

# DIGITAL Server 5300

---

## Service Guide

Part Number: ER-K8FWW-SG. A01

**February 1998**

This manual is for anyone who services the DIGITAL Server 5300 systems. It includes troubleshooting information, configuration rules, and instructions for removal and replacement of field-replaceable units.

**Digital Equipment Corporation  
Maynard, Massachusetts**

---

**February 1998**

Digital Equipment Corporation makes no representations that the use of its products in the manner described in this publication will not infringe on existing or future patent rights, nor do the descriptions contained in this publication imply the granting of licenses to make, use, or sell equipment or software in accordance with the description.

Possession, use, or copying of the software described in this publication is authorized only pursuant to a valid written license from DIGITAL or an authorized sublicensor.

© Digital Equipment Corporation 1998. All rights reserved.

The following are trademarks of Digital Equipment Corporation: Alpha, DIGITAL, RRD46, StorageWorks, and the DIGITAL logo.

The following are third-party trademarks:

Adobe and PostScript are registered trademarks of Adobe Systems, Incorporated.

Helvetica and Times are registered trademarks of Linotype Co.

Microsoft and MS-DOS are registered trademarks and Windows is a trademark of Microsoft Corporation.

---

# Table of Contents

## 1 System Overview

System Enclosure.....	1-2
Cover Interlock.....	1-3
Operator Control Panel and Drives.....	1-4
System Consoles.....	1-6
AlphaBIOS Boot Menu.....	1-6
SRM Console.....	1-6
AlphaBIOS Console.....	1-7
Environment Variables.....	1-7
System Architecture.....	1-8
CPU Types.....	1-10
Alpha Chip Composition.....	1-11
CPU Configuration Rules.....	1-11
Memory.....	1-12
Memory Variants.....	1-13
Memory Operation.....	1-13
Memory Configuration Rules.....	1-13
Memory Addressing.....	1-14
System Motherboard.....	1-16
System Bus (Backplane).....	1-18
System Bus to PCI Bus Bridge.....	1-20
PCI I/O Subsystem.....	1-22
Remote Control Logic.....	1-24
Power Control Logic.....	1-26
Power Circuit and Cover Interlock.....	1-28
Power Supply.....	1-30
Description.....	1-31
Power Supply Features.....	1-31

Power Up/Down Sequence.....	1-32
Maintenance Bus (I <sup>2</sup> C Bus).....	1-34
Monitor.....	1-35
Fault Display .....	1-35
Error State .....	1-35
Configuration Tracking.....	1-35
StorageWorks Drives.....	1-36

## 2 Power-Up

Control Panel.....	2-2
Power-Up Sequence.....	2-4
Definitions .....	2-4
SROM Power-Up Test Flow .....	2-8
SROM Errors Reported.....	2-11
XSROM Power-Up Test Flow .....	2-12
XSROM Errors Reported.....	2-15
Console Power-Up Tests.....	2-16
Console Device Determination .....	2-18
Console Device Options.....	2-19
Console Power-Up Display.....	2-20
Fail-Safe Loader .....	2-24

## 3 Troubleshooting

Troubleshooting with LEDs.....	3-2
System Motherboard LEDs.....	3-3
Troubleshooting Power Problems .....	3-4
Power Problem List .....	3-4
Halt Caused by Power, Fan, or Overtemperature Condition .....	3-5
If Power Problem Occurs at Power-Up.....	3-5
Recommended Order for Troubleshooting Failure at Power-Up.....	3-5
Running Diagnostics — Test Command .....	3-6
Releasing Secure Mode .....	3-7
Testing an Entire System .....	3-8
Testing Memory .....	3-10
Testing PCI.....	3-12
Other Useful Console Commands .....	3-14

## 4 Error Registers

External Interface Status Register - EI_STAT.....	4-2
---	-----

External Interface Address Register - EI_ADDR.....	4-5
MC Error Information Register 0 (MC_ERR0 - Offset = 800).....	4-6
MC Error Information Register 1 (MC_ERR1 - Offset = 840).....	4-7
CAP Error Register (CAP_ERR - Offset = 880).....	4-9
PCI Error Status Register 1 (PCI_ERR1 - Offset = 1040).....	4-11

## 5 Removal and Replacement

System Safety .....	5-1
FRU List.....	5-2
System Exposure .....	5-6
Exposing the System.....	5-7
Dressing the System.....	5-7
CPU Removal and Replacement .....	5-8
Removal .....	5-9
Replacement .....	5-9
Verification.....	5-9
CPU Fan Removal and Replacement .....	5-10
Removal .....	5-11
Replacement .....	5-11
Verification.....	5-11
Memory Riser Card Removal and Replacement.....	5-12
Removal .....	5-13
Replacement .....	5-13
Verification.....	5-13
DIMM Removal and Replacement.....	5-14
Removal .....	5-15
Replacement .....	5-15
Verification.....	5-15
System Motherboard Removal and Replacement .....	5-16
Removal .....	5-17
Replacement .....	5-17
Verification.....	5-17
PCI/EISA Option Removal and Replacement .....	5-18
Removal .....	5-19
Replacement .....	5-19
Verification.....	5-19
Power Supply Removal and Replacement.....	5-20
Removal .....	5-21
Replacement .....	5-21
Verification.....	5-21
Power Harness Removal and Replacement.....	5-22

Removal .....	5-23
Replacement .....	5-23
Verification.....	5-23
System Fan Removal and Replacement .....	5-24
Removal .....	5-25
Replacement .....	5-25
Verification.....	5-25
Cover Interlock Removal and Replacement .....	5-26
Removal .....	5-27
Replacement .....	5-27
Verification.....	5-27
Operator Control Panel Removal and Replacement .....	5-28
Removal .....	5-29
Replacement .....	5-29
Verification.....	5-29
CD-ROM Removal and Replacement .....	5-30
Removal .....	5-31
Replacement .....	5-31
Verification.....	5-31
Floppy Removal and Replacement.....	5-32
Removal .....	5-33
Replacement .....	5-33
Verification.....	5-33
SCSI Disk Removal and Replacement .....	5-34
Removal .....	5-35
Replacement .....	5-35
Verification.....	5-35
StorageWorks Backplane Removal and Replacement .....	5-36
Removal .....	5-37
Replacement .....	5-37
Verification.....	5-37
StorageWorks Ultra SCSI Bus Extender Removal and Replacement.....	5-38
Removal .....	5-39
Replacement .....	5-39
Verification.....	5-39

## 6 Running Utilities

Running Utilities from a Graphics Monitor.....	6-2
Running Utilities from a Serial Terminal .....	6-3
Running ECU .....	6-4
Running RAID Standalone Configuration Utility.....	6-5

Updating Firmware with LFU .....	6-6
Updating Firmware from the CD-ROM.....	6-8
Updating Firmware from a Network Device.....	6-12
LFU Commands.....	6-16
Updating Firmware from AlphaBIOS.....	6-19
Upgrading AlphaBIOS.....	6-20

## 7 Halts, Console Commands, and Environment Variables

Halt Button Functions .....	7-2
Using the Halt Button .....	7-2
Using Halt to Clear the Console Password .....	7-2
Halt Assertion.....	7-3
Summary of SRM Console Commands .....	7-5
Summary of SRM Environment Variables .....	7-7
Recording Environment Variables .....	7-8

## 8 Managing the System Remotely

RCM Overview.....	8-2
First-Time Setup.....	8-3
Configuring the Modem.....	8-4
Qualified Modems.....	8-4
Modem Configuration Procedure.....	8-4
Dialing In and Invoking RCM.....	8-5
Dialing In and Invoking RCM.....	8-5
Using RCM Locally .....	8-6
RCM Commands .....	8-7
Command Conventions .....	8-8
Dial-Out Alerts .....	8-16
Enabling Dial-Out Alerts .....	8-16
Composing the Dial-Out String .....	8-17
Using the RCM Switchpack .....	8-19
Uses of the Switchpack .....	8-21
Changing a Switch Setting .....	8-21
Resetting the RCM to Factory Defaults.....	8-22
Troubleshooting Guide .....	8-23
Modem Dialog Details.....	8-26
Default Initialization and Answer Strings.....	8-26
Modifying Initialization and Answer Strings.....	8-26
Initialization String Substitutions .....	8-27

## Figures

Figure 1-1	System Enclosure .....	1-2
Figure 1-2	Cover Interlock Circuit.....	1-3
Figure 1-3	Control Panel Assembly .....	1-4
Figure 1-4	AlphaBIOS Boot Menu.....	1-6
Figure 1-5	Architecture Diagram .....	1-8
Figure 1-6	CPU Module Placement.....	1-10
Figure 1-7	Memory Placement.....	1-12
Figure 1-8	How Memory Addressing Is Calculated.....	1-14
Figure 1-9	System Motherboard.....	1-16
Figure 1-10	System Bus Block Diagram .....	1-18
Figure 1-11	System Bus to PCI Bus Bridge Block Diagram .....	1-20
Figure 1-12	PCI Block Diagram .....	1-22
Figure 1-13	Remote Control Logic .....	1-24
Figure 1-14	Power Control Logic.....	1-26
Figure 1-15	Power Circuit Diagram .....	1-28
Figure 1-16	Back of Power Supply and Location .....	1-30
Figure 1-17	Power Up/Down Sequence Flowchart.....	1-32
Figure 1-18	I <sup>2</sup> C Bus Block Diagram.....	1-34
Figure 1-19	StorageWorks Drive Location.....	1-36
Figure 2-1	Control Panel and LCD Display.....	2-2
Figure 2-2	Power-Up Flow .....	2-4
Figure 2-3	Contents of FEPROMs .....	2-5
Figure 2-4	Console Code Critical Path (Block Diagram).....	2-6
Figure 2-5	SRROM Power-Up Test Flow .....	2-8
Figure 2-6	XSROM Power-Up Flowchart .....	2-12
Figure 2-7	Console Device Determination Flowchart.....	2-18
Figure 3-1	System Motherboard LEDs.....	3-2
Figure 5-1	System FRU Locations .....	5-2
Figure 5-2	Exposing the System .....	5-6
Figure 5-3	Removing CPU Module.....	5-8
Figure 5-4	Removing CPU Fan.....	5-10
Figure 5-5	Removing Memory Riser Card .....	5-12
Figure 5-6	Removing a DIMM from a Memory Riser Card.....	5-14
Figure 5-7	Removing System Motherboard.....	5-16
Figure 5-8	Removing PCI/EISA Option.....	5-18
Figure 5-9	Removing Power Supply .....	5-20
Figure 5-10	Removing Power Harness .....	5-22
Figure 5-11	Removing System Fan.....	5-24
Figure 5-12	Removing Cover Interlock.....	5-26
Figure 5-13	Removing the OCP.....	5-28
Figure 5-14	Removing CD-ROM.....	5-30



Figure 5-15	Removing Floppy .....	5-32
Figure 5-16	Removing StorageWorks Disk .....	5-34
Figure 5-17	Removing StorageWorks Backplane .....	5-36
Figure 5-18	Removing StorageWorks Ultra SCSI Bus Extender.....	5-38
Figure 6-1	Running a Utility from a Graphics Monitor.....	6-2
Figure 6-2	Starting LFU from the AlphaBIOS Console .....	6-6
Figure 6-3	AlphaBIOS Setup Screen .....	6-19
Figure 8-1	RCM Connections .....	8-3
Figure 8-2	Location of RCM Switchpack on System Board .....	8-19
Figure 8-3	RCM Switches (Factory Settings) .....	8-20

## Tables

Table 1-1	Chip Description .....	1-11
Table 1-2	CPU Variants .....	1-11
Table 1-3	Memory Variants .....	1-13
Table 1-4	PCI Motherboard Slot Numbering .....	1-22
Table 1-5	Remote Control Switch Functions .....	1-25
Table 2-1	Control Panel Display .....	2-3
Table 2-2	SROM Tests .....	2-10
Table 2-3	XSROM Tests.....	2-13
Table 2-4	Memory Tests .....	2-14
Table 2-5	IOD Tests .....	2-16
Table 2-6	PCI Motherboard Tests .....	2-17
Table 4-1	External Interface Status Register .....	4-4
Table 4-2	Loading and Locking Rules for External Interface Registers.....	4-5
Table 4-3	MC Error Information Register 0 .....	4-6
Table 4-4	MC Error Information Register .....	4-8
Table 4-5	CAP Error Register.....	4-9
Table 4-6	PCI Error Status Register .....	4-11
Table 5-1	Field-Replaceable Unit Part Numbers .....	5-2
Table 6-1	AlphaBIOS Option Key Mapping .....	6-3
Table 6-2	LFU Command Summary .....	6-16
Table 7-1	Results of Pressing the Halt Button .....	7-2
Table 7-2	Summary of SRM Console Commands .....	7-5
Table 7-3	Environment Variable Summary .....	7-7
Table 7-4	Environment Variables Worksheet.....	7-8
Table 8-1	RCM Command Summary .....	8-7
Table 8-2	RCM Status Command Fields .....	8-15
Table 8-3	Elements of the Dial-Out String .....	8-18
Table 8-4	RCM Switch Settings.....	8-20
Table 8-5	RCM Troubleshooting .....	8-23

---

# Preface

## Intended Audience

This manual is written for the customer service engineer.

