stereo audio-digital converters for microphone and line-input levels. The input sampling rate and format are programmable, as are the input gain and output attenuation.

A $^1/_8$-inch mini-jack is used for the speaker output connection. The remaining audio signals are via a 9-pin D-sub connector. Output impedance is nominally 8 ohms, but higher impedance devices can also be driven.

For information on programming for audio, refer to *Using the Audio Developer's Kit* (B2355-90069) and the man page *audio.*

Product Identification

On the bottom, a label lists the product serial number. Its information can be interpreted as shown in Figure 1-4 below for an example serial number 6421A00001:

Figure 1-4   **Serial Number Information**

```
6 4 2 1  A  0 0 0 0 1
                    ┗━━━━ 5-digit sequential identifying number
                 ┗━━━━━━ Country of manufacture:
                              A = U.S.A.
                              G = Germany
                              J = Japan
           ┗━━━━━━━━━━━━ Fiscal week of manufacture
         ┗━━━━━━━━━━━━━━ Last digit of year of manufacture
       ┗━━━━━━━━━━━━━━━━ Entity Code
```

Support

Support services and policies mentioned in this section are subject to change. Please consult your local Hewlett-Packard Sales and Service Office for the current support policies.

Hardware Support

Field Repair Philosophy

Field Repair Philosophy for these products is assembly, or board level. When a failure occurs, the problem is diagnosed to the assembly having the failed part, that assembly is then replaced.

Some assemblies may be exchanged for rebuilt ones. Other assemblies are only available as new ones. Refer to appropriate service handbook for information on replacement parts.

Additional Technical Information

Additional technical information on this product can be found in the *Model 745 Technical Reference*. Detailed information about architecture is provided.

Schematics

In support of the repair philosophy, this manual contains information to the assembly level. Schematics are not available for these products.

Supported Configurations

Only products with Hewlett-Packard approved parts, accessories, peripherals, operating systems and application programs are supported by Hewlett-Packard. Any product with other than HP approved hardware or software connected or installed must have the non-HP approved hardware and software removed by the customer before On-Site repair is accomplished.

Repair Services

Hewlett-Packard supports three repair services:

> Return to Hewlett-Packard Repair
>
> On-Site Repair
>
> Customer Repair

For Return to Hewlett-Packard Repair, customers return the product to their local HP Sales and Service Office, where an HP Bench Repair Engineer troubleshoots, and repairs the hardware to the assembly level. The defective assembly is replaced with a new or rebuilt assembly and the product is returned to the customer. This service is available through a service contract or a time-and-materials basis.

On-Site Repair is performed at the customer's site. This service is available through a service contract or a time-and-materials basis.

Customers have the option of repairing their own HP products. Contact your nearest Hewlett-Packard Sales and Service Office for information concerning service training, special tools and test equipment, and spare parts.

2

**Environmental/
Installation/PM**

Overview

This chapter lists the environmental specifications and regulatory requirements for the system. Installation and preventive maintenance information, if applicable, is also provided.

Environmental Specifications

Table 2-1 lists the environmental specifications for this workstation.

Table 2-1   **Environmental Information**

Operating temperature	0° - 55° C (without mass storage) 5° - 40° C (with mass storage)
Non-operating temperature	-30° - 70° C
Heat dissipation	2390 BTU, 600 Kcal/hr
Humidity (non-condensing); operating	95% maximum at 40deg; C (without mass storage) 90% maximum at 40deg; C (with mass storage)
Humidity (non-condensing); non-operating	5 - 95%
Maximum altitude, operating (to 47° C):	4.6 K meters (15 K ft.)(without mass storage) 3.05 K meters (10 K ft.)(with mass storage)
Maximum altitude, non-operating:	4.6 K meters (15 K ft.)

Regulatory Requirements

Table 2-2 lists the regulatory requirements for this workstation.

Table 2-2   **Regulatory Information**

Safety Specification:	UL 1950, CSA 950M, IEC 950
Acoustics	NS ISO 7779
Electromagnetic Certification	FCC, VCCI, Taiwan,Australia, Canada, and European CE marks

Installation

Refer to *Model 745 Owner's Guide* for system installation information.

Preventive Maintenance

The system unit requires no preventive maintenance. Some removable media storage devices require operator preventive maintenance. Refer to *Model 745 Owner's Guide* for more information.

3

Configuration

This chapter describes the interface to the Boot Console Handler (BCH), and discusses power budgeting.

Boot Console User Interface Features

There are times when you want to interact directly with the hardware of your single board computer **before** it boots the operating system. Your 745 system provides a menu-driven **boot console interface** that allows you to perform special tasks, display information, and set certain system parameters, even if the operating system is unavailable.

Here are some of the things you can do:

• Boot your workstation

• Search for bootable media

• Reset your workstation

• Display and set boot paths

• Display and set your monitor type

• Display memory configuration information

• Display the status of the EISA slots

• Set Auto Boot and Auto Search

• Set Fastboot

• Display LAN information

• Display system information

• Display PIM information

The **boot console** menus follow, showing the various tasks you can perform and the information available.

The shortened version of all commands is indicated by the uppercase letters.

Help is available for all menus and commands by using either **help**, **he**, or **?** and the menu or command you want help on.

Main Menu

```
------ Main Menu -----------------------------------------
Command                          Description
-------                          -----------
BOot [PRI|ALT|<path>]            Boot from specified path
PAth [PRI|ALT|CON|KEY][<path>]   Display or modify a path
SEArch [DIsplay|IPL] [<path>]    Search for boot devices

COnfiguration [<command>]        Access Configuration menu/commands
INformation [<command>]          Access Information menu/commands
SERvice [<command>]              Access Service menu/commands

DIsplay                          Redisplay the current menu
HElp [<menu>|<command>]          Display help for menu or command
RESET                            Restart the system
------
Main Menu: Enter command >
```

Configuration Menu

```
------ Configuration Menu ------------------------------------------
Command                         Description
-------                         -----------
AUto [BOot|SEArch] [ON|OFF]     Display or set specified auto flag
BootID [<proc>] [<boot ID>]     Display or modify processor boot ID
BootINfo                        Display boot-related information
BootTimer [0 - 200]             Seconds allowed for boot attempt
DEfault                         Set the system to predefined values
FastBoot [ON|OFF]               Display or set boot tests execution
MOnitor [LIST|<path> <type>]    Change the current monitor type
PAth [PRI|ALT|CON|KEY] [<path>] Display or modify a path
SEArch [DIsplay|IPL] [<path>]   Search for boot devices
SECure [ON|OFF]                 Set/show security mode
TIme [c:y:m:d:h:m:[s]           Read or set real time clock in GMT


BOot [PRI|ALT|<path>]           Boot from specified path
DIsplay                         Redisplay the current menu
HElp [<menu>|<command>]         Display help for menu or command
RESET                           Restart the system
MAin                            Return to Main Menu
------
Configuration Menu: Enter command >
```

Information Menu

```
------ Information Menu --------------------------------------------
Command                 Description
-----------             -----------
ALL                     Display all system information
BootINfo                Display boot-related information
CAche                   Display cache information
ChipRevisions           Display revisions of VLSI and firmware
COprocessor             Display coprocessor information
FwrVersion              Display firmware version
IO                      Dispay I/O interface information
LanAddress              Display built-in system LAN address
MEmory                  Display memory information
PRocessor               Display processor information
WArnings                Display selftest warning messages

BOot [PRI|ALT|<path>]   Boot from specified path
DIsplay                 Redisplay the current menu
HElp [<menu>|<command>  Display help for menu or command
RESET                   Restart the system
MAin                    Return to Main Menu
------
Information Menu: Enter command >
```

Service Menu

```
------ Service Menu ------------------------------------
Command                      Description
-------                      -----------
ChassisCodes [<proc>]        Display chassis codes
CLEARPIM                     Clear (zero) the contents of PIM
EepromRead [<addr>] {<len>}  Read EEPROM locations
MemRead <addr> [<len>] [a]   Read memory locations
PIM [<proc> [HPMC|TOC]]       Display PIM information

BOot [PRI|ALT|<path>]        Boot from specified path
DIsplay                      Redisplay the current menu
HElp [<menu>|<command>]      Display help for menu or command
RESET                        Restart the system
MAin                         Return to Main Menu
------
Service Menu: Enter command >
```

Accessing the Boot Console Interface

To access the boot console interface, follow these steps:

NOTE: This procedure should be done by a system administrator with **root** user privileges.

1 Close any files and applications on your workstation.

2 In a terminal window, enter the following command:

　　reboot -h

3 When the system has completely shut down, power off the system then power it back on.

　　If **Autoboot** is turned off, the boot sequence automatically stops at the boot console Main Menu.

　　If **Autoboot** is turned on, you will see the following messages:

```
Processor is starting Autoboot process. To discontin-
ue, press any key within 10 seconds.
```

　　If **Autoboot** and **Autosearch** are both turned on, you will see the following messages:

```
Processor is booting from first available device.To
discontinue, press any key within 10 seconds.
```

NOTE: If you are using a power-saving monitor, you will have less than 10 seconds from the time this message appears to press a key. Power saving monitors usually indicate the presence of a live video sync signal through the power LED on the monitor. When the LED is on, press **ESC** .

4 Press a key. You will then see the following message:

```
Boot terminated
```

The Main Menu of the boot console appears.

```
------ Main Menu ---------------------------------------
Command                         Description
-------                         -----------
BOot [PRI|ALT|<path>]           Boot from specified path
PAth [PRI|ALT|CON|KEY][<path>]  Display or modify a path
SEArch [DIsplay|IPL] [<path>]   Search for boot devices


COnfiguration [<command>]       Access Configuration menu/commands
INformation [<command>]         Access Information menu/commands
SERvice [<command>]             Access Service menu/commands


DIsplay                         Redisplay the current menu
HElp [<menu>|<command>]         Display help for menu or command
RESET                           Restart the system
------
Main Menu: Enter command >
```

Booting Your Workstation

Usually, you start your workstation by turning it on and waiting for the operating system to boot automatically. However, you may not always want the usual sequence to occur.

For example, you may want to start your workstation from an operating system that is stored on a device that is different from your usual boot device. If your normal operating system kernel or the disk on which it resides becomes damaged or unusable, you may wish to boot from a different disk or perhaps another type of device, such as a DDS-format tape drive.

Here are some situations and examples:

• If you know which device you want to boot from, and you know that it contains a boot-able operating system, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter, and then type the following at the prompt:

```
Main Menu: Enter command >   boot device
```

where *device* is the **hardware path** to the device, specified in Mnemonic Style Notation. When prompted whether or not to interact with the ISL enter **n** for no.

For example, if you wish to boot an operating system that is stored on a DDS-format tape in a drive that is located at ''sescsi.1.0'', follow the directions in "Accessing the Boot Console Interface" earlier in this chapter, and then type the following command at the prompt:

```
Main Menu: Enter command >  boot sescsi.1.0
```

Interact with ISL (Y,N,Q)> **n**

The operating system on the specified device is used to start your workstation.

• The Initial System Loader (ISL) is the program that actually controls the loading of the operating system. By interacting with ISL, you can choose to load an alternate version of the HP-UX operating system. If you wish to interact with the ISL before booting your workstation, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter, and then type the following at the prompt:

```
Main Menu: Enter command > boot device
```

You are prompted:

```
Interact with ISL (Y,N,Q)>
```

Answering quit (**q**) aborts the boot and returns you to the boot console handler.

Answering no (**n**) continues the boot sequence with the device specified from the main menu prompt.

Answering yes (**y**) causes the ISL to be loaded from the specified device. After a short time, the following prompt appears on your screen:

```
ISL>
```

For example, if the usual kernel (**/stand/vmunix**) on your root disk (**fwscsi.6.0**) has become corrupted, and you wish to boot your workstation from the backup kernel (**/stand/vmunix.prev**), type the following at the `ISL>` prompt:

`ISL>` **hpux /stand/vmunix.prev**

To quit out of the ISL without booting, you must power cycle the board computer.

• If you do not know which media in your file systems have bootable operating systems, you can find them with the **search IPL** command. See the section "Searching for Bootable Media".

Searching for Bootable Media

To list devices that contain bootable media, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter, and then type the following at the prompt:

```
Main Menu: Enter command > search ipl
```

The search command searches all buses. The search may turn up more devices than there are lines on your display. If you are using a text terminal, you may control the progress of the search from your terminal's keyboard by using the following commands:

- To hold the display temporarily, press **Ctrl** **S**
- To continue the display, press **Ctrl** **Q**
- To halt the search, press any other key

These flow-control commands do not work with a bitmapped display, but such a display can show more than forty lines of text, so you are unlikely to need them.

To search for devices of *just one type* that actually contain bootable media, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter, and then type the following at the prompt:

```
Main Menu: Enter command >
```
 search ipl *device_type*

Where *device_type* is one of the following:

sescsi is the built-in single-ended SCSI bus

lan is all connections to the built-in LAN

pci*n* is an optional PCI card in slot *n*

pmc*n* is an optional PMC card in site *n*

Restoring the Factory Default Configuration

To restore the factory default values in the EEPROM, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter, and then type the following at the prompt to access the Configuration Menu:

```
Main Menu: Enter command > co
```

When the Configuration Menu appears, type the following at the prompt:

```
Configuration Menu: Enter command > default
```

The process takes less than 30 seconds and messages similar to the following are displayed:

```
Initializing...


TEST 30CD

INIT 30CD

Configuration Menu: Enter command >
```

The factory default EEPROM settings are now restored.

The defaults are as follows:

OS_ID:	HP-UX
Fast Size:	0xF (all memory is tested)
Primary Path:	sescsi.6.0
Alternate Path:	sescsi.5.0
Console Path:	GRAPHICS(0) *or* PMC*n* where *n* is the lowest numbered device installed. If no graphics devices are installed this is set to SERIAL_1.
Keyboard Path:	PS2
Autoboot:	OFF
Autosearch	OFF
Autostart	ON

Displaying and Setting Paths

A **path** is the hardware address of a device that is attached to the I/O system of your work-station. The **path** command sets the system paths shown in Table 3-1.

The **path** command sets and displays the hardware address of a specified device attached to the I/O bus of your workstation.

Table 3-1 System Paths

Path Type	Device
primary or **pri**	Your workstation's default boot device (usually the root disk)
alternate or **alt**	Your workstation's alternate boot device (usually a DDS-format tape device)
console or **con**	Your workstation's primary display device
keyboard or **key**	Your workstation's primary ASCII input device

To display the current settings for the system paths, type the following at the prompt:

```
Main Menu: Enter command > path
```

To obtain a full listing of currently supported boot device "mnemonic" paths, use the fol-lowing command:

```
Main Menu: Enter command > pa prim ?
```

To obtain a full listing of currently supported console "mnemonic" paths, use the follow-ing command:

```
Main Menu: Enter command > pa con ?
```

The paths are displayed in **Mnemonic Style Notation,** as shown in
Table 3-2.

Table 3-2 Mnemonic Style Notation

I/O Type	Specification Format
Built-in SCSI	**sescsi.**_scsi_address_**.**_logical_unit_number_
Built-in LAN	**lan.**_server_address_**.**_init_retries.io_retries_ [1]
PCI Slot	**pci**_n_
PMC Slot	**pmc**_n_
On-board Graphics	**graphics(0)**
PS/2 Keyboard	**ps2**
RS232(A)	**serial_1.**_baudrate.wordlength.parity_
RS232(B)	**serial_2.**_baudrate.wordlength.parity_
1. _server_address_ is the IP address of the host system	
_init_retries,_ default (0) = 3 retries, 255=nerver stop, 1-254=that exact number	
_io_retries,_ default (0) = 254 retries, 255=nerver stop, 1-254=that exact number	

To display the current setting for a particular system path, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter, and then type the following at the prompt:

> Main Menu: Enter command > **path** *path_type*

where *path_type* is one of the path types listed in Table 3-1.

For example, to get the path to the primary boot device, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter, and then type the following at the prompt:

> Main Menu: Enter command > **path primary**

To set a system path to a new value, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter, and then type the following at the prompt:

> Main Menu: Enter command > **path** *path_type path*

where *path_type* is one of the path types listed in Table 3-1 and *path* is the specification of the path in Mnemonic Style Notation (as described in Table 3-2). For example, to set the primary boot path to a SCSI disk with an ID of 6.0, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter, and then type the following at the prompt:

> Main Menu: Enter command > **path pri sescsi.6.0**

Displaying and Setting the Monitor Type

Your system ships from the factory preset to use a monitor with a specific resolution and frequency. If you replace your workstation's monitor with a different type of monitor, you must reconfigure your workstation to support the new monitor.

The Monitor Command

The **monitor** command lets you change your workstation's graphics configuration. This command is available in the Configuration Menu of the boot console interface.

To display the current graphics and console information, enter the following command:

    Configuration Menu: Enter command > **monitor**

The correct usage for setting the graphics configuration is:

    Configuration Menu: Enter command > **monitor** *graphics_path type*

where valid *graphics_path* parameters are:

  graphics(0) - The on-board 8-plane graphics adapter.

  pmc1 - Graphics adapter installed in PMC site 1.

  pmc2 - Graphics adapter installed in PMC site 2.

  pmc3 - Graphics adapter installed in PMC site 3.

  pmc4 - Graphics adapter installed in PMC site 4.

and *type* is the numerical monitor type as shown with the **monitor list** command.

You can also use the **monitor** command to disable the onboard graphics if you plan to use only PMC graphics cards to drive displays. To disable the onboard graphics, enter the following command:

    Configuration Menu: Enter command > **monitor disable builtin**

NOTE: If you disable the onboard graphics, and later need to use the onboard graphics as the console device, see "Using the Emergency Interactive Console Search" on page 21.

Displaying the Current Monitor Configuration

To display the current monitor configuration for your system from the Configuration Menu of the boot console interface, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter. Once you are in the Boot Console Interface Main Menu, type:

```
Main Menu: Enter command >  configuration
```

This places you in the Configuration Menu. From here type:

```
Configuration Menu: Enter command >  monitor
```

The screen displays a list of the current graphics adapters and their monitor types configured for your workstation.

```
MONITOR INFORMATION


   Path        Slot  Head   HPA      Resolution  Freq  Type  Class
----------     ----  ----  ------    ----------  ----  ----  --
GRAPHICS(0)      0    1    f8000000  1280x1024    72Hz   12


Configuration Menu: Enter command >
```

In this example, only the built-in graphic adapter graphics(0) is configured. The monitor type for graphics(0) is set to type 12, which is a 1280 by 1024 monitor that uses a frequency of 72 Hz.

Setting the Monitor Type

You can set the monitor type for a graphics adapter from the configuration menu by entering the following:

> Configuration Menu: Enter command > **monitor graphics(0)** *tt*
> *- or -*
> Configuration Menu: Enter command > **monitor pmc***n tt*

Where *n* is the number of the PMC site and *tt* is the monitor type.

To display a list of supported monitors, enter the following command;

> Configuration Menu: Enter command > **monitor list**

A list of valid monitor types similar to the following is displayed;

```
MONITOR INFORMATION


Path          Slot Head Type   Size      Freq  Class
----          ---- ---- ---- --------- ----  -----
 GRAPHICS(0)  0    1    1    1280x1024  75Hz  VESA
*GRAPHICS(0)  0    1    2    1280x1024  75Hz  VESA, Double buffered
 GRAPHICS(0)  0    1    3    1280x1024  75Hz  VESA, Greyscale
*GRAPHICS(0)  0    1    4    1280x1024  75Hz  VESA, Double Buffered,Greyscale
 GRAPHICS(0)  0    1    5    1024x768   75Hz  VESA
 GRAPHICS(0)  0    1    6    800x600    75Hz  VESA
 GRAPHICS(0)  0    1    7    640x480    75Hz  VESA
*GRAPHICS(0)  0    1    8    1600x1200  75Hz  VESA
*GRAPHICS(0)  0    1    9    1600x1200  75Hz  VESA,Greyscale
*GRAPHICS(0)  0    1    10   1200x1600  75Hz  VESA
*GRAPHICS(0)  0    1    11   1200x1600  75Hz  VESA,Greyscale
 GRAPHICS(0)  0    1    12   1280x1024  72Hz
*GRAPHICS(0)  0    1    13   1280x1024  72Hz  Double buffered
 GRAPHICS(0)  0    1    14   640x480    60Hz
 GRAPHICS(0)  0    1    15   --------user defined-------


Configuration Menu: Enter command >
```

* These monitor types are not supported on the Model 745 built-in graphics.

To set the monitor type for graphics(0) to monitor type 2 you would enter the following;

      Configuration Menu: Enter command > **monitor graphics(0) 2**

This will take effect on the next reboot.

```
MONITOR INFORMATION


   Path        Slot  Head    HPA      Resolution  Freq  Type  Class
-----------    ----  ----  --------   ----------  ----  ----  -----
GRAPHICS(0)      0     1   f8000000   1280x1024  72Hz    2
```

The boot console displays a message that tells you that your new monitor selection will take effect the next time you reboot your system.

The boot console also displays the new monitor information.

Trying to change the monitor type to a number not listed for that graphics device fails and gives you the following warning message:

```
  Value of monitor type n out of range (n - nn)
```

Setting the Monitor Type at Power On

If you replace your workstation's monitor with a different monitor type, and do not set the workstation's graphics parameters by using the monitor command before doing so, you need to perform the following steps at power on:

If your keyboard connects to the PS/2 connector on your system, wait 2 seconds after the Num Lock light flashes near the end of the boot sequence, then press **Tab** to initiate the automatic monitor selection process.

The system cycles through all of the available monitor types one at a time. When you can see a message similar to the following clearly and legibly, select that monitor type by pressing **Enter**.

```
MONITOR INFORMATION


   Path        Slot  Head   Type      Size     Freq  Class
-----------    ----  ----   ----   ----------  ----  -----
GRAPHICS(0)     0     1      n      nnnnxnnnn   nnHz
Press [RETURN] to select this monitor type (type n of n types).
```

NOTE: If you are using a power saving monitor, the power LED will light when the monitor senses a valid video synch signal.

The system queries you to confirm your selection. Press **Y** to save this monitor type.

If you press any key other than **Y**, the following message is displayed:

```
Monitor type not saved.
```

At this point, the new monitor type is active, but not saved. Because you didn't save the monitor type, the next time you reboot the system, the original monitor type will be used.

Next, the following message is displayed:

```
To select a new Graphics Monitor Type press the <TAB> key now, otherwise EXIT
by entering any other key (or will time out in 15 seconds)...
```

To restart the monitor selection process, press **TAB**.

Using the Emergency Interactive Console Search

If the system console is set to a device that is not installed in the system, you can use the emergency interactive console search to set the console to one of the terminal devices that is currently connected.

Use the following procedure to set the console with the emergency interactive console search:

1 Make sure that the monitor(s) and/or terminal(s) are powered on.

2 Hold the Model 744 board computer's reset/abort switch in its **Abort** position, then turn on power to the chassis.

3 A message similar to the following is displayed on each monitor connected to a graphics device recognized by the system:

```
GRAPHICS(s) MONITOR INFORMATION

Slot       Model        Type  Resolution  Freq  Class
----  -----------------  ----  ----------  ----  -----
   0  INTERNAL_EG_1280    12   1280x1024   75Hz

The following keyboard(s) are available:
       PS2
Press the <n> key to select GRAPHICS(s) as the CONSOLE or
press the <Tab> key to select the next monitor type.
```

Where n is a single-digit number or a keyboard key.