## Document Structure

This manual uses a structured documentation design. Topics are organized into small sections for efficient reference. Each topic begins with an abstract, followed by an illustration or example, and ends with descriptive text. This manual has eight chapters, as follows:

- Chapter 1, **System Overview**, introduces the DIGITAL Server 5300 system. It describes each system component.
- Chapter 2, **Power-Up**, provides information on how to interpret the power-up display on the operator control panel, the console screen, and system LEDs. It also describes how hardware diagnostics execute when the system is initialized.
- Chapter 3, **Troubleshooting**, describes troubleshooting during power-up and booting, as well as the test command.
- Chapter 4, **Error Registers**, describes the error registers used to hold error information.
- Chapter 5, **Removal and Replacement**, describes removal and replacement procedures for field-replaceable units (FRUs).
- Chapter 6, **Running Utilities**, explains how to run utilities such as the EISA Configuration Utility and RAID Standalone Configuration Utility.
- Chapter 7, **Halts, Console Commands, and Environment Variables**, summarizes the commands used to examine and alter the system configuration.
- Chapter 8, **Managing the System Remotely**, describes how to use the Remote Console Manager (RCM) to monitor and control the system remotely.

## Documentation Titles

The following table lists other books in the documentation set.

### System Documentation

<b>Title</b>	<b>Order Number</b>
<b>User and Installation Documentation Kit</b>	QC-06CAB-H8
<i>DIGITAL Server 5300 User's Guide</i>	ER-K8FWW-UA
<i>DIGITAL Server 5300 Basic Installation</i>	ER-K8FWW-IM

## Information on the Internet

Access the latest system firmware with a Web browser as follows:

<http://www.windowsnt.digital.com/>

---

# System Overview

The DIGITAL Server 5300 system base unit consists of up to two CPUs, up to 2 Gbytes of memory, 6 I/O slots, and up to 7 SCSI storage devices. The system is enclosed in a pedestal. DIGITAL Server 5300 systems can also be mounted in a standard 19" rack.

The DIGITAL Server 5300 system supports the Windows NT operating system.

Topics in this chapter include the following:

- System Enclosure
- Operator Control Panel and Drives
- System Consoles
- System Architecture
- CPU Types
- Memory
- Memory Addressing
- System Motherboard
- System Bus Backplane
- System Bus to PCI Bus Bridge
- PCI I/O Subsystem
- Remote Control Logic
- Power Control Logic
- Power Circuit and Cover Interlock
- Power Supply
- Power Up/Down Sequence
- Maintenance Bus (I<sup>2</sup>C Bus)
- StorageWorks Drives

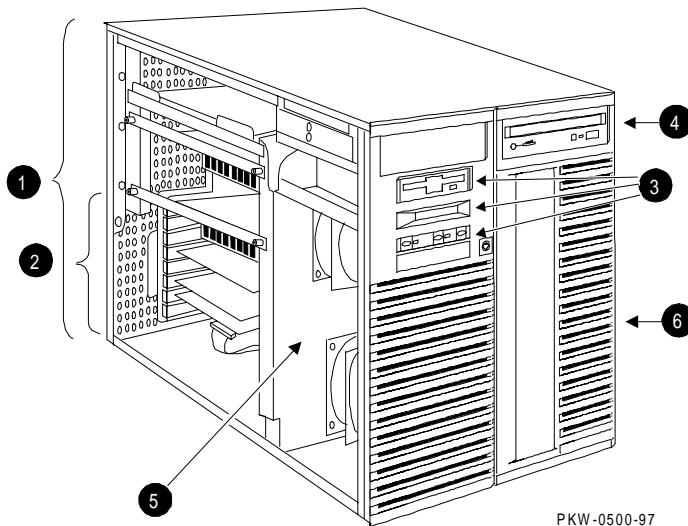
## System Enclosure

---

The system has up to two CPU modules and up to 2 Gbytes of memory. A single fast wide or fast wide Ultra SCSI StorageWorks shelf provides storage.

---

Figure 1-1 System Enclosure



PKW-0500-97

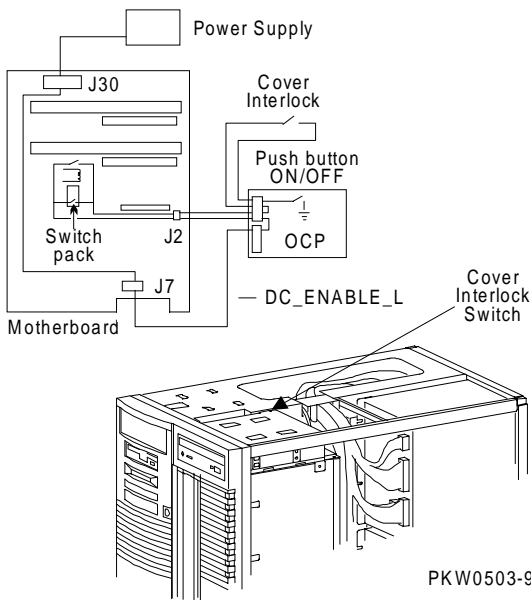
The numbered callouts in Figure 1-1 refer to the system components.

- ❶ System card cage, which holds the system motherboard and the CPU, memory, and system I/O.
- ❷ PCI/EISA section of the system card cage.
- ❸ Operator control panel assembly, which includes the control panel, the LCD display, and the floppy drive.
- ❹ CD-ROM drive.
- ❺ Cooling section containing two fans.
- ❻ StorageWorks shelf.

## Cover Interlock

The system has a single cover interlock switch tripped by the top cover. To override the cover interlock, use a suitable object to close the interlock circuit. **Disk damage will result if the system is run with the top cover off.**

**Figure 1-2 Cover Interlock Circuit**




---

### Note

The cover interlock must be engaged to enable power-up.

---

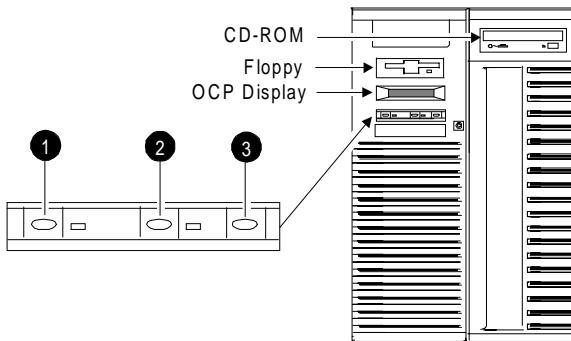
## Operator Control Panel and Drives

---

The control panel includes the On/Off, Halt, and Reset buttons and an LCD display.

---

**Figure 1-3 Control Panel Assembly**



PKW-0501-97

**OCP display.** The OCP display is a 16-character LCD that indicates status during power-up and self-test. While the operating system is running, the LCD displays the system type. Its controller is on the XBUS.

**CD-ROM.** The CD-ROM drive is used to load software, firmware, and updates. Its controller is on PCI1 on the PCI backplane on the system motherboard.

**Floppy disk.** The floppy drive is used to load software. The floppy controller is on the XBUS on the PCI backplane on the system motherboard.

- ❶ On/Off button. Powers the system on or off. When the LED to the right of the button is lit, the power is on. The On/Off button is connected to the power supplies through the system interlock and the RCM logic.
- ❷ Reset button. Initializes the system.
- ❸ Halt button. When the halt button is pressed, different results are manifest depending upon the state of the machine.

To get to the SRM console, press the Halt button and then press the Reset button. (Pressing the Halt button when the system is running Windows NT causes a “halt assertion” flag to be set in the firmware. When Reset is pressed the console reads the “halt assertion” flag and ignores environment variables that would cause the system to boot.)

Function of the Halt button is complex because it depends upon the state of the machine when the button is pressed. See “Halt Button Functions” in Chapter 7 for a full discussion of the Halt button.



## System Consoles

---

**There are two console programs: the SRM console and the AlphaBIOS console.**

---

---

### Note

---

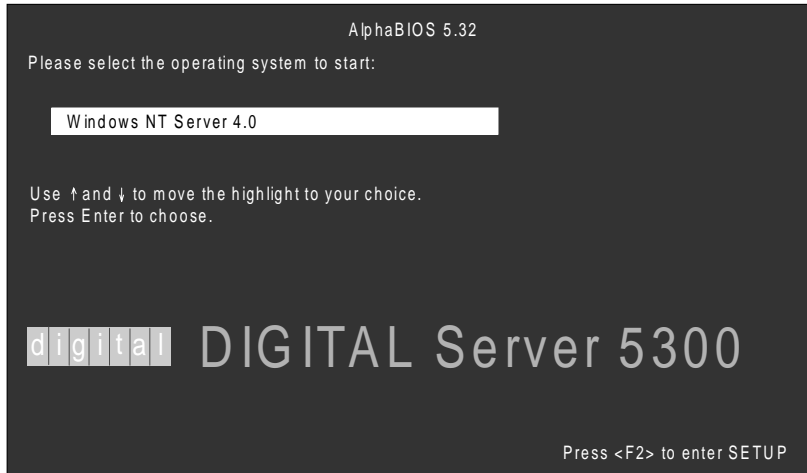
NOTE: The console prompt displays only after the entire power-up sequence is complete. This can take up to several minutes if the memory is very large.

---

## AlphaBIOS Boot Menu

On systems running the Windows NT operating system, the Boot menu is displayed when the AlphaBIOS console is invoked (see Figure 1-4).

**Figure 1-4 AlphaBIOS Boot Menu**



ML014366

## SRM Console

The SRM console is a command-line interface that provides support for examining and modifying the system state and configuring and testing the system. The SRM console can be run from a serial terminal or a graphics monitor. The following console prompt is displayed whenever the SRM console is invoked:

```
P00>>>
```

## AlphaBIOS Console

The AlphaBIOS console is a menu-based interface that supports the Microsoft Windows NT operating system. AlphaBIOS is used to set up operating system selections, boot Windows NT, and display information about the system configuration. The EISA Configuration Utility and the RAID Standalone Configuration Utility are run from the AlphaBIOS console. AlphaBIOS runs on either a serial or graphics terminal. Windows NT requires a graphics monitor.

## Environment Variables

Environment variables are software parameters that define, among other things, the system configuration. They are used to pass information to different pieces of software running in the system at various times.

Refer to Chapter 7 of this guide for a list of the environment variables used to configure a system.

Refer to your system User's Guide for information on setting environment variables.

Most environment variables are stored in the NVRAM that is placed in a socket on the system motherboard. Even though the NVRAM can be removed and replaced on a new system motherboard, it is recommended that you keep a record of the environment variables for each system that you service. Some environment variable settings are lost when a module is swapped and must be restored after the new module is installed. Refer to Chapter 7 for a convenient worksheet for recording environment variable settings.

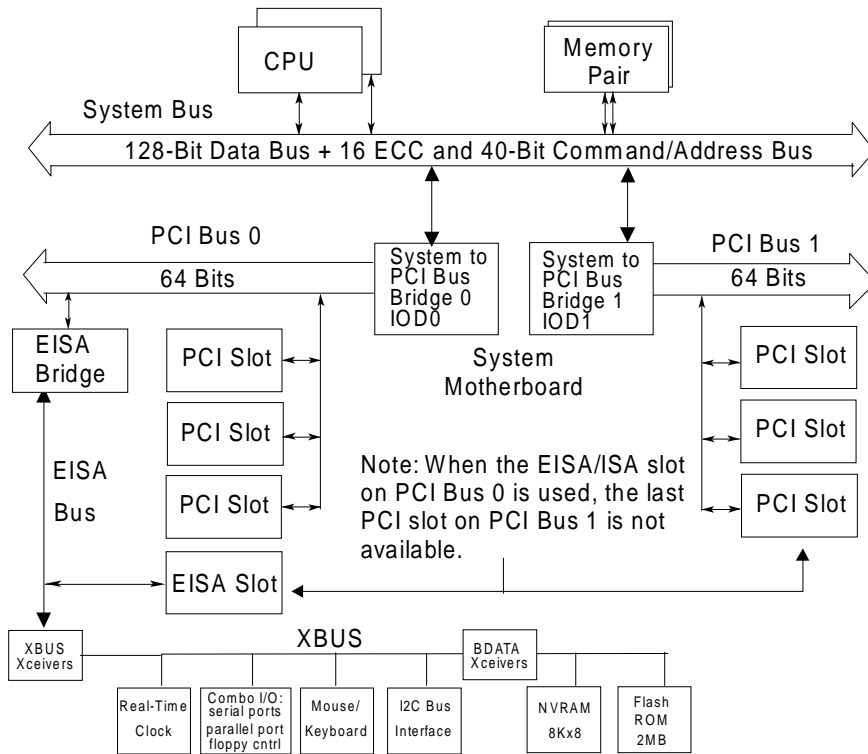
## System Architecture

---

**Alpha microprocessor chips are used in these systems. The CPU, memory, and the I/O modules are connected to the system motherboard.**

---

**Figure 1-5 Architecture Diagram**



PKW0502-97

Both systems use the Alpha chip for the CPU. The CPU, memory, and I/O devices connect to the system motherboard. On the system motherboard is:

- The system bus
- Two system bus to PCI bus chip sets that bridge two PCI buses to the system bus
- Two 64-bit PCI buses with three PCI options slots each (5 64-bit PCI slots; 1 32-bit PCI slot)
- One EISA/ISA bus bridged to one of the PCIs (If an EISA/ISA option is used, one PCI slot cannot be used)
- One CD-ROM controller built in to the other PCI
- One EISA/ISA to XBUS bridge to the built-in XBUS options

A fully configured system can have two CPUs, eight DIMM memory pairs, and a total of six I/O options. The I/O options can be all PCI options or a combination of PCI options and a single EISA/ISA option.

The system bus has a 144-bit data bus, protected by 16 bits of ECC, and a 40-bit command/address bus, protected by parity. The bus speed is set to 66.6 MHz. The 40-bit address bus can create one terabyte of addresses (that's a million million). The bus connects CPUs, memory, and the system bus to PCI bus bridge(s).

There is a cache external to the CPU chip on CPU modules. The Alpha chip has an 8-Kbyte instruction cache (I-cache), an 8-Kbyte write-through data cache (D-cache), and a 96-Kbyte, write-back secondary data cache (S-cache). The cache system is write-back. The system supports up to two CPUs.

Memory on these systems is constructed of DIMM memory pairs placed onto two memory modules called riser cards. The riser cards are placed into the two memory slots on the system motherboard. One member of a DIMM pair is placed onto one riser card, and the other member is placed onto another riser card. Each riser card drives half of the system bus, along with the associated ECC bits. Memory pairs consist of two synchronous DIMMs of the same size and are placed into the same slot on each riser card.

The system bus-to-PCI bus bridge chip set translates system bus commands and data addressed to I/O space to PCI commands and data. It also translates PCI bus commands and data addressed to system memory or CPUs to system bus commands and data. The PCI bus is a 64-bit wide bus used for I/O.

Logic and sensors on the system motherboard monitor power status and the system environment (temperature and fan speeds).

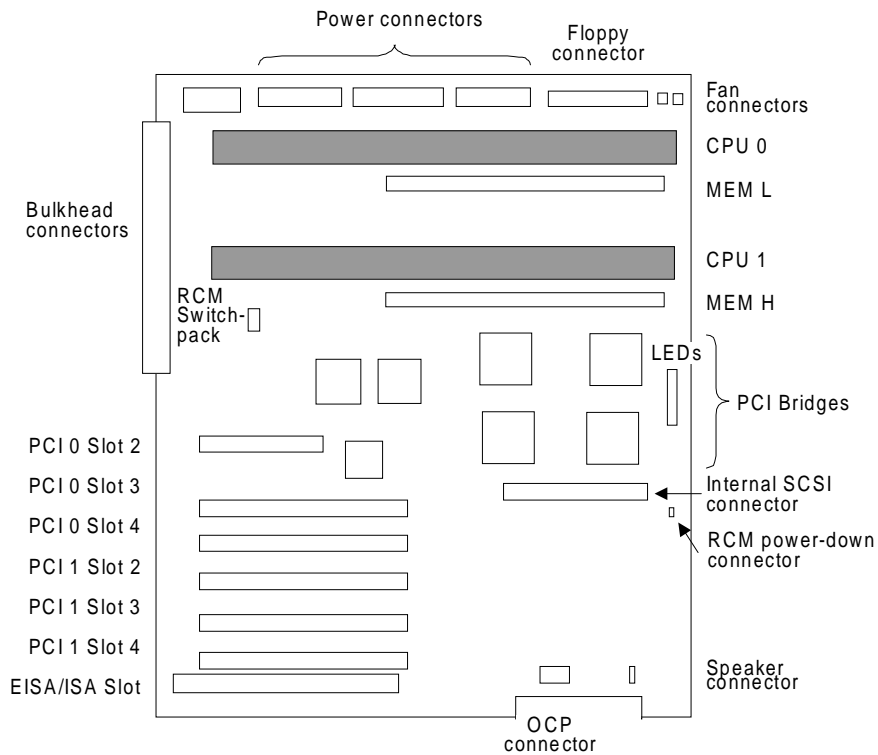
## CPU Types

---

**There are several CPU variants differentiated by CPU speeds.**

---

**Figure 1-6 CPU Module Placement**



## Alpha Chip Composition

The Alpha chip is made using state-of-the-art chip technology, has a transistor count of 9.3 million, consumes 50 watts of power, and is air cooled (a fan is on the chip). The default cache system is write-back and when the module has an external cache, it is write-back. The Alpha chip used in these systems is the 21164.

**Table 1-1 Chip Description**

Unit	Description
Instruction	8-Kbyte cache, 4-way issue
Execution	4-way execution; 2 integer units, 1 floating-point adder, 1 floating-point multiplier
Memory	Merge logic, 8-Kbyte write-through first-level data cache, 96-Kbyte write-back second-level data cache, bus interface unit

**Table 1-2 CPU Variants**

Module Variant	Clock Frequency	Onboard Cache	Color
B3007-AA	400 MHz	4 Mbytes	Orange
B3007-CA	533 MHz	4 Mbytes	Violet

## CPU Configuration Rules

The following rules should be applied to CPU configuration:

- The first CPU must be in CPU slot 0 to provide the system clock.
- The second CPU should be installed in CPU slot 1.
- Both CPUs must have the same Alpha chip clock speed. The system bus may hang without an error message if the oscillators clocking the CPUs are different.

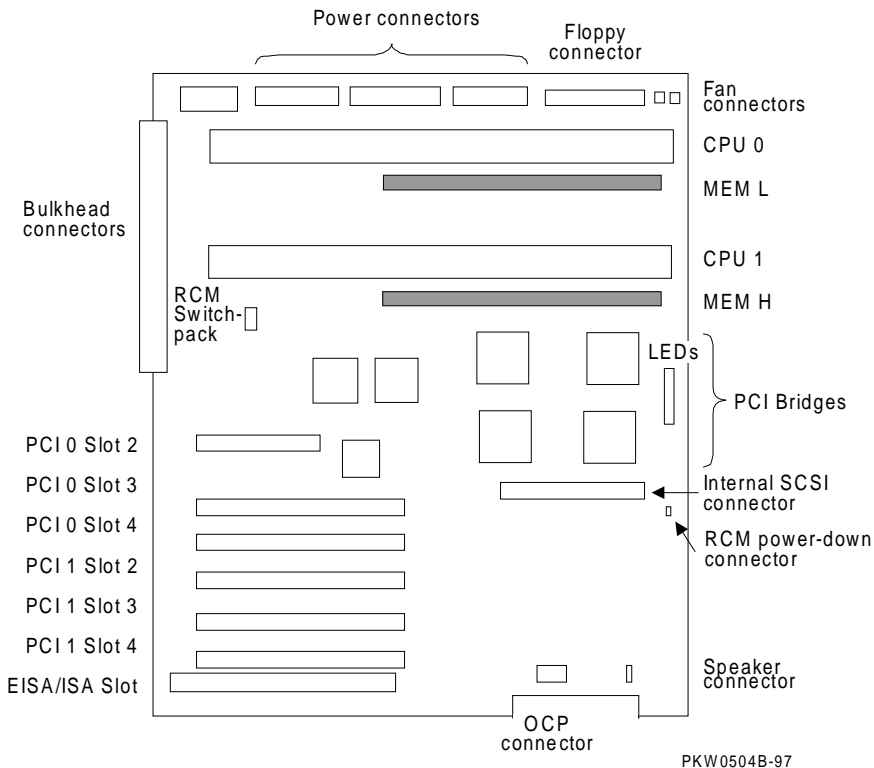
# Memory

---

**Memory consists of two riser cards and up to eight pairs of DIMMs. Each riser card receives one of the two DIMMs in the DIMM pair. There are two DIMM variants: a 32-Mbyte version and a 128-Mbyte version.**

---

**Figure 1-7 Memory Placement**



## Memory Variants

Memory consists of two riser cards supporting eight DIMM pairs. There are two DIMM variants: a 32-Mbyte version and a 128-Mbyte version. Maximum memory using 32-Mbyte DIMMs is 128 Mbytes and the maximum memory using 128-Mbyte DIMMs is 2 Gbytes. All memory is synchronous.

**Table 1-3 Memory Variants**

Option	Size	Module	Type	DRAM No.	Size
MS300-BA	64 MB	54-25084-DA 20-47405-D3	Synch.	18	4M x 72 = 32MB
MS300-DA	256 MB	54-25092-DA 20-45619-D3	Synch.	18	16M x 72 = 128MB

## Memory Operation

Memory drives the system bus in bursts. Upon each memory fetch, data is transferred in 4 consecutive cycles transferring 64 bytes. Each DIMM in the pair provides half the data, or 64 bits plus 8 ECC bits, of the octaword (16 byte) transferred on the system bus. DIMMs are placed in slots on the riser cards, which are placed in the slots designated MEM L and MEM H on the system motherboard.

### NOTE

Memory in slot MEM L does not drive the lower 8 bytes, and memory in slot MEM H does not drive the higher 8 bytes of the 16-byte transfer. Some bits originating from MEM L are high order bits, and some bits originating from MEM H are low order bits.