When the message is displayed clear and undistorted on the monitor for your console device, enter the number or key that corresponds to the display device that you are selecting.

NOTE: The message is displayed for sixty seconds before proceeding to the next monitor resolution.

If you are using a power saving monitor, the power LED will light when the monitor senses a valid video synch signal.

If this message is not displayed on your monitor, review the procedures in Chapter 1 and Chapter 2 to make sure that you correctly installed the option board.

If no keyboards are found the following message is displayed:

```
WARNING: No keyboard(s) found. Turn off system
         power, check keyboard connection(s) and
         repeat interactive console search.
```

To advance all graphics adapter monitors to the next resolution, press the <Tab> key
one time and wait five seconds for all monitor types to change. Do not hold down the
<Tab> key or press it multiple times as this will cause the monitor types to advance
for each press of the <Tab> key.

4   When the following message is displayed, press the <Esc> key to confirm selection of
the device as the console:

```
Press the <Esc> key to confirm selection of GRAPHICS(s) as
the CONSOLE.
```

```
This selection will timeout in 10 seconds if not confirmed.
```

NOTE: The message is displayed for only ten seconds before console
search is resumed. Press <Esc> as soon as possible after the
message is displayed.

The following message is displayed on the selected display:

```
GRAPHICS(s) MONITOR INFORMATION

Slot        Model        Type  Resolution  Freq  Class
----  ----------------  ----  ----------  ----  -----
   0  INTERNAL_EG_1280    12  1280x1024   75Hz

Selected CONSOLE path is: GRAPHICS(s)

Selected KEYBOARD path is: PS2
```

Displaying the Current Memory Configuration

The **memory** command shows the memory configuration table.

To display the current memory configuration for your system, from the Information Menu of the boot console interface, follow the directions in "Accessing the Boot Console Interface" earlier in this chapter. Once you are in the Boot Console Interface Main Menu, type:

```
Main Menu: Enter command > information
```

This places you in the Information Menu. From here type:

```
Information Menu: Enter command > memory
```

The screen displays status and configuration information for the memory modules installed in your workstation.

Memory Information Example

If a memory card failure is detected during power-on selftest, the following message is displayed on the console (after completing all selftests) and the autoboot/autosearch process is automatically stopped:

```
WARNING: One or more memory banks were not configured due
         to a SIMM size mismatch or a SIMM failure. For
         more details, use the MEMORY command in the
         INFORMATION menu.
```

NOTE: The above condition occurs only after the testing and successful configuration of at least one memory card.

The following listing is a sample memory configuration table when memory modules are properly installed and configured:

```
      MEMORY INFORMATION


      MEMORY STATUS TABLE
      Slot    Size    Status
      ----------------
      0       64MB    Configured
      1       32MB    Configured
      2       64MB    Configured
      ---------
   TOTAL      160MB
```

If the power-on selftest detects a defective or damaged memory card, using the **memory** command (from the Information Menu prompt) displays the following information:

```
  WARNING: One or more memory banks were not configured due
           to errors in the following SIMM(s).

    Physical Slot   Error Type
    -------------   -----------
    3               SIMM hardware error

               Memory Card Stack
         +-------------------------+
    Slot 3 |          Failed          |
         +-------------------------+
         +-------------------------+
    Slot 2 |          64MB OK         |
         +-------------------------+
         +-------------------------+
    Slot 1 |          32MB OK         |
         +-------------------------+
         +-------------------------+
    Slot 0 |          64MB OK         |
         +-------------------------+
  =========================================================
  Side view of Model 9000/744/165L Single Board Computer PCB.

  SUGGESTION: If possible, turn off the computer and check to
         see if the memory card(s) are seated properly.

      Memory
      HVERSION                 SVERSION
      ---------------  ---------------
      0x0740                   0x0900
```

Displaying the Status of the System I/O

The **IO** command is available from the information menu. It lets you identify all built-in I/O devices and optional I/O devices installed in the option slots.

To use the **IO** command from the Information Menu of the boot console interface, type:

```
Information Menu: Enter command > IO
```
Information about the built-in and optional I/O devices is displayed as shown in the following example:

```
I/O MODULE INFORMATION
                                                       IODC IODC
Path          Decimal   Type              Location  HVER SVER Vers Dep
------------  -------   ----------------  --------- ---- ---- ---- ----
8             8         Bus Converter     built-in  5040 0000 0x00 0x00
8             8         Bus Converter     built-in  5050 0000 0x00 0x00
8/16          8/16      Bus Adapter       built-in  04b0 8100 0x00 0x00
8/16/0        8/16/0    Parallel          built-in  04b0 7400 0x00 0x00
8/16/1        8/16/1    Audio             built-in  04b4 7b00 0x00 0x00
SERIAL_1      8/16/4    RS232             built-in  04b0 8c00 0x01 0x00
SESCSI        8/16/5    SE SCSI           built-in  04b0 8200 0x96 0x00
LAN           8/16/6    LAN               built-in  04b0 8a00 0x02 0x00
PS2           8/16/7    Keyboard          built-in  04b0 8400 0x00 0x00
8/16/8        8/16/8    Mouse             built-in  04b0 8400 0x00 0x00
8/20          8/20      Bus Adapter       EISA      0110 8e00 0x00 0x00
EISA          8/20/5    Bus Adapter       EISA      0110 9000 0x00 0x00
GRAPHICS(0)   8/24      INTERNAL_EG_1280  built-in  04b0 8500 0x01 0x00
8/28          8/28      Bus Adapter       built-in  04a0 9300 0x00 0x00
SERIAL_2      8/28/2    RS232             built-in  04a0 8c00 0x01 0x00
BPR           8/28/3    BPR               built-in  04a0 8f00 0x00 0x01
62            62        Native Processor  built-in  50f0 0481 0x00 0x00
63            63        Proc Dep Memory   built-in  0740 0900 0x00 0x00

EISA Cards
Path    Type                    EISA ID
----    ----                    -------
20/5/1  100VG AnyLAN adapter cardHWP1990
20/5/2  Unknown EISA card or empty slot
20/5/3  Smart 16/4 Ringnode cardMDG0002
20/5/4  PSI card                HWP1870
20/5/5  Unknown EISA card or empty slot
20/5/6  Unknown EISA card or empty slot
20/5/7  Unknown EISA card or empty slot
20/5/8  Unknown EISA card or empty slot

PCI Cards
Slot    Path                      Bus Class
----    ------------------------- --- --------------


Information Menu: Enter command >
```

Setting the Auto Boot and Auto Search and Auto Start Flags

The **auto boot, auto search,** and **auto start** flags are variables stored in your workstation's nonvolatile memory. (Nonvolatile memory retains its contents even after power is turned off.) If you reset these flags to a new value, the change takes effect the next time you reboot the workstation.

The **auto boot** variable boots the operating system whenever your workstation is turned on.

To examine the state of **auto boot** and **auto search**, type the following at the prompt:

```
Configuration Menu: Enter command > auto
```

If **auto boot** is set to **on**, your workstation automatically attempts to boot the operating system when turned on. If **auto boot** is set to **off**, your workstation enters the boot administration mode of the boot console user interface.

The state of **auto search** determines how your workstation seeks a boot device during autoboot. If **auto search** is set to **on**, your workstation will search for other boot devices if the primary boot device is not available. If **auto search** is **off**, your workstation will default to the boot administration mode if it can't see the primary boot device.

To change the state of **auto boot** or **auto search**, enter either of the following commands at the prompt:

```
Configuration Menu: Enter command > auto boot state
```

```
Configuration Menu: Enter command > auto search state
```

where *state* is **on** or **off**.

Autosearch searches for devices in the following order:
Primary Boot Path
Alternate Boot Path
Built-in Single-Ended SCSI Devices
Built-in LAN bootp servers

Displaying and Setting the Security Mode

The **SECure** flag is a variable stored in non-volatile memory. (Non-volatile memory retains its contents even after power is turned off.) If you reset this flag to a new value, the change takes effect the next time you reboot the board computer.

When the **SECure** flag is set to **on**, **autoboot** and **autosearch** are enabled and cannot be stopped. The system boots from the default boot paths regardless of user intervention.

To display the current setting for the **SECure** flag, enter the following command:

```
Configuration Menu: Enter command > secure
```

To set the **SECure** flag on or off, enter one of the following:

```
Configuration Menu: Enter command > secure on
```

```
Configuration Menu: Enter command > secure off
```

Displaying and Setting the Fastboot Mode

When **fastboot** is enabled (set to **on**), your workstation does a quick check of the memory and skips I/O interface testing during its power-on self tests. This enables your workstation to complete its boot process more quickly. The default factory setting is for **fastboot** to be disabled (**off**).

The **fastboot** mode allows your workstation to boot quickly by performing a less extensive check of the system's memory.

When **fastboot** is disabled (set to **off**), more extensive memory testing and I/O interface testing is performed during the selftests, causing the boot process to take longer.

If you are experiencing difficulty in booting your workstation, set **fastboot** to **off** and reboot the system. The more extensive testing may reveal the error condition.

To display the status of **fastboot**, type the following at the prompt:

```
Configuration Menu: Enter command > fastboot
```

To disable **fastboot**, type the following at the prompt:

```
Configuration Menu: Enter command > fastboot off
```

To enable **fastboot**, type the following at the prompt:

```
Configuration Menu: Enter command > fastboot on
```

CAUTION: If a graphics adapter is installed in the system, it must be selected as the console device. If additional graphics adapters are installed, Fastboot mode cannot be used.

Displaying the LAN Station Address

It is sometimes necessary to supply the LAN station address of your workstation to other users. For example, if your workstation is to become a member of a cluster, the cluster administrator needs to know your LAN station address in order to add your workstation to the cluster.

A **LAN station address** of your workstation is the label that uniquely identifies the LAN connection for your workstation at the **link level** (the hardware level).

To display your workstation's LAN station addresses, type the following at the prompt:

```
Information Menu: Enter command > lanaddress
```

The LAN station address is displayed as a twelve-digit number in hexadecimal notation, similar to the following:

```
LAN Station Addresses:   0060b0-789abc
```

The address is for the system's built-in LAN.

Displaying System Information

The **all** command allows you to display the system's processor revision and speed, cache size, memory size, flag settings, and the boot and console paths. To display system information from the Information Menu, type the following at the prompt:

```
Information Menu: Enter command > all
```

This information is paged to allow you to view it as necessary.

Displaying PIM Information

The **pim** command allows you to display the most recent PIM information for the specified fault type. To display PIM information for a specific fault, type the following at the Service Menu prompt:

```
Service Menu: Enter command > pim processor_number
```

You can use **pim** in the following ways:

pim - Gives all fault types

pim 0 - Gives HPMC information on the processor

pim 0 *fault_type* -Provides fault type information on the processor. Where *fault_type* is **HPMC**, **LPMC**, or **TOC**

Power Budgeting

The power supply accomodates the needs of all devices and options available for the Model 745 (within specifications for the options and applicable interface specifications). No power budgeting is required.

4

Troubleshooting

This chapter provides information about isolating a failing/failed component in a Model 744 board computer through the use of diagnostic tests and troubleshooting techniques. A failed component is traced to the level of the Field Replaceable Unit (FRU) and the FRU is replaced to correct a problem.