## Memory Configuration Rules

In a system, memories of different sizes are permitted, but:

- DIMMs are installed and used in pairs. Both DIMMs in a memory pair must be of the same size.
- Each riser card receives one DIMM of the DIMM pair.
- The largest DIMM pair must be in riser card slot 0.
- Other memory pairs must be the same size or smaller than the first memory pair.



## System Overview

- Memory pairs must be installed in consecutive slots.
- Memory configurations that have a 64-Mbyte pair in riser card slot 0 are limited to two DIMM pairs or 128 Mbytes for the system. (The reason for this restriction is that the bit map describing memory holes can grow larger than physical memory.)

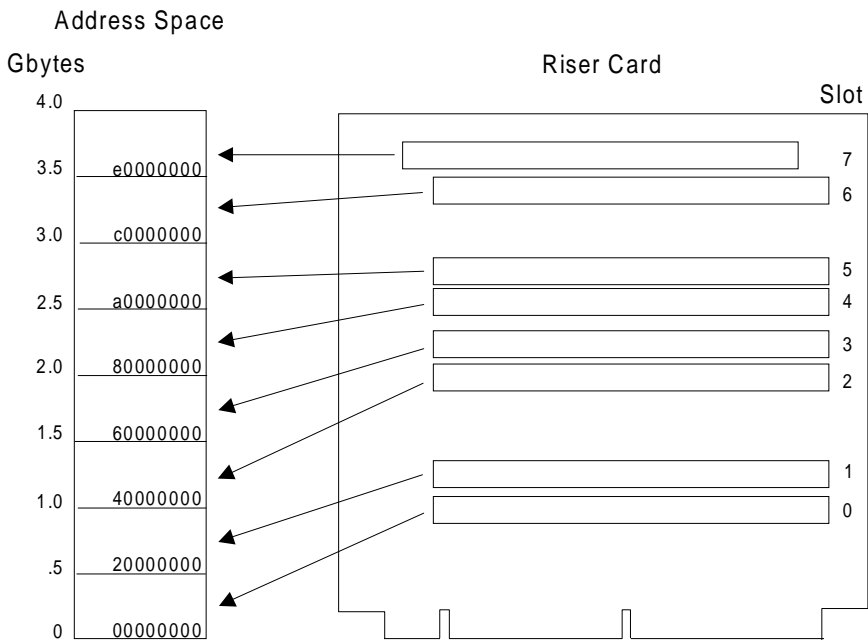
## Memory Addressing

---

**Memory addressing in these systems is fixed regardless of the size of the DIMMs. The address of a DIMM pair is fixed according to the slot in which the pair is placed. The starting address of each pair in each slot on the riser card starts on a 512-Mbyte boundary.**

---

**Figure 1-8 How Memory Addressing Is Calculated**



PKW 0505-97

**The rules for addressing memory are as follows:**

1. A memory pair consists of two DIMMs of the same size.
2. Memory pairs in riser cards may be of different sizes.
3. The memory pair in slot 0 must be the largest of all memory pairs. Other memory pairs may be as large but none may be larger.
4. The physical starting address of each memory pair is N times 512 Mbytes (2000000) where N is the slot number on the riser card.
5. Memory addresses are contiguous within each memory pair.
6. If memory pairs do not completely fill the 512-Mbyte space provided, memory “holes” occur in the physical address space.
7. Software creates contiguous virtual memory even though physical memory may not be contiguous.

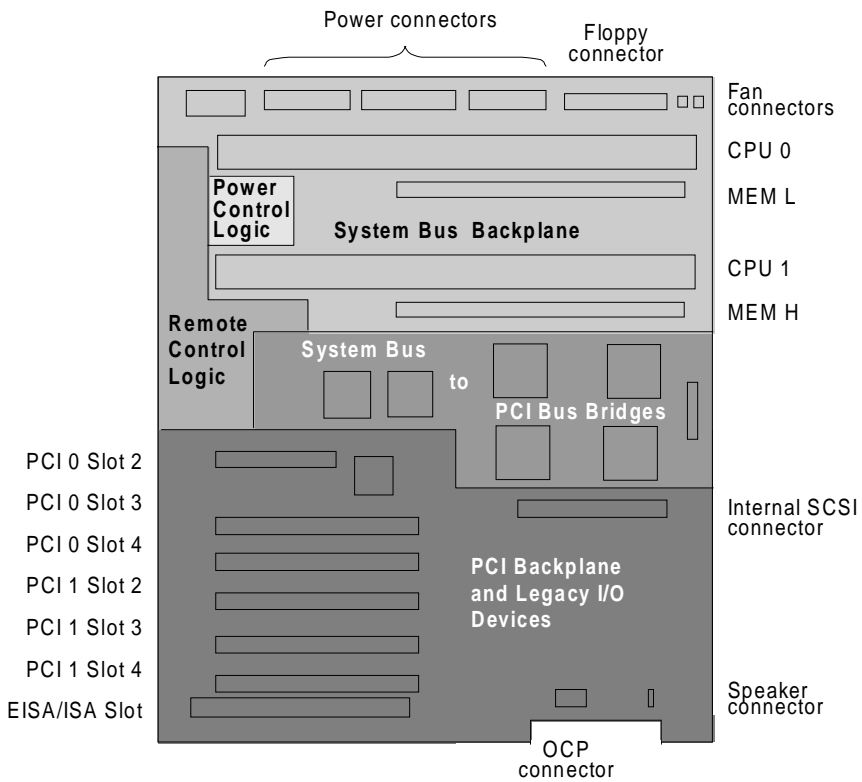
# System Motherboard

---

The system motherboard contains five major logic sections performing five major system functions.

---

Figure 1-9 System Motherboard



The five sections on the system motherboard are:

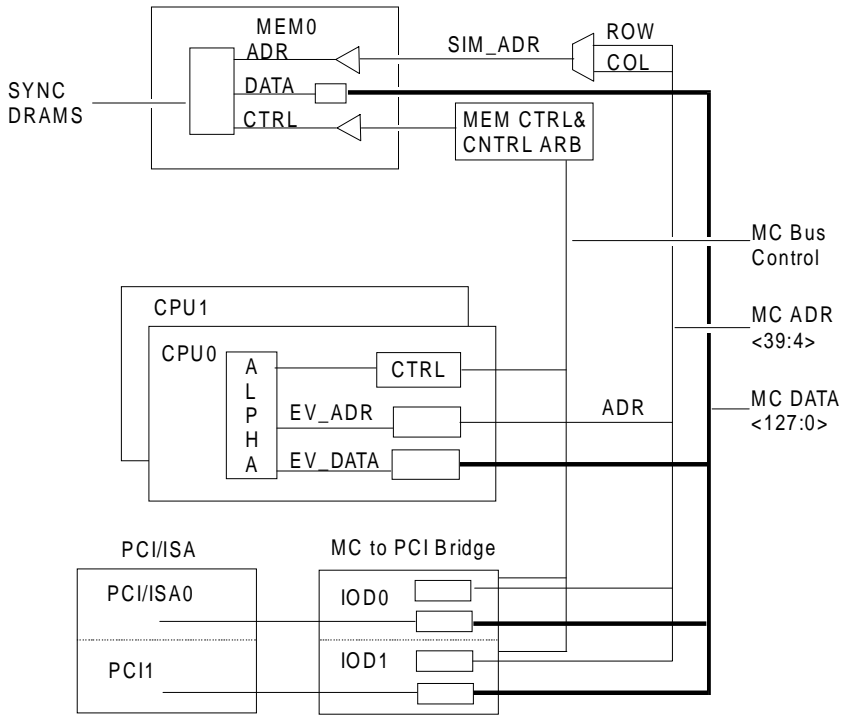
- The system bus or the CPU and memory backplane
- The power control logic
- The remote control logic
- The system bus to PCI bus bridges
- The PCI backplane containing two PCI buses, an EISA/ISA bus, a built-in CD-ROM controller, and an XBUS with several devices integral to the system.

# System Overview

## System Bus (Backplane)

The system bus consists of a 40-bit command/address bus, a 128-bit plus ECC data bus, and several control signals and clocks. The system bus is part of the system motherboard.

**Figure 1-10 System Bus Block Diagram**



PKW0506-97

The system bus consists of a 40-bit command/address bus, a 128-bit plus ECC data bus, and several control signals, clocks, and a bus arbiter. The bus requires that all CPUs have the same high-speed oscillator providing the clock to the Alpha chip.

The system bus connects up to two CPUs, up to eight DIMM memory pairs on two riser cards, and two I/O bus bridges.

The system bus clock is provided by an oscillator on the CPU in slot CPU0. This oscillator is adjusted to maintain the system bus at a 66 MHz speed no matter what the speed of the CPU is.

The system bus backplane initiates memory refresh transactions.

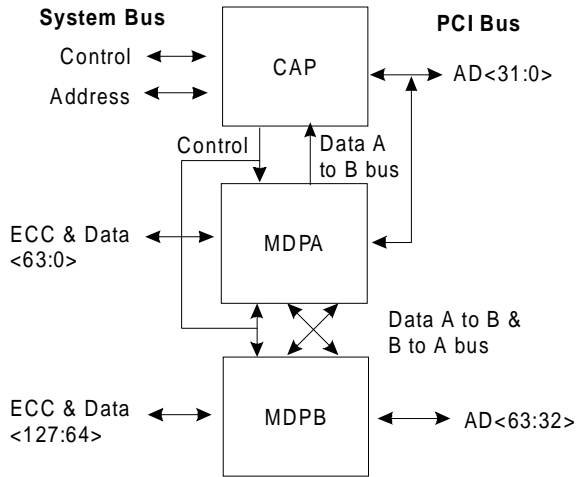
Five volt, 3.43 volt, and 12 volt power is provided directly to the motherboard from the power supplies.

# System Overview

## System Bus to PCI Bus Bridge

The bridge is the physical interconnect between the system bus and the PCI bus.

**Figure 1-11 System Bus to PCI Bus Bridge Block Diagram**



PKW0507-97

The system bus to PCI bus bridge module converts system bus commands and data addressed to I/O space to PCI commands and data; and converts PCI bus commands and data addressed to system memory or CPUs to system bus commands and data.

The bridge has two major components:

- Command/address processor (CAP) chip
- Two data path chips (MDPA and MDPB)

There are two sets of these three chips, one set for each PCI.

The interface on the system bus side of the bridge responds to system bus commands addressed to the upper 64 Gbytes of I/O space. I/O space is addressed whenever bit <39> on the system bus address lines is set. The space so defined is 512 Gbytes in size. The first 448 Gbytes are reserved and the last 64 Gbytes, when bits <38:36> are set, are mapped to the PCI I/O buses.

The interface on the PCI side of the bridge responds to commands addressed to CPUs and memory on the system bus. On the PCI side, the bridge provides the interface to the PCIs. Each PCI bus is addressed separately. The bridge does not respond to devices communicating with each other on the same PCI bus. However, should a device on one PCI address a device on the other PCI bus, commands, addresses, and data run through the bridge out onto the system bus and back through the bridge to the other PCI bus.

In addition to its bridge function, the system bus to PCI bus bridge module monitors every transaction on the system bus for errors. It monitors the data lines for ECC errors and the command/address lines for parity errors.

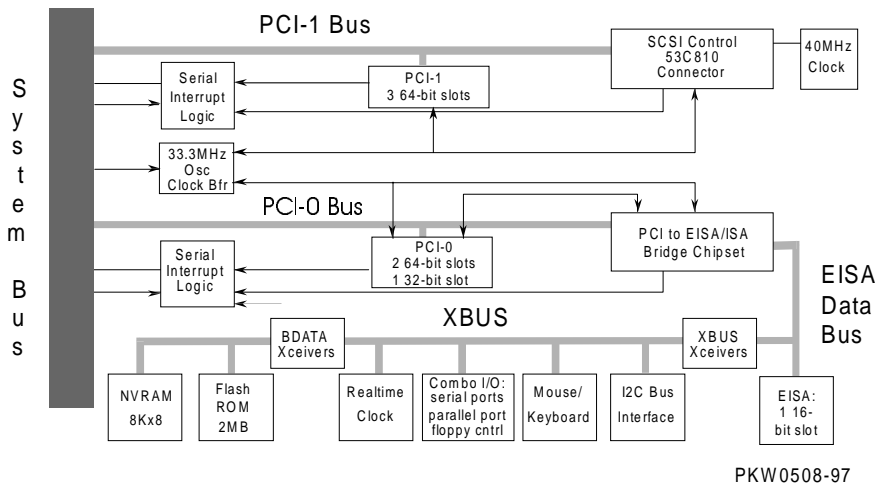


# System Overview

## PCI I/O Subsystem

The I/O subsystem consists of two 64-bit PCI buses. One has an embedded EISA/ISA bridge and three PCI option slots; the other has a built-in CD-ROM driver and three PCI option slots.

**Figure 1-12 PCI Block Diagram**



**Table 1-4 PCI Motherboard Slot Numbering**

Slot	PCI0	PCI1
1	PCI to EISA/ISA bridge	Internal CD-ROM controller
2	PCI slot	PCI slot
3	PCI slot	PCI slot
4	PCI slot	PCI slot

The logic for two PCI buses is on each PCI motherboard.

- PCI0 is a 64-bit bus with a built-in PCI to EISA/ISA bus bridge. PCI0 has three PCI slots and one EISA/ISA slot. When the EISA/ISA slot is used, PCI slot 4 on PCI bus 1 is not available. An 8-bit XBUS is connected to the EISA/ISA bus. On this bus there is an interface to the system I2 C bus; mouse and keyboard support; an I/O combo controller supporting two serial ports, the floppy controller, and a parallel port; a real-time clock; two 1-Mbyte flash ROMs containing system firmware, and an 8-Kbyte NVRAM.
- PCI1 is a 64-bit bus with a built-in CD-ROM SCSI controller with three PCI slots.

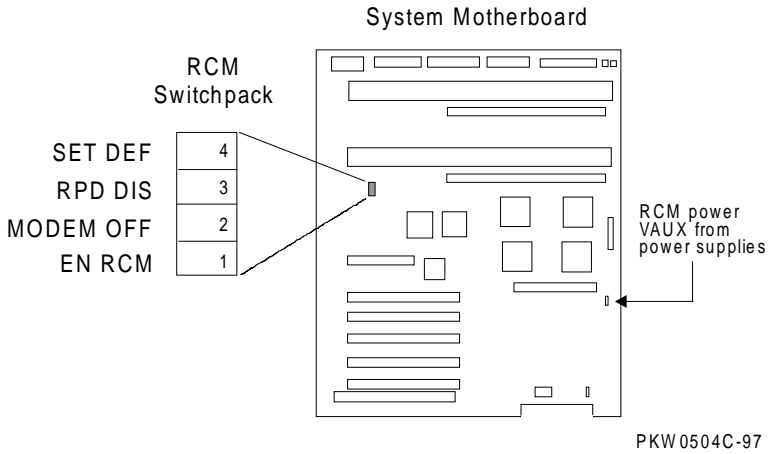
Cable connectors to the CD-ROM, the floppy, and the OCP are on the motherboard.

Connectors for the mouse, keyboard, two COM ports, the serial port, and a modem are on the system bulkhead. The bulkhead is part of the system motherboard.

### Remote Control Logic

A section of the motherboard provides remote control operation of the system. A four-switch switchpack enables or disables remote control features.

**Figure 1-13 Remote Control Logic**



The system allows both local and remote control. A set of switches enables or disables remote control.

**Table 1-5 Remote Control Switch Functions**

Switch	Condition	Function
1 EN RCM	On (default)	Allows remote system control
	Off	Does not allow remote system control
2 Modem Off	On	Disables the RCM modem port
	Off (default)	Enable the RCM modem port
3 RPD DIS	On	Disables remote power down
	Off (default)	Enables remote power down
4 SET DEF	On	Resets the RCM microprocessor defaults
	Off (default)	Allows use of conditions set by the user

The default settings allow complete remote control. The user would have to change the switch settings to any other desired control.

See Chapter 8 for information on controlling the system remotely.

The remote console manager connects to a modem through the modem port on the bulkhead. The RCM uses VAUX power provided by the system power supplies.

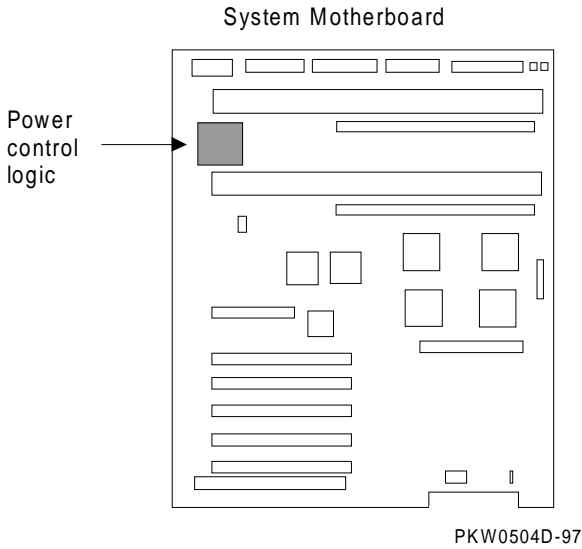
The standard I/O ports (keyboard, mouse, COM1 and COM2 serial ports, and parallel ports) are on the same bulkhead.

# System Overview

## Power Control Logic

The power control section of the motherboard controls power sequencing and monitors power supply voltage, system temperature, and fans.

**Figure 1-14 Power Control Logic**



The power control logic performs these functions:

- Monitors system temperature and powers down the system 30 seconds after it detects that internal temperature of the system is above the value of the environment variable **over\_temp**. Default = 550 C.
- Monitors the system and CPU fans at one second intervals and powers down the system 30 seconds after it detects a fan failure.
- Provides some visual indication of faults through LEDs.
- Controls reset sequencing.
- Provides I<sup>2</sup>C interface for fans, power supplies, and temperature signals:
  - Power supply 0, 1: present
  - Power supply 0, 1: power OK
  - CPU fan 0, 1: OK
  - CPU 1: present
  - Overtemp: Temp OK
  - System fan 0, 1: OK
  - Fan Kit OK

## Power Circuit and Cover Interlock

---

**Power is distributed throughout the system and mechanically can be broken by the On/Off switch, the cover interlock, or remotely through the RCM.**

---

**Figure 1-15 Power Circuit Diagram**

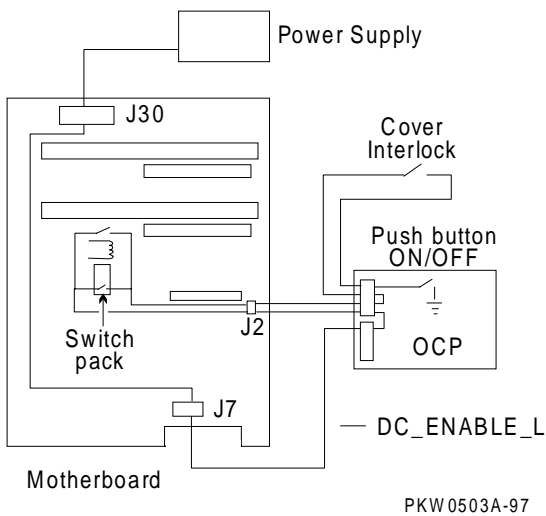


Figure 1-14 shows the distribution of power throughout the system. Opens in the circuit or the RCM signal RCM\_DC\_EN\_L, or a power supply detected power fault interrupt DC power applied to the system. The opens can be caused by the On/Off button or the cover interlock.

A failure anywhere in the circuit will result in the removal of DC power. A potential failure is the relay used in the remote control logic to control the RCM\_DC\_EN\_L signal.

The cover interlock is located under the top cover between the system card cage and the storage area. To override the interlock, place a suitable object in the interlock switch that closes it.



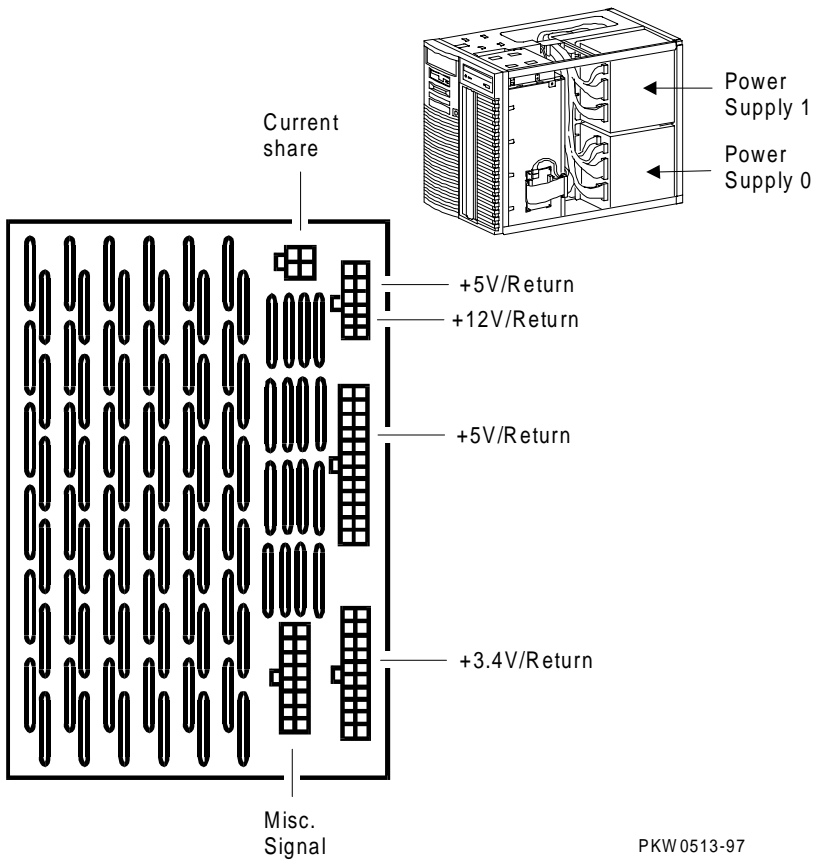
## Power Supply

---

**Two power supplies provide system power.**

---

**Figure 1-16 Back of Power Supply and Location**



PKW0513-97

## Description

Two power supplies each provide 450 W to the system. Redundant power is not available at this time.