Dealing with a Boot Failure

To start this workstation from an operating system stored on a device different from the usual boot device, to boot from a different disk, or to boot from another type of device (such as a DDS tape drive), see the following situations and examples that use the Boot Console Interface. To access the Boot Console Interface, see Chapter3 of this book.

- To boot from a known device containing a bootable operating system, type the following at the prompt:

    ```
    Main Menu: Enter command > boot <device>
    ```

    where *device* is the **hardware path** to the device, specified in Mnemonic Style Notation.

    For example, to boot an operating system stored on a DDS-format tape in a drive located at "scsi.1.0," go to the Main Menu of the Boot Console Interface and then type the following command at the prompt:

    ```
    Main Menu: Enter command >boot scsi.1.0
    ```

    The operating system on the specified device is used to start the workstation.

- To interact with the Initial System Loader (ISL) before booting the workstation, type the following at the prompt:

    ```
    Main Menu: Enter command >boot <device>
    ```

    You are prompted:

    ```
    Interact with IPL (Y, N, Q)?>
    ```

Answering yes (**y**) causes the ISL to be loaded from the specified device. After a short time, the following prompt appears on the screen:

```
ISL>
```

ISL is the program that actually controls the loading of the operating system. By interacting with ISL, you can choose to load an alternate version of the HP-UX operating system.

For example, in HP-UX, if the usual kernel (**/stand/vmunix**) on the root disk (**fwscsi.6.0**) has become corrupted, boot the workstation from the backup kernel (**/stand/vmunix.prev**) by typing the following at the ISL> prompt:

```
ISL> hpux  /stand/vmunix.prev
```

• To find the location of the bootable operating systems on the various media in the file system, use the search command.

Searching for Bootable Media

To list all devices that may contain bootable media, go to the Main Menu of the Boot Console Interface and then type the following at the prompt:

> Main Menu: Enter command > **search ipl**

The search may turn up more devices than there are lines on the display. If using a text terminal, control the progress of the search from the terminal's keyboard by performing the following commands:

* To hold the display temporarily, press **Ctrl** **S**

* To continue the display, press **Ctrl** **Q**

* To halt the search, press any key.

These flow-control commands do not work with a bitmapped display, but such a display can show more than forty lines of text, so they are unnecessary.

To search for devices of *just one type* that actually contain bootable media, go to the Main Menu of the Boot Console Interface and then type the following at the prompt:

> Main Menu: Enter command > **search ipl** *device_type*

where *device_type* is one of the following:

>   **gsc***n* is an optional FW SCSI adapter in GSC slot 1 or 2

>   **sescsi** is the built-in single-ended SCSI bus

>   **lan** is the built-in network adapter

>   **bpn** is the VME backplane networking

>   **bpr** is the VME backplane boot ROM

>   **ata(0)** is the optional PCMCIA adapter (HP-RT only)

Stable Storage

Stable Storage is non-volatile memory associated with each PA-RISC processor module. Stable storage is used by the processor (CPU) to store device path information, the state of the boot flags, HPMC error information, and operating system initialization data.

Boot Command Notations

The **boot** command supports the following two notations:

• Mnemonic

• Path number

Type **help path** or **help boot** for more information on the boot path parameters.

Here are examples of mnemonic notation:

• **boot** with "no parameters" selects the primary boot path in stable storage.

• **boot** with the **alternate** or **alt** parameter selects the alternate boot path in stable storage.

Here is an example of path number notation:

boot p1 attempts to boot from the second path indicated by the **search** command.

ISL Environment

ISL provides the means to load the operating system. ISL also provides an offline platform to execute diagnostic and utility programs contained in the LIF volume on the boot device when the operating system is not loaded.

The ISL program is the first program loaded into main memory from an external media (LAN, disk, or tape) and launched by the initial program loader (IPL) routine from the Boot Administration environment.

The ISL environment provides the following capabilities:

*   Execute user-entered commands to modify boot device paths and boot options in stable storage.

*   Run offline diagnostic programs, as described later in this chapter.

*   Provide automatic booting of the operating system after power-on or reset.

Firmware Selftest Failures

Two methods are used by the firmware to provide diagnostic information: the LEDs on the board computer's front panel and ASCII encoded chassis codes which are output through the RS-232 (A) port.

Interpreting the Front Panel LEDs

The Model 744 provides two LEDs, located to the left and right of the reset switch, as shown in Figure 4-1. The red LED is labeled SYSFAIL and the green LED is labeled POWER.

Figure 4-1 Model 744 LED Location

Table 4-1 provides information on interpreting the system status from the LEDs.

Table 4-1 LED Indicators

SYSFAIL (Red)	POWER (Green)	Meaning	Possible Solution
Off	Off	No Power	Check for board seating in chassis.
On	2Hz Flash	Normal Power-on/ selftest	If the system never proceeds past this point, either the console path is not set or there is a critical CPU failure. Refer to "Using the Emergency Interactive Console Search" in Chapter 3 to set the console path. If this fails, replace the system board.
On	Off	Memory Failure	Troubleshoot for failed RAM card or problem with the RAM connection.
On	1 Flash/ second	CPU (board) Failure	Replace the system board.
On	4 Flash/ second	No console identified	Check the console search path and keyboard connections. If no problem is found, replace the system board.
On	On	OS is booted with VME services failure	Check the Operating System VME services. Check that VME services is configured in the kernel.
Off	On	OS is booted with VME services OK	

Interpreting the Diagnostic Chassis Codes

The chassis codes convey the state of the system. Each chassis code consists of two fields, the general operating state of the system and a four-digit hexadecimal (hex) status code indicating the specific system hardware or software component as follows:

> *xxxx nnnn*

Where *xxxx* is an ASCII string indicating the operating state, and *nnnn* is the hexadecimal status code.

For example, in the chassis code TEST 3000, TEST is the operating state, and 3000 is the hexadecimal status code.

Table 4-2 lists the five possible operating states that can be reported.

Table 4-2 Chassis Code Operating States

State	Description
FLT	A critical hardware fault which will result in a system halt.
INIT	A hardware or software component being initialized.
SHUT	The system is shutting down.
TEST	A hardware component is being tested.
WARN	A non-critical warning.

Under normal operating conditions the operating states of the displayed chassis codes are INIT and TEST.

In cases of a critical hardware component failure, the operating state displayed is FLT.

In cases when an optional component is not found or configuration information is incorrect, the displayed operating state is WARN. The WARN operating state is a noncritical condition, but the condition of the indicated component should be verified.

During the system shutdown process, the displayed state is SHUT.

The following table provides information on interpreting the diagnostic chassis codes to troubleshoot the system to the FRU (Field Replaceable Unit) level.

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
1001-101F	Unknown	Unexpected Interrupt	Note what chassis codes precede this fault condition, then remove or replace the component indicated by the preceding chassis codes. This condition is generally due to memory corruption.
1030		Start of early self-test phase	
1031		Early self-test phase skipped. (Fastboot enabled)	
103C	744 SBC[a]	Initializing CPU	
103E		Early self-tests completed	
1040-1099	744 SBC[a]	CPU self-tests	Replace the single board computer.
10A0-10AE	744 SBC[a]	Floating-point co-processor self-tests	Replace the single board computer.
10AF	744 SBC[a]	Floating-point co-processor disabled	
10B0-10BF	744 SBC[a]	TLB init and self-test	Replace the single board computer.
10C0-10DF	744 SBC[a]	PDH status information	Replace the single board computer.
10EF		Self-test returned a warning	

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
10FF	744 SBC[a]	Self-test failure	Replace the single board computer.
2000-20FF	744 SBC[a]	CPU built-in level-1 cache self-tests and init	Replace the single board computer.
3000--30FF	744 SBC[a]	PDH self-test, init, and fault conditions	Replace the single board computer.
4000		Start of late self-tests	
4001		Late self-test phase skipped. (Fastboot enabled)	
400E		Late self-tests completed	
4010-406F	744 SBC[a]	Cache late self-tests	Replace the single board computer.
4070-4071	744 SBC[a]	CPU super-scalar self-tests	Replace the single board computer.
5000	Unknown	Unknown bus error	

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
503F	Unknown	HPMC due to bus error	These conditions result in an HPMC. Refer to the section "Dealing with HPMC (Uncorrectable Error)" later in this chapter.
504F		Processor memory access exceeded bounds of configured memory space	
505F		Processor I/O access timed out	
506F		DMA guest detected data parity error on GSC bus	
507F		Processor detected data parity error on GSC bus	
7000-7FFF	Memory Modules	Memory init, self-test, and fault codes	Refer to the section "Determining the Faulty Memory Card" later in this chapter.
80F3	Various	Could not get IODC bytes for current module	Confirm that the paths are set correctly, cables are correctly connected, and power is turned on to external devices.
80F4	Various	Could not get ENTRY_INIT procedure for current module	
80F5	Various	ENTRY_INIT procedure for the current module returned a failure status	
80F6	Various	Could not get ENTRY_IO procedure for current module	

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
80F7	Various	ENTRY_IO procedure for the current module returned a failure status	Confirm that the paths are set correctly, cables are correctly connected, and power is turned on to external devices.
80F8	Various	Device class for current boot device is invalid	
80F9	Various	Could not get ENTRY_TEST procedure for current module	
80FA	Various	ENTRY_TEST procedure for the current module returned a failure status	
8414	744 SBC[a]	Testing RS232C port A	
8415		Testing SCSI controller	
8416		Testing LAN controller	
8417		Testing PS/2 keyboard controller	
84FF		Core I/O adapter not found	Replace the single board computer.
8FFF		Late self-test failure	

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
9000	Various	Device specified by console path not found	Confirm that the paths are set correctly, cables are correctly connected, and power is turned on to external devices.
9001	Various	Could not find a console device	
A008	Various	Could not locate a boot device	
A00F	Various	Could not get path for current module	
A088	Various	Unable to boot, no console	
A0BD	Various	ENTRY_INIT returned *device not ready* status	
A50F	Various	Failed to init boot device specified by primary path	
A70F	Various	Failed to init alternate boot device	
C200	Memory	Starting memory configuration	
C201		Starting destructive memory test	
C202		Starting non-destructive memory test	
C2E0		Memory config and self-test complete	
C300	744 SBC[a]	CPU is executing early selftests	
C3FF	744 SBC[a]	CPU is executing late selftests	

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
C400		Retrieving the Stable Store console path	
C440		Initializing the Stable Store console path	
C500		Retrieving the primary boot path	
C540		Initializing the primary boot path	
C580		Loading IPL from the primary boot path	
C5F0		An error occurred reading IPL from primary boot device	File system may be corrupt on boot device. Try booting from alternate boot device. Replace or repair boot device.
C5F1		LIF address is zero or not 2K byte aligned on primary boot device	
C5F2		LIF file not present on media on primary boot device	
C5F3		LIF file is zero, not a multiple of 2K bytes, or is greater than 256KB on primary boot device	File system may be corrupt on boot device. Try booting from alternate boot device. Replace or repair boot device.
C5F4		LIF entry point not word aligned or >= size of LIF file on primary boot device	
C5F8		IPL checksum error on primary boot device	

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
C5FF		Branching to IPL from the primary boot device	
C600		Retrieving default console path	
C640		Initialize default console path	
C641		Initializing current graphics device	
C64F		Retrying bad monitor type	
C650-C652		Initializing graphics device 0, 1, or 2	
C740		Initializing alternate boot path	
C780		Loading IPL from alternate boot device	