## Power Supply Features

- 88–132 and 176–264 Vrms AC input
- 450 watts output. Output voltages are as follows:

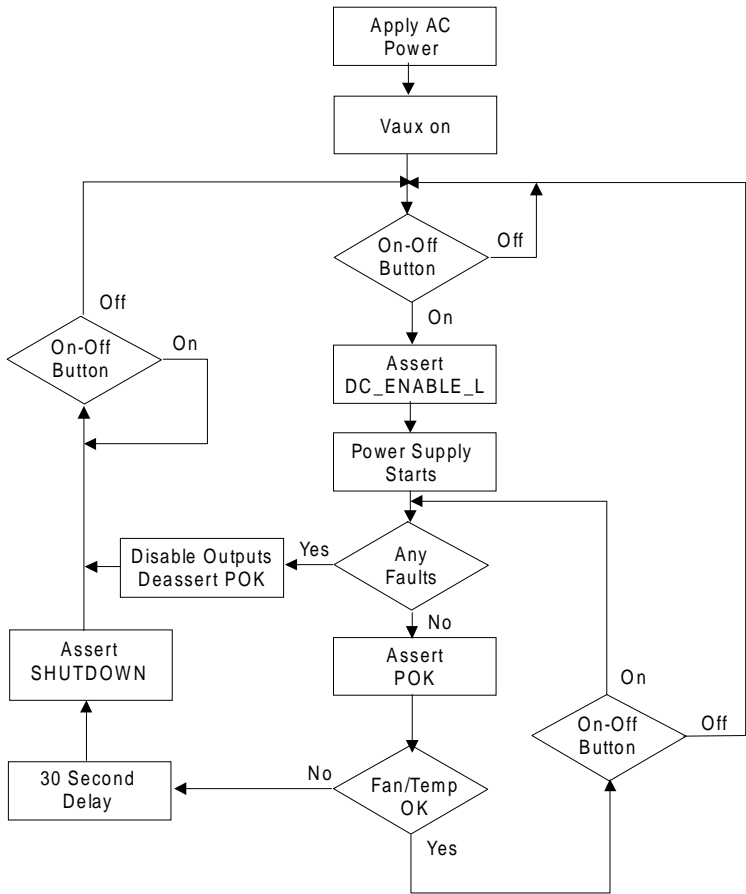
Output Voltage	Min. Voltage	Max. Voltage	Max. Current
+5.0	4.90	5.25	52
+3.43	3.400	3.465	37.4
+12	11.5	12.6	17
-12	-13.2	-10.9	0.5
-5.0	-5.5	-4.6	0.2
Vaux	4.85	5.25	0.6

- Remote sense on +5.0V and +3.43V
  - +5.0V is sensed on the system motherboard.
  - +3.43V is sensed on all CPUs in the system and the system bus motherboard.
- Current share on +5.0V, +3.43V, and +12V.
- 1 % regulation on +3.43V.
- Fault protection (latched). If a fault is detected by the power supply, it will shut down. The power supply faults detected are:
  - Fan Failure
  - Over-voltage
  - Overcurrent
  - Power overload
- DC\_ENABLE\_L input signal starts the DC outputs.
- SHUTDOWN\_H input signal shuts the power supply off in case of a system fan or CPU fan failure.
- POK\_H output signal indicates that the power supply is operating properly.

## Power Up/Down Sequence

System power can be controlled manually by the On/Off button on the OCP or remotely through the RCM. The power-up/down sequence flow is shown below.

**Figure 1-17 Power Up/Down Sequence Flowchart**



PKW-0513A-97

When AC is applied to the system, Vaux (auxiliary voltage) is asserted and is sensed by the power control logic (PCL) section of the motherboard if the On-Off Button is On. The PCL asserts DC\_ENABLE\_L starting the power supplies. If there is a hard fault on power-up, the power supplies shut down immediately; otherwise, the power system powers up and remains up until the system is shut off or the PCL senses a fault. If a power fault is sensed, the signal SHUTDOWN is asserted after a 30 second delay. Cycling the On-Off button can restore the power.

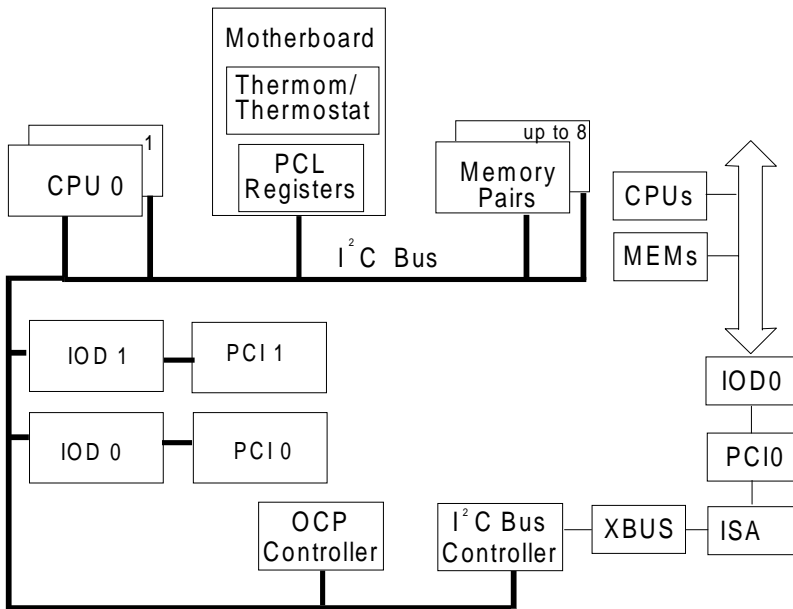
## Maintenance Bus (I<sup>2</sup>C Bus)

---

The IC bus (referred to as the “I squared C bus”) is a small internal maintenance bus used to monitor system conditions scanned by the power control logic, write the fault display, store error state, and track configuration information in the system. Although all system modules (not I/O modules) sit on the maintenance bus, only the IC controller accesses it.

---

Figure 1-18 I<sup>2</sup>C Bus Block Diagram



PKW0511-97

## Monitor

The I<sup>2</sup>C bus monitors the state of system conditions scanned by the power control logic. There are two registers that the PC logic writes data to:

- One records the state of the fans and power supplies and is latched when there is a fault.
- The other causes an interrupt on the I<sup>2</sup>C bus when a CPU or system fan fails, an overtemperature condition exists, or power supplied to the system exhibits an overcurrent condition.

The interrupt received by the I<sup>2</sup>C bus controller on PCI 0 and passed on to the IOD 0 chip set alerts the system of imminent power shutdown. The controller has 30 seconds to read the two registers and store the information in the EEPROM on the motherboard. The SRM console command show power reads these registers.

## Fault Display

The OCP display is written through the I<sup>2</sup>C bus.

## Error State

Error state is stored for power, fan, and overtemperature conditions on the I<sup>2</sup>C bus.

## Configuration Tracking

Each CPU and each logical section of the system motherboard (the PCI bridge, the PCI backplane, the power control logic, the remote console manager), and the system motherboard itself has an EEPROM that contains information about the module that can be written and read over the I<sup>2</sup>C bus. All EEPROMs contain the following information:

- Module type
- Module serial number
- Hardware revision for the logical block
- Firmware revision

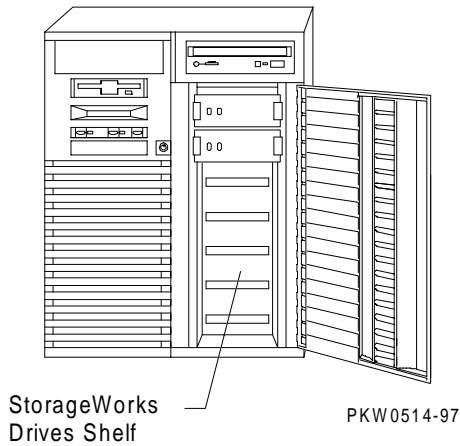
## StorageWorks Drives

---

The system supports up to seven StorageWorks drives.

---

**Figure 1-19 StorageWorks Drive Location**



The StorageWorks drives are to the right of the system cage. Up to seven drives fit into the shelf. The system supports fast wide Ultra SCSI disk drives. The RAID controller is also supported. With an optional Ultra SCSI Bus Splitter Kit the StorageWorks shelf can be split into two buses.

# 2

---

## Power-Up

This chapter describes system power-up testing and explains the power-up displays. The following topics are covered:

- Control Panel
- Power-Up Sequence
- SRAM Power-Up Test Flow
- SRAM Errors Reported
- XSRAM Power-Up Test Flow
- XSRAM Errors Reported
- Console Power-Up Tests
- Console Device Determination
- Console Power-Up Display
- Fail-Safe Loader



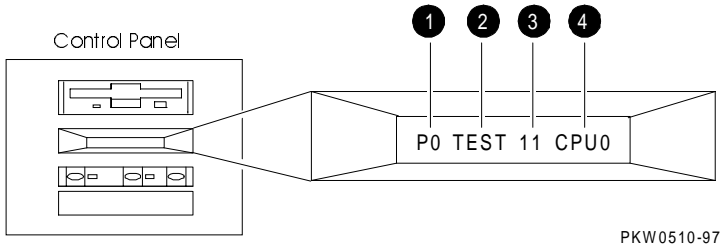
## Control Panel

---

**The control panel display indicates the likely device when testing fails.**

---

**Figure 2-1 Control Panel and LCD Display**



PKW0510-97

- When the On/Off button LED is on, power is applied and the system is running. When it is off, the system is not running, but power may or may not be present. If the power supplies are receiving AC power, Vaux is present on the system motherboard regardless of the condition of the On/Off switch.
- When the Halt button LED is lit and the On/Off button LED is on, the system should be running either the SRM console or Windows NT.

The potentiometer, accessible through the access hole just above the Reset button controls the intensity of the LCD. Use a small Phillips head screwdriver to adjust.

**Table 2-1 Control Panel Display**

<b>Field</b>	<b>Content</b>	<b>Display</b>	<b>Meaning</b>
❶	CPU number	P0–P1	CPU reporting status
❷	Status	TEST*	Tests are executing
		FAIL	Failure has been detected
		MCHK	Machine check has occurred
		INTR	Error interrupt has occurred
❸	Test number		
❹	Suspected device	CPU0–1	CPU module number
		MEM0–7 and L, H, or *	Memory pair number and low DIMM, high DIMM, or either
		IOD0	Bridge to PCI bus 0 <sup>1</sup>
		IOD1	Bridge to PCI bus 1 <sup>1</sup>
		FROM0	Flash ROM <sup>1</sup>
		COMBO	COM controller <sup>1</sup>
		PCEB	PCI-to-EISA bridge <sup>1</sup>
		ESC	EISA system controller <sup>1</sup>
		NVRAM	Nonvolatile RAM <sup>1</sup>
		TOY	Real-time clock <sup>1</sup>
		I8242	Keyboard and mouse controller <sup>1</sup>

---

<sup>1</sup> On the system motherboard (54-25147-01).

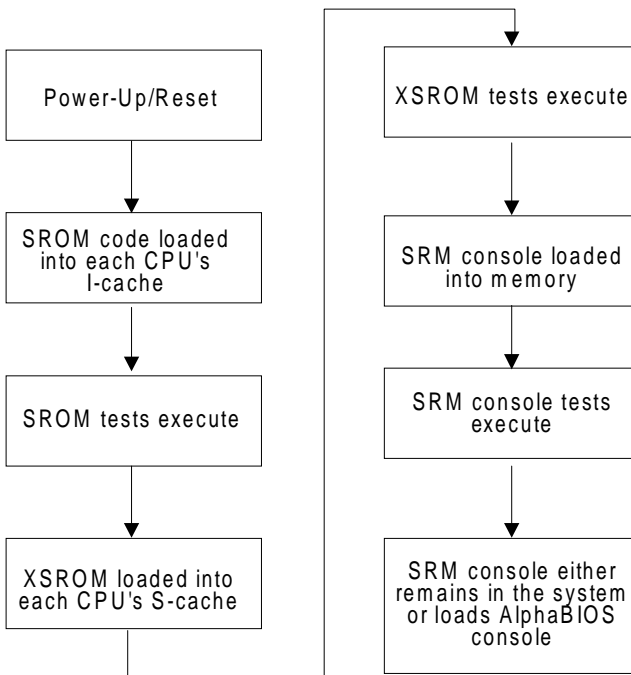
## Power-Up Sequence

---

**Console and most power-up tests reside on the I/O subsystem, not on the CPU nor on any other module on the system bus.**

---

**Figure 2-2 Power-Up Flow**



PKW0432B-96

### Definitions

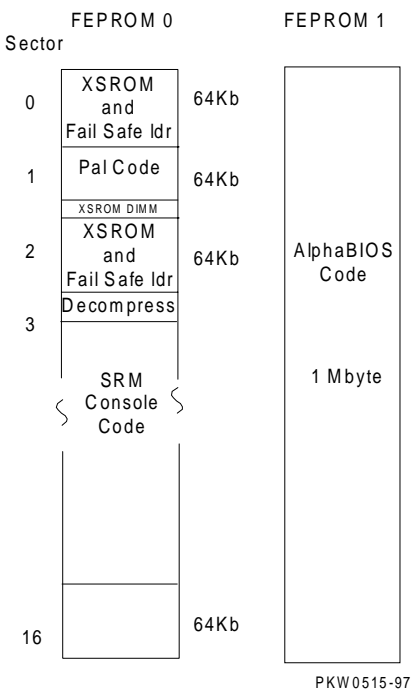
**SRM.** The SRM is a 128-Kbit ROM on each CPU module. The ROM contains minimal diagnostics that test the Alpha chip and the path to the XSROM. Once the path is verified, it loads XSROM code into the Alpha chip and jumps to it.

**XSROM.** The XSROM, or extended SRM, contains back-up cache and memory tests, the I/O subsystem tests for embedded devices, and a fail-safe loader. The XSROM code resides in sector 0 of FEPROM 0 on the XBUS. Sector 2 of **FEPROM 0** contains a

duplicate copy of the code and is used if sector 0 is corrupt. Code for sizing DIMM memory resides in sector 1 of FEPROM 0 along with the PAL code.

**FEPROM.** Two 1-Mbyte programmable ROMs (FEPROMS) are on the XBUS on PCI0. FEPROM 0 contains two copies of the XSROM, and the SRM console and decompression code. FEPROM 1 contains the AlphaBIOS and NT HAL code. See Figure 2-3. These two FEPROMs can be flash updated. Refer to Chapter 6.

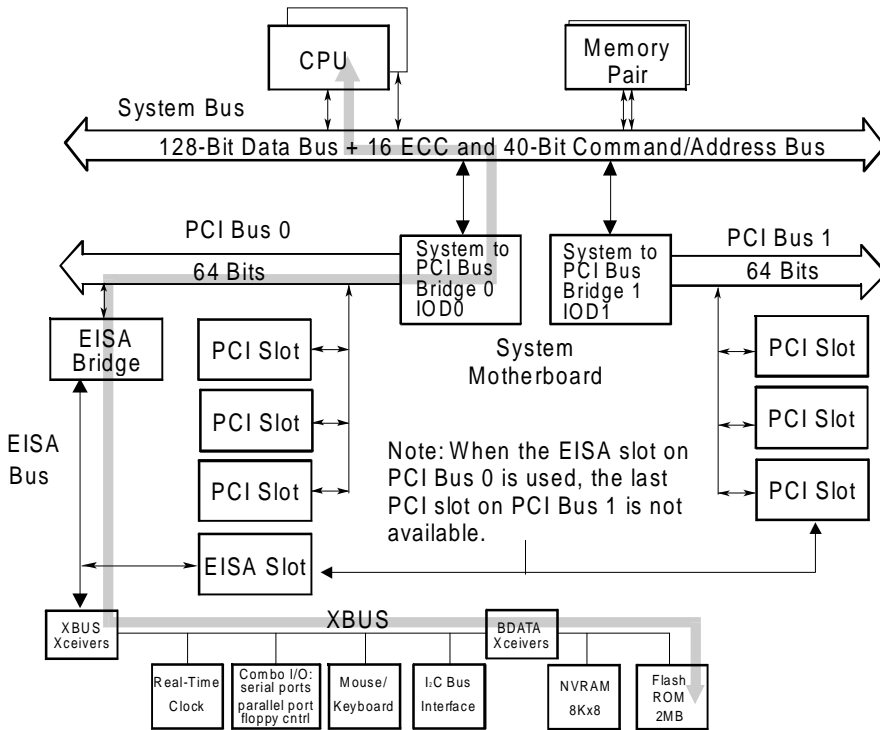
**Figure 2-3 Contents of FEPROMs**



# Power-Up

For the console to run, the path from the CPU to the XSROM must be functional. The XSROM resides in FEPR0M0 on the XBUS, off the EISA bus, off PCI 0, off IOD 0. See Figure 2-4. This path is minimally tested by SROM.

**Figure 2-4 Console Code Critical Path (Block Diagram)**



PKW0502A-97

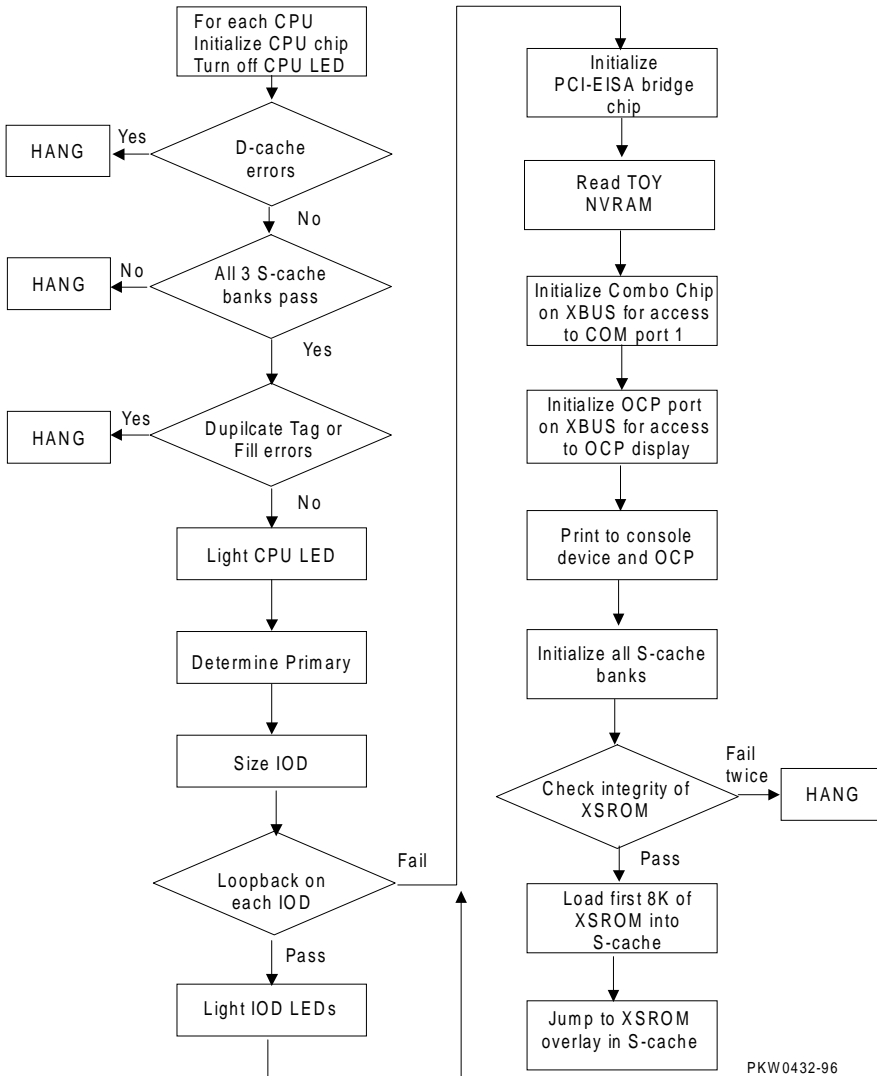
The SROM contents are loaded into each CPU's I-cache and executed on power-up/reset. After testing the caches on each processor chip, it tests the path to the XSROM. Once this path is tested and deemed reliable, layers of the XSROM are loaded sequentially into the processor chip on each CPU. None of the SROM or XSROM power-up tests are run from memory—all run from the caches in the CPU chip, thus providing excellent diagnostic isolation. Later power-up tests, run under the console, are used to complete testing of the I/O subsystem.

There are two console programs: the SRM console and the AlphaBIOS console, as detailed in your system *User's Guide*. By default, the SRM console is always loaded and I/O system tests are run under it before the system loads AlphaBIOS.

# SROM Power-Up Test Flow

**The SROM tests the CPU chip and the path to the XSROM.**

**Figure 2-5 SROM Power-Up Test Flow**



PKW0432-96

The Alpha chip built-in self-test tests the I-cache at power-up and upon reset.

Each CPU chip loads its SRROM code into its I-cache and starts executing it. If the chip is partially functional, the SRROM code continues to execute. However, if the chip cannot perform most of its functions, that CPU hangs and that CPU pass/fail LED remains off. (In these systems, the CPU pass/fail LED is not visible.)

If the system has more than one CPU and at least one passes both the SRROM and XSROM power-up tests, the system will bring up the console. The console checks the FW\_SCRATCH register where evidence of the power-up failure is left. Upon finding the error, the console sends these messages to COM1 and the OCP:

- COM1 (or VGA): Power-up tests have detected a problem with your system
- OCP: Power-up failure



## Power-Up

Table 2-2 lists the tests performed by the SROM.

**Table 2-2 SROM Tests**

<b>Test Name</b>	<b>Logic Tested</b>
D-cache RAM March test	D-cache access, D-cache data, D-cache address logic
D-cache Tag RAM March test	D-cache tag store RAM, D-cache bank address logic
S-cache Data March test	S-cache RAM cells, S-cache data path, S-cache address path
S-cache Tag RAM March test	S-cache tag store RAM, S-cache bank address logic
I-cache Parity Error test	I-cache parity error detection, ISCR register and error forcing logic, IC_PERR_STAT register and reporting logic
D-cache Parity Error test	D-cache parity error detection, DC_MODE register and parity error forcing logic, DC_PERR_STAT register and reporting logic
S-cache Parity Error test	S-cache parity error detection, SC_CTL register and parity error forcing logic, SC_STAT register and reporting logic
IOD Access test	Access to IOD CSRs, data path through CAP chip and MDP0 on each IOD, PCI0 A/D lines <31:0>

## SROM Errors Reported

---

The SROM reports machine checks, pending interrupt/exception errors, and errors related to corruption of FEPR0M 0. If SROM errors are fatal, the particular CPU will hang and only the CPU self-test pass LEDs and/or the LEDs on the system motherboard will indicate the failure. The CPU self-test pass LED is not visible but the IOD0 and IOD1 pass LEDs are.

---

### Example 2-1 SROM Errors Reported at Power-Up

#### Unexpected Machine Check (CPU Error)

```

UNEX MCHK on CPU 0
EXC_ADR 42a9
EI(STAT ffffffff004fffffff
EI(ADDR fffffff000000801f
SC(STAT 0
SC(ADDR FFFFFFF0000005F2F

```

#### Pending Interrupt/Exception (CPU Error)

```

INT-EXC on CPU0
ISR          400000
EI(STAT ffffffff007fffffff
EI(ADDR fffffff7fffffffdf
FIL(SYN 631B
BCTGADR fffffffa7fffcffff

```

#### FEPR0M Failures (PCI Motherboard Error)

##### Sector 0 failures (XSROM flash unload failure)

```

Sctr 0 -XSROM headr PTTRN fail
Sctr 0 -XSROM headr CHKSM fail
Sctr 0 -XSROM code  CHKSM fail

```

##### Sector 2 failures (XSROM recovery flash unload failure)

```

Sctr 2 -XSROM headr PTTRN fail
Sctr 2 -XSROM headr CHKSM fail
Sctr 2 -XSROM code  CHKSM fail