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
C7F0		An error occurred reading IPL from alternate boot device	File system may be corrupt on boot device. Try booting from alternate boot device. Replace or repair boot device.
C7F1		LIF address is zero or not 2K byte aligned on alternate boot device	
C7F2		LIF file not present on alternate boot device	
C7F3		LIF file is zero, not a multiple of 2K bytes, or is greater than 256KB on alternate boot device	
C7F4		LIF entry point not word aligned or >= size of LIF file on alternate boot device	
C7F8		IPL checksum error on alternate boot device	
C7FF		Branching to IPL loaded from alternate boot device	
CB00		TOC handling initiated	
CB01		No OS_TOC vector	
CB02		Invalid OS_TOC vector	
CB03		Invalid OS_TOC code	
CB04		Invalid OS_TOC code length	

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
CB05		Invalid checksum for OS_TOC code	
CB0A		Previous TOC PIM logged	
CB0B		Branching to OS_TOC handler	
CB0C		Branch to OS_TOC failed	
CB9A		HPMC PIM overwritten	Refer to the section Dealing with HPMC (Uncorrectable Error) later in this chapter.
CBF0		HPMC handling initiated	
CBF1		OS did not replace PDC IVA	
CBF2		Invalid length for OS_HPMC code	
CBF3		Invalid address for OS_HPMC code	
CBF4		Invalid checksum for OS_HPMC code	
CBF5		IVA + 32 = 0	
CBFA		Previous HPMC PIM logged	

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
CBFB		Branching to the OS HPMC handler	Refer to the section Dealing with HPMC (Uncorrectable Error) later in this chapter.
CBFC		Failed branch to the OS HPMC handler	
CBFE		HPMC interrupted a TOC	
CBFF		Nested HPMC occurred	
CD00		Beginning initialization of the I/O subsystem	
CD10-CD17		Initializing GSC slots 1 through 8	
CD18		Initializing the VME ASIC	
CD1A-CD1D		Initializing graphics devices	
CD1E		Initializing EISA subsystem	
CD1F		Initializing core I/O ASIC	
CDE0		EISA subsystem initialization complete	
CDEA		Initializing EISA subsystem	
CDEF		EISA subsystem not found	Reseat the EISA tray in the chassis. If this message still occurs, replace the EISA tray.

Table 4-3 Chassis Codes

Chassis Code Range	FRU	Description	Possible Solution
CDFF		System map initialization complete	

   a. SBC (Single Board Computer)

To get additional information about failures, from the boot console interface, use the **pim** and **Chassis Code** commands from the Service Menu.

Running ODE-Based Diagnostics

The Offline Diagnostic Environment (ODE) consists of diagnostic modules for testing and verifying system operation. ODE provides all the necessary functions for the user to load specified tests and interact with those tests.

ODE is an ISL utility. To boot ODE:

1 Invoke the ISL environment from the system disk.

2 Type **ode** after the ISL> prompt to invoke ODE from the LIF directory on the system disk. The prompt changes to ODE>.

Not all of the test modules are available on all systems. To see what test modules are available to run on this system, type ls at the ODE> prompt. The available modules include the following:

- **lasidiag**- tests and verifies the core-I/O functionality within the I/O ASIC chip. The diagnostics test the SCSI interface, LAN interface logic, parallel interface, audio, RS-232, PS/2 keyboard and mouse interface, real time clock, and the PC floppy interface and drive.

- **memtest** - tests and verifies the memory arrays. If an error is detected, the diagnostic reports the memory card that needs replacement and its slot number. Memtest also provides a map of the memory configuration so that the user can identify the type of memory and its slot location.

- **update** - updates the system's Processor Dependent Code (PDC) firmware on the EEPROM.

- **mapper** - identifies the configuration of HPPA systems. It displays path, identification, and revision information of I/O components, configuration of memory controllers, processors, co-processors, cache, and TLB, as well as processor board component revisions and values of various HPPA system identifiers, revisions, and capabilities.

For further information on the various ODE commands and a complete listing of the command set, type **help** at the ODE> prompt or at the prompt of one of the test modules.

Running System Verification Tests

HP-UX uses an online diagnostics product called the Support Tools Manager that allows system operation verification. HP-RT does not support online diagnostics.

Three interfaces are available with the Support Tools Manager: a command line interface (accessed through the **cstm** command), a menu-driven interface (accessed through the **mstm** command), and the graphical user interface (accessed through the **xstm** command).

For more information on these user interfaces see the online man pages by entering the following at an hpterm command line prompt:

$ **man cstm**

$ **man mstm**

$ **man xstm**

For information on the enhanced online diagnostics, see the *Precision Architecture RISC HP 9000 Series 700 Diagnostics Manual.*

To access the Support Tools Manager, you must be logged in as "root" or "superuser", and perform the following steps:

1   In a terminal window, type the following at the # prompt to invoke the command line interface:

    # **cstm**

2   The following message appears:

```
Support Tool Manager  Version A.01.00
Type 'help' for a list of available commands:
CSTM>
```

3   To verify the system operation, type the following at the CSTM> prompt:

    CSTM> **verify all**

Messages similar to the following appear:

```
Verification has started on device (CPU).
Verification has started on device (FPU).
CSTM>Verification of (FPU) has completed.
CSTM>Verification of (CPU) has completed.
```

4   Press <u>Enter</u> to return to the CTSM> after all test results are reported.

5   To exit the Support Tools Manager, enter the following:

    CTSM> **exit**

If any tests failed, run Self Test and ISL diagnostics to isolate the problem.

Dealing with HPMC (Uncorrectable Error)

The power-on sequence follows this path:

Power-on -> Selftest -> Console Path -> Boot Admin Mode -> Boot Path -> ISL Mode -> Operating System Mode

When the hardware detects an unrecoverable (HPMC) error in the Operating System environment, an error message, referred to as a Kernel Tombstone is displayed on the monitor. The state of the system is written to main memory and the entire contents of main memory is dumped (written) to the swap area on the system disk.

HPMC error information is logged into Stable Storage; this information is referred to as PIM (Processor Internal Memory). The HPMC error information is available from the Boot Administration environment using the **PIM** command at the **service** menu.

To identify the failed FRU(s) after an HPMC, follow these steps:

1   Examine the first line of the data returned from the PIM command to display the latest error information from the last TOC, LPMC, or HPMC interruption detected.

2   Compare the values from the PIM command with those shown in Table 4-4 and take the appropriate action.

Table 4-4 PIM Action Table

Check Type Word	Cache Check Word	Bus Check Word	System Responder Word	Action
0x80000000	0x40000000	N/A	N/A	Replace CPU board
0x20000000	N/A	0x00210003	0x00000000 0xEFFFFFF	Refer to Determining the Faulty Memory Card, later in this chapter.
0x20000000	N/A	0x00310007	0xF0000000 0xF01FFFFF	Replace CPU board.
0x20000000	N/A	0x00310007	0xF0200000 0xF0207FFF	Replace EISA tray, if present, or replace CPU board.

Table 4-4 PIM Action Table

Check Type Word	Cache Check Word	Bus Check Word	System Responder Word	Action
0x20000000	N/A	0x00310007	0xF0280000 0xF029FFFF	Replace PCMCIA adapter. If problem persists replace CPU board.
0x20000000	N/A	0x00310007	0xF0300000 0xF031FFFF	Replace CPU board.
0x20000000	N/A	0x00310007	0xF0400000 0xF3FFFFFF	Check VME system configuration and/or replace CPU board.
0x20000000	N/A	0x00310007	0xF4000000 0xF5FFFFFF	Replace Graphics in GSC Slot 2, if present, otherwise check VME cards, and/or replace CPU board.
0x20000000	N/A	0x00310007	0xF6000000 0xF7FFFFFF	Check VME system configuration and/or replace CPU board.
0x20000000	N/A	0x00310007	0xF8000000 0xF9FFFFFF	Replace Graphics in GSC Slot 1, if present, otherwise check VME cards, and/or replace CPU board.
0x20000000	N/A	0x00310007	0xFA000000 0xFBFFFFFF	Check VME system configuration and/or replace CPU board.

Table 4-4 PIM Action Table

Check Type Word	Cache Check Word	Bus Check Word	System Responder Word	Action
0x20000000	N/A	0x00310007	0xFC000000 0xFFBFFFFF	Replace EISA tray, if present, otherwise check VME system configuration, and/or replace CPU board.
0x20000000	N/A	0x00310007	0xFFC00000 0xFFD1FFFF	Replace CPU board
0x20000000	N/A	0x00310007	0xFFF80000 0xFFF83FFF	Replace optional GSC card in GSC Slot 1, if present, or replace CPU board.
0x20000000	N/A	0x00310007	0xFFF88000 0xFFF8BFFF	Replace optional GSC card in GSC Slot 2, if present, or replace CPU board.
0x20000000	N/A	0x00310007	0xFFF8C000F 0xFFFFFFFF	Replace CPU board

HPMC Caused by a Data Cache Parity Error

For example, an HPMC interruption is forced when a data cache parity error is detected during a load instruction to the memory address space or during a data cache flush operation.

Table 4-5 shows an example of the HPMC error information retrieved from Stable Storage by the PIM command from the Boot Administration environment.

Table 4-5 Processor Module Error (Data Cache Parity)

Word	Value
Check Type	0x80000000
CPU State	0x9e000004
Cache Check	0x40000000
TLB Check	0x00000000
Bus Check	0x00000000
Assists Check	0x00000000
Assists State	0x00000000
System Responder Address	0x00000000
System Requester Address	0x00000000
System Controller Status	0x00000nnn

The value in the CPU State word indicates that register values and addresses stored in Stable Storage at the time of the HPMC were saved.

The value of the Cache Check word identifies that logic in the processor module detected a (data) cache parity error. Ignore the value in the System Controller Status word.

HPMC Caused by a Multi-Bit Memory Parity Error

An HPMC interruption is forced when a multi-bit memory parity error is detected during a "DMA read" operation or fetching an I/D cache line (32 bytes).

Table 4-6 shows an example of the HPMC error information retrieved from Stable Storage by the PIM command during the Boot Administration environment.

Table 4-6 Multi-Bit Memory Parity Error

Word	Value
Check Type	0x20000000
CPU State	0x9e000004
Cache Check	0x00000000
TLB check	0x00000000
Bus Check	0x00210004
Assists Check	0x00000000
Assists State	0x00000000
System Responder Address	0xnnnnnnnn
System Requester Address	0x00000000
System Controller Status	0x00000nnn

Interpreting the Table

The values in the Bus Check and System Responder Address words indicate that a multi-bit memory parity error was detected by logic in the memory module. Ignore the value in the System Controller Status word.

The System Responder contains the hexadecimal address of the faulty memory location. Read the following section, Determining the Faulty Memory Card, to determine which memory card contains the faulty memory location.

Determining the Faulty Memory Card

Memory is configured in a contiguous fashion starting at a base hexadecimal address of 0x00000000 to a maximum of 0x3FFFFFFF (1024MB).

Memory is installed on the Model 744 in a single stack of up to four memory cards of 16MB, 32MB, 64MB, 128MB or 256MB capacity. The card on the bottom of the stack, or closest to the system board, is considered to be in physical slot 0, the second board in the stack is physical slot 1, the third card is physical slot 2, and the fourth card in the stack is physical slot 3, as shown in Figure 4-2.

NOTE: When mixing memory cards of different capacities, 128MB and 256MB cards must always be in the lowest numbered physical slots.

Physical Slot 3

Physical Slot 2

Physical Slot 1

Physical Slot 0

Figure 4-2 Physical Memory Slots

During the boot process, when the system sizes the memory to create a memory map, the memory slots are divided into eight logical slots. For better understanding, they will be referred to from herein as logical slots 0 through 7.

The system maps two logical slots to each physical slot as shown in Table 4-7. Notice that the logical slots are not sequential.

Table 4-7 Logical Memory Slots

Logical Slot 6	Physical Slot 3
Logical Slot 7	
Logical Slot 5	Physical Slot 2
Logical Slot 4	
Logical Slot 3	Physical Slot 1
Logical Slot 1	
Logical Slot 2	Physical Slot 0
Logical Slot 0	

When sizing memory, the system first looks for 256MB memory cards. It starts mapping address ranges with the 256MB memory card in the lowest numbered slot first, then the 128MB cards in the next highest slots in order.

Each 256MB, 128 MB, 64MB or 16MB card is mapped to the bottom one of the two logical slots for its physical slot. As shown in Table 4-7, a 128 MB, 64MB or 16MB card is mapped to logical slot 0, 1, 4, or 7. For example, a 128 MB, 64MB or 16MB card in physical slot 3, is mapped to logical slot 7.

The 32MB cards are mapped as two segments of 16MB. One for each logical slot associated with the cards physical slot. For example, a 32MB card installed in physical slot 0 has 16MB mapped to logical slot 0 and 16MB mapped to logical slot 2.

As you can see from Table 4-7, the logical slot numbering does not progress in a numerical order from physical slot 0 to physical slot 3. Because of this, a 32MB card may not have both of its 16MB segments mapped contiguously.

After the 256MB cards are sized, the 128 and 64MB cards are sized in a similar manner. Then the sizing progresses to the 16MB segment of memory in the lowest numbered logical slot, then the 16MB segment in the next highest numbered logical slot, and so on, until all of the memory has been mapped.

For example; suppose you have four memory cards installed as shown in Table 4-8.

Table 4-8 Memory Configuration Example

32 MB Card	**Logical Slot 6 (16MB)**	**Physical Slot 3**
	Logical Slot 7 (16MB)	
64 MB Card	Logical Slot 5	**Physical Slot 2**
	Logical Slot 4 (64MB)	
16 MB Card	Logical Slot 3	**Physical Slot 1**
	Logical Slot 1 (16MB)	
256 MB or 128 MB Card	Logical Slot 2	**Physical Slot 0**
	Logical Slot 0 (128MB or 256MB)	

The memory is mapped in the following order:

- 256 MB or 128MB Card in Physical Slot 0 (Logical Slot 0)
- 64MB Card in Physical Slot 2 (Logical Slot 4)
- 16MB Card in Physical Slot 1 (Logical Slot 1)
- 16MB of the 32MB Card in Physical Slot 3 (Logical Slot 6)
- 16MB of the 32MB Card in Physical Slot 3 (Logical Slot 7)

A worksheet is needed to determine the address ranges associated with each of the logical slots. In the example in Figure 4-3 below, the memory configuration example shown in Table 4-8 has been used.

In this example, we first determine the memory cards that are installed in each physical slot.

Next, we circle the corresponding memory card capacity in the second column. Note that we circled two 16's for each 32MB memory card.

We now look for the 128MB memory card that is associated with the lowest numbered logical slot. In our example, the 128MB card in physical slot 0, logical slot 0 is the first and only 128MB card.

Using Table 4-9, we write the hexadecimal address range for 0 to 128MB in the first column.

Next we look for the 64MB segment of memory in the lowest numbered slot. In our example, that is the 64MB segment in logical slot 4.

Then we look for the 16MB segment of memory in the lowest numbered slot. In our example, that is the 16MB segment in logical slot 1, which is the 16MB memory card in physical slot 1.

Using Table 4-9, we write the hexadecimal address range for 192MB to 208MB in the first column of our worksheet.

We continue this for each logical slot in numerical order, skipping the slots that do not have any memory.

Memory Address Range	Memory Card Capacity (MB)				Logical Slot	Physical Slot
0x0D000000 - 0x0DFFFFFF	32 (16) +				6	3
0x0E000000 - 0x0EFFFFFF	(16)	16	64	128	7	
	32 16 +				5	2
0x08000000 - 0x0BFFFFFF	16	16	(64)	128	4	
	32 16 +				3	1
0x0C000000 - 0x0CFFFFFF	16	(16)	64	128	1	
	32 16 +				2	0
0x00000000 - 0x07FFFFFF	16	16	64	(128)	0	

Figure 4-3 Example Memory Address Worksheet

Perform the following steps to fill out the worksheet:

1 Determine the memory capacity of each memory card in the **physical** slots and circle the corresponding number in the second column of Figure 4-4. For 32MB cards, circle a 16 for each of the two logical slots associated with the physical slot.

2 Use Table 4-9 to look up the memory address ranges of each segment of memory associated with the **logical** slots. Remember to use the following rules:

    a Find the 128MB card with the lowest numbered **logical** slot first.

    b Find 128MB cards with the next highest numbered **logical** slots next.

    c Find the 64MB card with the lowest numbered **logical** slot next.

    d Find 64MB cards with the next highest numbered **logical** slots next.

    e Find the 16MB memory segment with the lowest numbered **logical** slot next.

    f Find the rest of the 16MB memory segments in numerical order of the **logical** slots. Skip any logical slots that are empty.

Memory Address Range	Memory Card Capacity (MB)				Logical Slot	Physical Slot
— — — — — — —	32 16 + 16	16	64	128	6 — 7	3
— — — — — — —	32 16 + 16	16	64	128	5 — 4	2
— — — — — — —	32 16 + 16	16	64	128	3 — 1	1
— — — — — — —	32 16 + 16	16	64	128	2 — 0	0

Figure 4-4 Memory Address Worksheet

Table 4-9 Memory Address Ranges

Memory Range	Address Range	Memory Range	Address Range
0 - 16	0x00000000 - 0x00FFFFFF	512 - 528	0x20000000 - 0x20FFFFFF
16 - 32	0x01000000 - 0x01FFFFFF	528 - 544	0x21000000 - 0x21FFFFFF
32 - 48	0x02000000 - 0x02FFFFFF	544 - 560	0x22000000 - 0x22FFFFFF
48 - 64	0x03000000 - 0x03FFFFFF	560 - 576	0x23000000 - 0x23FFFFFF
64 - 80	0x04000000 - 0x04FFFFFF	576 - 592	0x24000000 - 0x24FFFFFF
80 - 96	0x05000000 - 0x05FFFFFF	592 - 608	0x25000000 - 0x25FFFFFF
96 - 112	0x06000000 - 0x06FFFFFF	608 - 624	0x26000000 - 0x26FFFFFF
112 - 128	0x07000000 - 0x07FFFFFF	624 - 640	0x27000000 - 0x27FFFFFF
128 - 144	0x08000000 - 0x08FFFFFF	640 - 656	0x28000000 - 0x28FFFFFF
144 - 160	0x09000000 - 0x09FFFFFF	656 - 672	0x29000000 - 0x29FFFFFF
160 - 176	0x0A000000 - 0x0AFFFFFF	672 - 688	0x2A000000 - 0x2AFFFFFF
176 - 192	0x0B000000 - 0x0BFFFFFF	688 - 704	0x2B000000 - 0x2BFFFFFF
192 - 208	0x0C000000 - 0x0CFFFFFF	704 - 720	0x2C000000 - 0x2CFFFFFF
208 - 224	0x0D000000 - 0x0DFFFFFF	720 - 736	0x2D000000 - 0x2DFFFFFF
224 - 240	0x0E000000 - 0x0EFFFFFF	736 - 752	0x2E000000 - 0x2EFFFFFF
240 - 256	0x0F000000 - 0x0FFFFFFF	752 - 768	0x2F000000 - 0x2FFFFFFF
256 - 272	0x10000000 - 0x10FFFFFF	768 - 784	0x30000000 - 0x30FFFFFF
272 - 288	0x11000000 - 0x11FFFFFF	784 - 800	0x31000000 - 0x31FFFFFF
288 - 304	0x12000000 - 0x12FFFFFF	800 - 816	0x32000000 - 0x32FFFFFF
304 - 320	0x13000000 - 0x13FFFFFF	816 - 832	0x33000000 - 0x33FFFFFF
320 - 336	0x14000000 - 0x14FFFFFF	832 - 848	0x34000000 - 0x34FFFFFF
336 - 352	0x15000000 - 0x15FFFFFF	848 - 864	0x35000000 - 0x35FFFFFF
352 - 368	0x16000000 - 0x16FFFFFF	864 - 880	0x36000000 - 0x36FFFFFF
368 - 384	0x17000000 - 0x17FFFFFF	880 - 896	0x37000000 - 0x37FFFFFF
384 - 400	0x18000000 - 0x18FFFFFF	896 - 912	0x38000000 - 0x38FFFFFF
400 - 416	0x19000000 - 0x19FFFFFF	912 - 928	0x39000000 - 0x39FFFFFF
416 - 432	0x1A000000 - 0x1AFFFFFF	928 - 944	0x3A000000 - 0x3AFFFFFF
432 - 448	0x1B000000 - 0x1BFFFFFF	944 - 960	0x3B000000 - 0x3BFFFFFF
448 - 464	0x1C000000 - 0x1CFFFFFF	960 - 976	0x3C000000 - 0x3CFFFFFF
464 - 480	0x1D000000 - 0x1DFFFFFF	976 - 992	0x3D000000 - 0x3DFFFFFF
480 - 496	0x1E000000 - 0x1EFFFFFF	992 - 1008	0x3E000000 - 0x3EFFFFFF
496 - 512	0x1F000000 - 0x1FFFFFFF	1008-1034	0x3F000000 - 0x3FFFFFFF

5

Field Replaceable Units

Introduction

This chapter contains the procedures to replace assemblies in the Model 745 chassis components (such as the board computer module, EISA/PCI module, mass storage module, power supply and chassis mounted hardware).

Tools Required

All field replaceable parts can be accessed with these tools:

Grounding wrist strap.
No. 1 Pozidriv screwdriver (with extension).
T-10 or T-15 Torx screwdriver
Small flat-tipped screwdriver.
3mm (0.125-in.) thin-wall nutdriver, maximum outer diameter of 5.7mm (0.225-in.).

Safety Precautions

As with any electrical/electronic product, certain safety precautions must be practiced. These safety precautions, *when followed*, can protect you from injury, and the equipment from possible permanent damage.

CAUTION: Integrated circuit components in these products can be damaged by electro-static discharge. It doesn't make any difference whether the ICs are installed on a printed circuit board or laying on a table. Static charges can build up in people to a potential of several thousand volts by simply walking across a room.

Integrated circuits can be protected by using a static free work place and wearing clothes that do not hold static charges before handling any of the workstation's PC boards.

When you need to remove or install a part or assembly, remove power from the product first. At the static free work place, touch sheet metal with your fingers before touching a printed circuit assembly. If the assembly is not going to be re-installed, place the assembly in an anti-static bag and set it aside.

Following these precautions will extend the life of the computer products you maintain.

New Parts

New parts are available direct from:

Support Materials Organization Hewlett-Packard Company 8050 Foothills Boulevard Roseville, California 95678 USA Telephone: (916) 786-8000	Parts Center Europe Hewlett-Packard GmbH Wolf-Hirth Strasse 33 D-7030 Boblingen, Germany Telephone: +41 7031 14-2253

Exchange Parts

Exchange parts are available for some items at a reduced cost. When an exchange part is ordered, your account will be charged for a new part.

Place failed exchange parts in anti-static bags and package them securely in a sturdy container. It's a good idea to save the containers and static-free bags you receive parts in and use them to ship parts in. Please return failed exchange parts to your exchange parts source as soon as possible. Customers have 15 days to return the failed part to receive credit for the difference between a new and exchange part.

Exchange parts only are available direct from:

Support Materials Organization Hewlett-Packard Company 8050 Foothills Boulevard Roseville, California 95678 USA Telephone: (916) 786-8000	Support Material & Services Europe Hewlett-Packard Ltd. Filton Road - Stoke Gifford Bristol BS12 6QZ United Kingdom Telephone: +44 272 799910

Local Hewlett-Packard Sales & Service Office

Name: _____

Address: _____

City, State, Zip: _____

Tel. Number: _____

Replaceable Parts

Figure 5-1 shows an exploded view of the Model 745 industrial system.

Figure 5-1   **Model 745 Exploded View**

Table 5-1 is a chassis parts list.

Table 5-1   **Model 745 Chassis Parts List**

Non-Exchange Part Number	Description
A4964-62008	Chassis Assembly
A4964-66006	System Backplane
A4505-66001	PCI Interface Board
A4964-66003	PCI Backplane
A4309-66001	EISA Interface Board
A4964-66004	EISA Backplane
A2636-00004	Slot 3 Cover Plate
A4964-40003	Feet
A4964-00003	Chassis Top Cover
A4964-00005	Chassis Front Bezel
0950-2690	Power Supply
A4964-62004	Cable - backplane to mid-tray
A4964-62005	Cable - fan power (front)
A4964-62006	Cable - ac input
A4964-62007	Cable - single fan (rear)
A4964-62016	Cable - LED (2)
A4190-62030	Fan (3)
2110-0528	Fuse (See CAUTION)

CAUTION: For continued protection against fire replace only with same type and rating of fuse (10A, 250V, 3AG, Fast-acting, .25 in. x 1.25 in.).

VORSICHT: Zum fortgesetzten Schutz gegen Feuer die Sicherung nur durch eine Sicherung desselben Typs und derselben Nennleistung austauschen (10A, 250V, 3AG, schnell wirkend, 0,25 Zoll x 1.25 Zoll [0,64 cm x 3,18 cm]).

ATTENTION: Pour assurer la continuité de la protection contre l'incendie, ne remplacer la pile qu'avec une pile du même calibre de fusible (10A, 250V, 3AG, action rapide, 6,3 mm x 32 mm).

Table 5-2 is a mass storage parts list.

Table 5-2   **Mass Storage Parts List**

Exchange Part Number	Non-Exchange Part Number	Description
A2084-69005		3.5 in. Flexible Disk Drive
A1658-69012		4GB Hard Disk Drive, SE
C1539-69201		DDS-2 Tape Drive
	A1658-60015	CD-ROM Drive
	A4964-62002	Internal SCSI Cable
	A4964-62001	Internal Power Cable
	A1658-62016	SE SCSI Terminator
	8120-5547	0.5 m External SCSI Cable

Model 744 Board Computer Parts

Consult the appropriate model Service Handbook for parts and part numbers.

Figure 5-2 lists the major pieces of the Model 744 assembly. Table 5-3 lists the part numbers of the exchange parts and Table 5-3 lists the part numbers of the non-exchange parts of the Model 744.

This section refers to exchange and nonexchange part numbers. You must return parts with exchange part numbers in exchange for a replacement part. Do not return parts with nonexchange part numbers. You may discard them.

Figure 5-2   **Model 744 Board Computer (Exploded View)**

Table 5-3   **Replaceable Parts**

Callout Number	Exchange Part Number	Non-Exchange Part Number	Description
1	A4500-69001 A4500-69006		System board: 132 MHz (**with** on-board graphics) System board: 165 MHz (**with** on-board graphics)
2	A4502-69001 A4503-69001 A4500-69005 A4500-69018		32 MB RAM card 64 MB RAM card 128 MB RAM card 256 MB RAM card
3		A2636-00002	Slot 2 Cover Plate
4		1420-0541	Real-time clock battery (See Warning Below)
Not Shown		A4504-60001	PMC Bridge Adapter Board
Not Shown		A4504-60002	PMC Expansion Adapter Board
Not Shown		A4979-60001	PMC Visualize-EG Graphics Card
Not Shown		A4500-00003	Standoff, Memory
Not Shown		A2636-61601	Cable, 9/9 Serial External
Not Shown		A2636-61602	Cable, 15/15 AUI, External
Not Shown		A2636-61604	Cable, 15/15, Parallel, External
Not Shown		A2636-61605	Cable, 9/9, Audio, External
Not Shown		A4500-62009	Cable, EVC Monitor, 15-Pin-35-pin
Not Shown		A4500-62004	Cable, Monitor, 15-Pin to 15-pin
Not Shown		S2413-40001	Chip Extractor, Firmware
Not Shown		A2261-62021	Rackmount Kit

WARNING: **Replace battery only with HP Part No. 1420-0541! Using any other battery can cause fire or explosion. Lithium batteries can explode if mistreated. Do not put lithium batteries in fires, try to recharge, or disassemble them.**

Removing and Replacing the Model 744 Board Computer

This section provides step-by-step instructions for removal and replacement of a single slot and dual slot 744 board computer.

Preliminary Requirements

If you are replacing a defective 744 board computer with a new one, you must determine the LAN ID of the existing 744 board computer before replacing it.

If the 744 board is operational you can access the LAN ID information from the Boot Console Handler's Information menu. At the information menu prompt, enter the following command:

```
Information Menu: Enter Command> LA
```

If the 744 board is non-operational, you can find the LAN ID on the label of UE1 which is the non-volatile stable store EEPROM where the LAN ID is saved.

The label on UE1 lists the last six digits of the LAN ID. Locate these digits as shown in Figure 5-3 and write them down here with the first six digits. LAN ID: **0060b0**_____

Figure 5-3   **Locating the LAN ID**

Removal

Follow these steps to remove the board computer from its card cage:

1   Shut down the system.

2   Loosen the captive screws, as shown in Figure 5-4. Loosen screws 1, 2, 3, and 4 for a
dual slot Model 744 (the factory default), and loosen screws 1, 2, 3 , 4, 5, and 6 for a
three slot Model 744.

3   Swing both ejector levers outwards and pull the board computer forward out of the
chassis

If you are replacing a defective Model 744 board, continue with Step 4, otherwise go to
the section of this chapter that pertains to the FRU with which you are concerned.
.

Figure 5-4   **Model 744 Captive Screws**

Replacement

1   After removing all the accessories, place them on the new/exchange board and return
the failed board to Hewlett-Packard.

2   Install the new Model 744 board computer in the chassis and reconnect any cables or
peripherals.

3   When you power on the new Model 744 for the first time, you need to enter the LAN ID that you recorded from the defective board in the Removing and Replacing the Model 744 Board Computer section earlier in this chapter. At the Boot Console's Service menu, enter the following command to enter the LAN ID:

```
Service Menu: Enter Command> ss_update
```

CAUTION: When installing additional cards or replacing the CPU, always use the latest version firmware (replaceable Boot ROM or downloadable code) available.

Removing and Replacing RAM Cards

This section provides step-by-step instructions for removing RAM cards from your
Model 744.

Preliminary Requirements

Before you remove a RAM card:

Remove the Model 744 from its card cage. (See Removing and Replacing the Model 744
Board Computer, earlier in this chapter.)

Removal

Follow these steps to remove RAM cards:

1 Remove the retaining screws from the uppermost RAM card, as shown in Figure 5-5.

Figure 5-5   **RAM Card Fasteners**

2 Pull the RAM card up and off the RAM stack or board computer.

3 Repeat the procedure for multiple RAM cards. The spacers between cards act as retaining screws for the card below; remove them to access the card.

Replacement

1 To replace a card, remove the old card according to the removal procedure.

2 Place the new card so the card is orientated in the same way as the old card.

3 Line up the connectors to match, then gently seat the card.

4 Replace the screws or standoffs used for that card.

Removing and Replacing the PMC Adapters

This section provides step-by-step instructions for replacing the adapter (expansion kit) fixture in your Model 744.

Preliminary Requirements

Before removing the adapter (Expansion Kit) fixture from your Model 744, remove the Model 744 from it's card cage. (See Removing and Replacing the Model 744 Board Computer, earlier in this chapter.)

Removal and Replacement

Follow these steps to remove the adapters from your Model 744:

1 Remove the ejector handle sleeve labels and springs, as shown in Figure 5-6.

2 Remove the ejector handle sleeves, as shown in Figure 5-7.

3 Remove the expansion adapter's two front panel screws, as shown in Figure 5-8.

4 Remove the expansion adapter's four backplane connector screws, as shown in Figure 5-8.

5 Separate the expansion adapter from the bridge adapter.

Ejector Handle Sleeves

Figure 5-6   **Removing the Labels and Springs**

Figure 5-7   **Removing the Sleeves**

Figure 5-8 **Removing the PMC Expansion Adapter**

6 To remove a PMC card from the expansion adapter, remove the four screws from the bottom of the expansion adapter and separate the PMC card from the expansion adapter, as shown in Figure 5-9.

Figure 5-9   **Removing a PMC card from the Expansion Adapter**

7 Remove the bridge adapter's four front panel screws, as shown in Figure 5-10.

8 Remove the bridge adapter's four backplane connector screws, as shown in Figure 5-10.

9 Separate the bridge adapter from the board computer.

Figure 5-10   **Removing the PMC Bridge Adapter**

Figure 5-11   **Removing a PMC card from the Bridge Adapter**

10 To remove a PMC card from the bridge adapter, remove the four screws from the bot-
tom of the bridge adapter and separate the PMC card from the bridge adapter, as shown
in Figure 5-11.

NOTICE: To replace the adapters, reverse the steps in the
procedure for removing the adapters. The
bridge and expansion adapters must be
assembled together before assembling to the
SBC.
When installing an expansion adapter, be
certain that the connector between the bridge
adapter and the expasion adapter is fully
seated.

Removing and Replacing the Front Panel

This section provides step-by-step instructions for removing the front panel of your Model 744.

Preliminary Requirements

Perform the following steps before removing the front panel:

1   Remove the Model 744 from its card cage.

2   Remove PMC adapters, if present.

3   Remove the slot 2 cover plate, if present.

NOTICE: The RFI clips on the front panel are not
                           individually replaceable. Replacing the RFI
                           clips requires replacing the complete front
                           panel.

Removal and Replacement

Follow these steps to remove the front panel:

1   Remove the interface port jack screws (There are two around each port - SCSI, video, and so forth) using the appropriate 3mm (0.125-inch) or 4mm (0.160-inch) nutdriver. The port jack screws are shown in Figure 5-12.

Port jack screws, 14 total, two each around seven of the ports.

Figure 5-12   **Port Jack Screws**

2   Remove the two small screws, one on each underside front corner of the board, that fasten the ejector handles to the board.

3   Pull the front panel forward, away from and off the system board.

4   Remove the RFI clip on the two RS-232 ports.

NOTICE: To replace the front panel, reverse the steps for removing the front panel extension panel.

Firmware ICs

This section provides information on the Model 744 firmware ICs.

Description

The ICs in the Model 744 are designated: UC1, UD1 an UE1. They perform booting functions, input/output and provide non-volatile stable storage.

Figure 5-13   **744 ICs**

UE1 is non-volatile stable storage. UD1 is input/output dependent code. UC1 is processor dependent code. The 744 firmware code is downloadable and can be upgraded by LAN and through the various storage media.

Removing and Replacing the Real-Time Clock Battery

This section provides step-by-step instructions for removing and replacing the real-time clock (RTC) in your Model 744.

Preliminary Requirements

WARNING: **Lithium batteries may explode if mistreated. Replace battery with only HP Part No. 1420-0541! Use of any other battery may cause fire or explosion. Use the following guidelines when handling old batteries:**

   Do not put lithium batteries in fires.
   Do not try to recharge lithium batteries.
   Do not disassemble lithium batteries.

Removal

Perform the following steps before removing the RTC battery from your Model 744:

1 Remove the 744 from the chassis.

2 Remove any accessory cards installed at the board computer's left position which cover the battery.

Replacement

Follow these steps to replace the RTC battery:

1 Locate the battery behind the left RAM connector. It is held in place by a spring arm marked with a "+".

2 Raise the spring arm holding the battery in place and remove the battery.

3 Install the new battery with its "+" side up.

Removing the Top Cover, Front Bezel, and Mid-Tray

Removing the top cover is necessary to gain access to internal components such as:

• mass storage devices
• PCI or EISA cards

Removing the front bezel is necessary to gain access to internal components such as:

• front fans
• mid-tray removal

Removing the mid-tray is necessary to gain access to internal components such as.

• power supply
• backplanes
• internal cabling

Preliminary Requirements

Before you remove the top cover perform the following:

1 Shut down any applications.

2 Shut down the Operating System.

3 Refer to the owner's guide, for information on properly shutting down HP-UX.

4 Turn off power to the Model 745.

5 Set up a static-free work place.

6 Disconnect all cables to the system.

Removing the Top Cover, Front Bezel, and Mid-Tray

Figure 5-14   Top Cover Removal

Figure 5-15   **Front Bezel Removal**

Removing the Top Cover, Front Bezel, and Mid-Tray

Figure 5-16   **Mid-Tray Removal**

Replacing Mass Storage Devices

NOTE: All Installation procedures are the reverse of removal in this section.

Procedure

1 Remove the system top cover using the procedure earlier in this chapter.

2 If replacing a device go to Selecting Device Address.

3 If the only action is to remove a device go to Mass Storage Device Removal.

Selecting Device Address

Procedure

1 Unpack the device.

2 Set only jumpers or switches that are required to change the device SCSI address, any others should remain as shipped.

The default SCSI addresses for devices is shown in Table 5-4. You should check the address as set on the failing drive and set the address on the new drive to the same value.

Table 5-4   **Default SCSI Addressing**

1st Hard Disk Drive	ID 6
2nd Hard Disk Drive	ID 5
3rd Hard Disk Drive	ID 4
DDS Drive	ID 3
CD-ROM Drive	ID 2
Floppy Drive	ID 0

CD-ROM

Figure 5-17 shows the CD-ROM disk drive address settings.

Figure 5-17   **CD-ROM Disk Drive**

Floppy Disk Drive

Figure 5-18 shows the floppy disk drive address settings.

Target SCSI ID

Figure 5-18   **Floppy Disk Drive**

DDS Tape Drive

Figure 5-19 shows the DDS tape drive address settings.

SCSI ID   **SCSI ID**

0   4

1   5

2   6

3

Figure 5-19   **DDS Tape Drive Address Selection**

Hard Disk Drive Address Selection

All replacement hard disk drives are shipped with jumper/configuration documentation. Please refer to the documentation shipped with the replacement disk drive for jumper settings and any applicable software patch dependencies.

Device Locations

Figure 5-20 shows the factory default device locations for the Model 745 industrial system. Note that the front and rear disk carriers can be reversed.

Front Disk Carrier:
two slots
Removable media and/or fourth and fifth hard drive

Fixed Disk Bay:
one slot
Third hard drive (ID4)

Rear Disk Carrier:
two slots
Top Slot - second hard drive (ID 5)
Bottom Slot - first hard drive (ID 6)

Figure 5-20   **Device Locations**

Removing a Device from the Mass Storage Carriers

CAUTION: Hard disk drives are vulnerable to physical shock. *Dropping a hard disk drive from even a small height will damage its heads and platters.* Always handle hard disk drives with extreme caution. Do not place a hard disk drive upside down on any surface.

Follow these steps to remove a drive.

1   Remove the disk retainer bracket (see Figure 5-21).

Figure 5-21   **Removing Retainer Bracket**

2   Unplug power and SCSI cables for the drive.

3   Remove the appropriate disk carrier by pulling it towards the center of the chassis, and then up and out.

4   Loosen the screws for that drive on the sides of the disk carrier.

5   Lift the drive up or slide the drive out of the carrier, depending on its slot position and other drives in the carrier.

6   Repeat this procedure, as needed, if you are removing additional devices

7 If necessary, remove the disk adapter brackets used to mount a 3.5-inch device in a 5.25-inch bay.

Installing a Device in a Mass Storage Carrier

1 Remove the new device from its shipping box

2 Ensure that the hardware SCSI bus address selected on the device is not already used by the system.

3 In the case of a removable media device (flexible disk, CD-ROM, or DDS tape) note any special requirements for bezel installation.

NOTE: Hard disk drives require special rubber grommets and mounting screws, shipped with the system.

4 If this is a hard disk drive, place the four rubber grommets in the mounting holes, as shown in Figure 5-23.

5 Place the device in the carrier and align the screw holes. See Figure 5-22 though Figure 5-24.

6 Adapter brackets are shipped with the system to allow mounting a 3.5-inch device in the upper (5.25-inch) slots of the disk carriers. If these brackets are installed into the disk carriers, you do not need to remove them to install the device. The brackets are packaged seperately if a 5.25-inch device is mounted in this slot.

7 Start, but do not tighten, each mounting screw.

8 After all mounting screws are started, tighten the mounting screws.

9 Replace disk carrier into the system. See Figure 5-25.

10 Replace the individual SCSI and power connectors.

11 Replace the retainer bracket. See Figure 5-26.

12 Replace the system's top cover.

13 Reconnect the power cable.

14 If the system is to be rack mounted, install into the rack now.

15 Turn on the power and boot the operating system.

Filler panel

Figure 5-22   **Device Installation in the Disk Carrier**

5.25-inch to 3.5-inch adapter brackets

Figure 5-23   **Installing the 3.5-inch adapter brackets**

Filler panels

Figure 5-24   **3.5-Inch Hard Disk Installation with Filler Panel**

Figure 5-25   **Replacing Disk Carriers**

Figure 5-26   **Replacing Retainer Bracket**

EISA or PCI Backplane Replacement

Preliminary Requirements

1 Remove the top cover using the procedure earlier in this chapter.

2 Remove the front bezel using the procedure earlier in this chapter.

3 Remove the mid-tray using the procedure earlier in this chapter.

Procedure

4 Remove any EISA or PCI cards from the chassis.

5 Remove the screws that hold the backplane assembly in the mid-tray. See Figure 5-27.

6 Slide out backplane assembly

Figure 5-27   **Backplane Assembly Removal**

7 Separate the backplane from the converter card by pulling the apart.

Disassembling   **Assembling**

Figure 5-28   **EISA or PCI Converter Board and Backplane Removal**

Power Supply Replacement

Two power supplies are used in the Model 745 - a Cherokee and an Astek

Preliminary Requirements

1   Remove the top cover using the procedure earlier in this chapter.

2   Remove the front bezel using the procedure earlier in this chapter.

3   Remove the mid-tray using the procedure earlier in this chapter.

Power Supply Removal

1   Disconnect the four wire harness leads - three from the system backplane and one from the ac switches. See Figure 5-29.

2   Slide the power supply out of the chassis.

3   If you are replacing the power supply with the same type supply, slide the new supply into the chassis and reconnect the harnesses.

NOTE: If you are installing an Astec power supply, make sure the long cable from the far end of the supply is positioned in the slot under the backplane cover (see Figure 5-30).

4   If you are replacing the supply with a different brand, you will need to move the screw located in the system backplane cover plate (see Figure 5-30).

Figure 5-29   **Cherokee Power Supply Removal and Replacement**

Power Supply Replacement

Push long cable
into slot

Screw

Astec
Position

Cherokee
Position

Figure 5-30   **Astec Power Supply Replacement**

System Backplane Replacement

Preliminary Requirements

1   Remove the top cover using the procedure earlier in this chapter.

2   Remove the front bezel using the procedure earlier in this chapter.

3   Remove the mid-tray using the procedure earlier in this chapter.

4   Remove the power supply using the procedure earlier in this chapter.

System Backplane Removal

1 Disconnect all wire harness from the backplane

2 Remove the Model 744 board compter and PMC bridge and expander baords, if present, from the chassis

3 Remove the system backplane cover plate. See Figure 5-31.

4 Remove the screws that secure the backplane to the chassis, and remove the backplane.

Figure 5-31   **System Backplane Removal**

Fuse Replacement

Preliminary Requirements

1 Remove the top cover using the procedure earlier in this chapter.

2 Remove the front bezel using the procedure earlier in this chapter.

3 Remove the mid-tray using the procedure earlier in this chapter.

See Figure 5-32.

Figure 5-32 **Fuse Removal**

Rear Fan Replacement

1 Remove fan guard (see Figure 5-33), disconnect the fan cable from the fan, and push the fan upwards.

Figure 5-33   **Rear Fan Removal (Step 1)**

2 Push the bottom of the fan inwards, moving the top of the fan down. See Figure 5-34.

3 Pull the fan out through the rear panel. See Figure 5-35

Figure 5-34 **RearFan Removal (Step 2)**

Figure 5-35 **Rear Fan Removal (Step 3)**

Front Fans Replacement

Preliminary Requirements

1   Remove the top cover using the procedure earlier in this chapter.

2   Remove the front bezel using the procedure earlier in this chapter.

3   Disconnect the fan cables from the fans.

See Figure 5-36.

Figure 5-36   **Front Fans Removal**

6

Diagrams

Functional Description of Model 745 Chassis

The Model 745 chassis provides the following:

- One 400-Watt power supply.

- Four slot EISA backplane or four slot PCI backplane

- Five Internal Mass Storage Device mounting and electrical capability.

Figure 6-3 shows the Model 745 functional block diagram.

Figure 6-1   **Model 745 Functional Block Diagram**

Figure 6-2 shows the Model 744 block diagram.

Figure 6-2   **Model 744 Block Diagram**

Figure 6-3 shows the Model 745 power distribution diagram.

Figure 6-3   **Model 745 Power Distribution Diagram**

7

Reference Documentation

Introduction

Information in this chapter should help you in various situations. The references include part numbers of many hardware documents relating to this system.

Service Documentation

Table 7-1　　　　　　**Related Service Documentation**

Manual Title	Part Number
HP Model 744 Board Computer Service Handbook	A4511-90603
Model 745 Technical Reference Manual for OEMs	A4964-90063

Table 7-2   **Diagnostic Documentatio**n

Manual Title	Part Number
Support Tools Manager User's Manual; HP 9000 Series 700 and 800	5961-1612
HP Apollo 9000 Series 700 Diagnostics Manual, Volume 1	09740-90041
HP Apollo 9000 Series 700 Diagnostics Manual, Volume 2	09740-90043
HP Apollo 9000 Series 700 Support Tape/CD-ROM User's Manual	B2380-90000
PA-RISC Support Tools Manual Licensed Users Volume 1, SPU	5960-3149
PA-RISC Support Tools Manual Licensed Users Volume 2, Device Adapters/MUXes	5960-3151
PA-RISC Support Tools Manual Licensed Users Volume 3, LAN	5960-3153
PA-RISC Support Tools Manual Licensed Users Volume 4, SCSI	5960-3155
PA-RISC Support Tools Manual Licensed Users Volume 5, Disks	5960-3157
PA-RISC Support Tools Manual Licensed Users Volume 6, Tapes/Printers	5960-3159
PA-RISC Support Tools Manual Licensed Users Volume 7, Utilities	5960-3161
PA-RISC Support Tools Manual Licensed Users Volume 8, ISL Support Tools	5960-3163
PA-RISC Support Tools Manual HP Employees	5960-3165
Offline Diagnostics Environment (ODE) User's Manual	5962-3648
System Exerciser Install and Operating Guide	5961-1624

System Installation and Getting Started Documentation

Table 7-3   **System Installation and Getting Started Documentation**

Manual Title	Part Number
Model 745 Industrial Controller Owner's Guide	A4964-90605
Model 744 Board Computer Owner's Guide	A4511-90606

8

Service Notes

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Place service notes here.

Index

Index