```

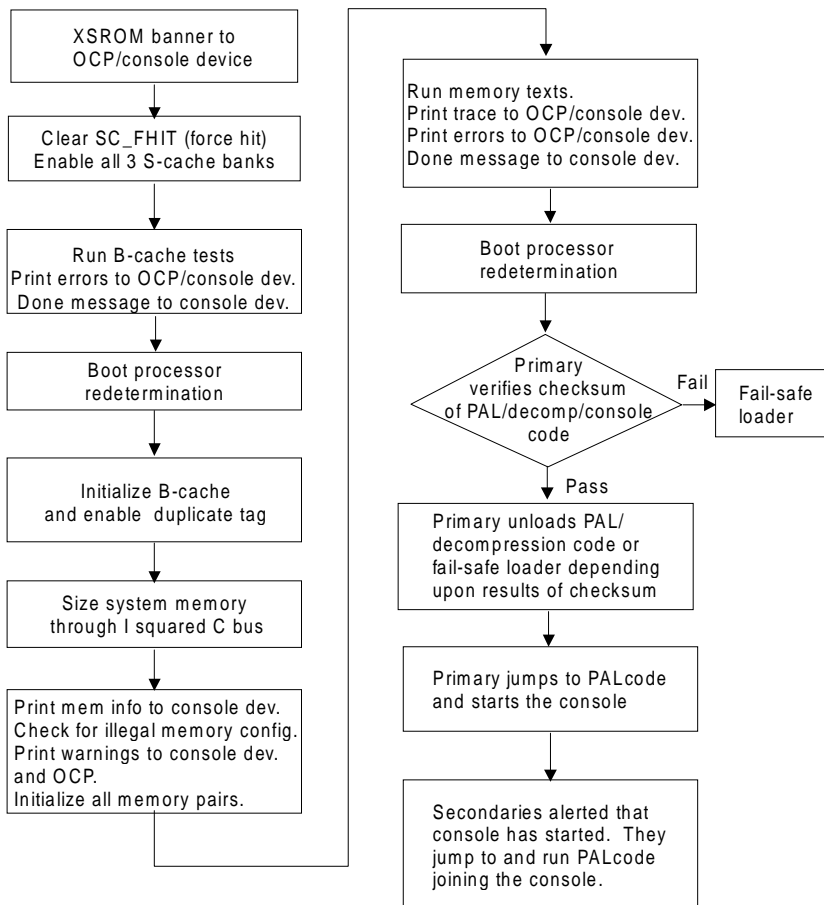
## XSROM Power-Up Test Flow

---

Once the SROM has completed its tests and verified the path to the FEPRM containing the XSROM code, it loads the first 8 Kbytes of XSROM into the primary CPU's S-cache and jumps to it. XSROM tests are described in Table 2-3. Failure indicates a CPU failure.

---

Figure 2-6 XSROM Power-Up Flowchart



Note: The XSROM can only print to the console device if the environment variable console = serial. It always sends output to the OCP.

PKW0432A-96

After jumping to the primary CPU's S-cache, the code then intentionally I-caches itself and is completely register based (no D-stream for stack or data storage is used). The only D-stream accesses are writes/reads during testing.

Each FEPRoM has sixteen 64-Kbyte sectors. The first sector contains B-cache tests, memory tests, and a fail-safe loader. The second sector contains support for system memory and PALcode. The third sector contains a copy of the first sector. The remaining thirteen sectors contain the SRM console and decompression code.

---

**NOTE**

---

Memory tests are run during power-up and reset (see Figure 2-4). They are also affected by the state of the `memory_test` environment variable, which can have the following values:

FULL	Test all memory
PARTIAL	Test up to the first 256 Mbytes
NONE	Test 32 Mbytes

---

**Table 2-3 XSROM Tests**

Test	Test Name	Logic Tested
11	B-cache Data March test	B-cache data RAMs, CPU chip B-cache control, CPU chip B-cache address decode, INDEX_H<23:6> (address bus)
12	B-cache Tag March test	B-cache tag store RAMs, B-cache STAT store RAMs
13	B-cache ECC Data Line test	CPU chip ECC generation and checking logic, ECC lines from CPU chip to B-cache, B-cache ECC RAMs
14	B-cache Tag Data Line test	Access to B-cache tags, shorts between tag data and its status and parity bits
15	B-cache Data Line test	B-cache data lines to B-cache data RAMs, B-cache read/write logic
16	B-cache ECC Data Line test	CPU chip ECC generation and checking logic, ECC lines from CPU chip to B-cache, B-cache ECC RAMs

---

**Table 2-4 Memory Tests**

<b>Test</b>	<b>Test Name</b>	<b>Logic Tested</b>	<b>Description</b>
20	Memory Data test	Data path to and from memory	Test floats 1 and 0 across data and check bit data lines. Errors are reported for each DIMM memory card from MEM0_L to MEM7_H.
21	Memory Address test	Address path to and from memory	Same as test 20.
23*	Memory Bitmap Building	No new logic	Maps out bad memory by way of the bitmap. It does not completely fail memory.
24	Memory March test	No new logic	Maps out bad memory.

\*There is no test 22.

## XSROM Errors Reported

---

**The XSROM reports B-cache test errors and memory test errors. It also reports a warning if memory is illegally configured.**

---

### Example 2-2 XSROM Errors Reported at Power-Up

#### B-cache Error (CPU Error)

```
TEST ERR on  cpu0                #CPU running the test
FRU          cpu0
err#  2
tst#  11
exp:  5555555555555555          #Expected data
rcv:  aaaaaaaaaaaaaaaaaa        #Received data
adr:  ffff8                      #B-cache location
                                     #error occurred
```

#### Memory Error (Memory Module Indicated)

```
20..21..
TEST ERR on cpu0                #CPU running test
FRU:  MEM1L                     #Low member of memory pair 1

err#  c
tst#  21
22..23..24..Memory testing complete on cpu0
```

#### Memory Configuration Error (Operator Error)

```
ERR!  mem(pair0 misconfigured
ERR!  mem(pair1 card size mismatch
ERR!  mem_pair6 card type mismatch
ERR!  mem(pair1 EMPTY
```

#### FEPROM Failures (PCI Error)

```
Sctr 1 -PAL headr PTRN fail
Sctr 1 -PAL headr CHKSM fail
Sctr 1 -PAL code  CHKSM fail
Sctr 3 -CONSLE headr PTRN fail
Sctr 3 -CONSLE headr CHKSM fail
Sctr 3 -CONSLE code  CHKSM fail
```

## Console Power-Up Tests

---

Once loaded, the SRM console tests each IOD further. Table 2-5 describes the IOD power-up tests, and Figure 2-6 describes the PCI power-up tests.

---

**Table 2-5 IOD Tests**

Test #	Test Name	Description
1	IOD CSR Access test	Read and write all CSRs in each IOD.
2	Loopback test	Dense space writes to the IOD's PCI dense space to check the integrity of ECC lines.
3	ECC test	Loopback tests similar to test 2 but with a varying pattern to create an ECC of 0s. Single- and double-bit errors are checked.
4	Parity Error and Fill Error tests	Parity errors are forced on the address and data lines on system bus and PCI buses. A fill error transaction is forced on the system bus.
5	Translation Error test	A loopback test using scatter/gather address translation logic on each IOD.
6	Write Pending test	Runs test 2 with the write-pending bit set and clear in the CAP chip control register.
7	PCI Loopback test	Loops data through each PCI on each IOD, testing the mask field of the system bus.
8	PCI Peer-to-Peer Byte Mask test	Tests that devices on the same PCI and on different PCIs can communicate.
9 <sup>1</sup>	Page Table Entry test 1 (CAP chip)	Tests every PTE using scatter/gather translation and addressing.
10 <sup>1</sup>	Page Table Entry test 2 (CAP chip)	Tests random PTEs forcing use of all interesting tag and page registers.

**Table 2-6 PCI Motherboard Tests**

<b>Test Number</b>	<b>Test Name</b>	<b>Diagnostic Name</b>	<b>Description</b>
1	PCEB	pceb_diag	Tests the PCI to EISA bridge chip
2	ESC	esc_diag	Tests the EISA system controller
3	8K NVRAM	nvrाम_diag	Tests the NVRAM
4	Real-Time Clock	ds1287_diag	Tests the real-time clock chip
5	Keyboard and Mouse	i8242_diag	Tests the keyboard/mouse chip
6	Flash ROM	flash_diag	Dumps contents of flash ROM
7	Serial and Parallel Ports and Floppy	combo_diag	Tests COM ports 1 and 2, the parallel port, and the floppy
8	CD-ROM	ncr810_diag	Tests the CD-ROM controller

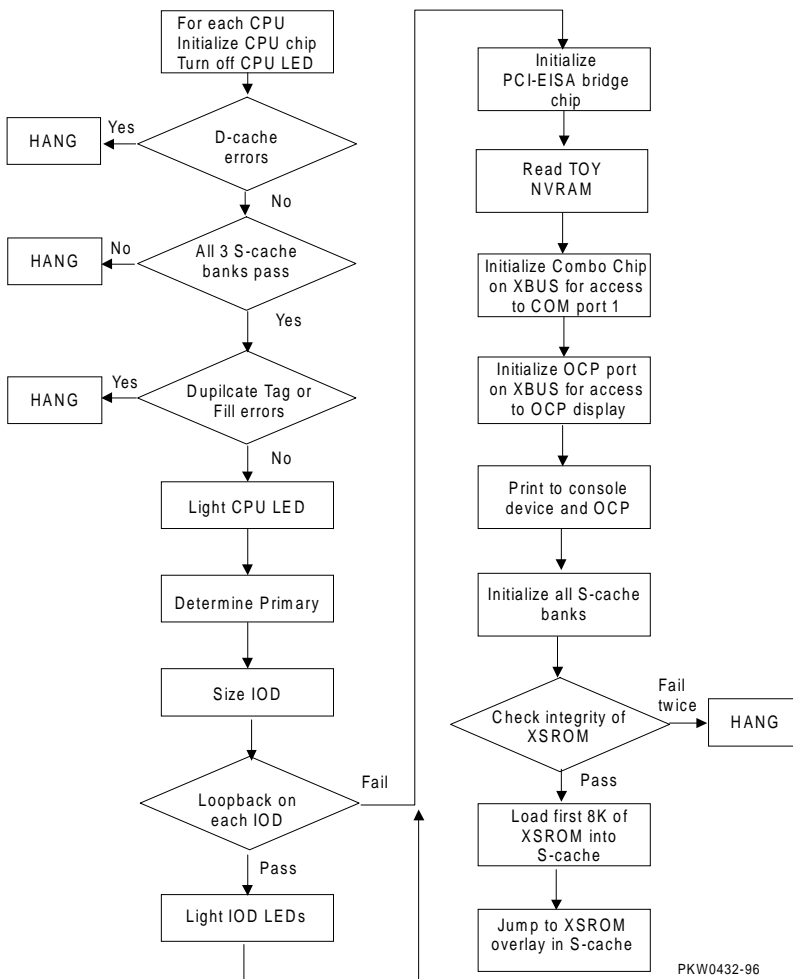
For both IOD tests and PCI 0 and PCI 1 tests, trace and failure status is sent to the OCP. If any of these tests fail, a warning is sent to the SRM console device after the console prompt (or AlphaBIOS pop-up box). The IOD LEDs on the system motherboard are controlled by the diagnostics. If a LED is off, a failure occurred.



## Console Device Determination

After the SRAM and XSROM have completed their tasks, the SRM console program, as it starts, determines where to send its power-up messages.

Figure 2-7 Console Device Determination Flowchart



## Console Device Options

The console device can be either a serial terminal or a graphics monitor. Specifically:

- A serial terminal connected to COM1 off the bulkhead. The terminal connected to COM1 must be set to 9600 baud. This baud rate cannot be changed.
- A graphics monitor off an adapter on PCI0.

Systems running Windows NT must have a graphics monitor as the console device and run AlphaBIOS as the console program.

During power-up, the SRROM and the XSROM always send progress and error messages to the OCP and to the COM1 serial port if the SRM console environment variable (set with the set console command) is set to serial. If the console environment variable is set to graphics, no messages are sent to COM1.

If the console device is connected to COM1, the SRROM, XSROM, and console power-up messages are sent to it once it has been initialized. If the console device is a graphics device, console power-up messages are sent to it, but SRROM and XSROM power-up messages are lost. No matter what the console environment variable setting, each of the three programs sends messages to the control panel display.

<b>Messages Sent By</b>	<b>Console Set to Serial</b>	<b>Graphics</b>
SRROM	COM1	Lost, though a subset is sent to the OCP
XSROM	COM1	Lost, though a subset is sent to the OCP
SRM console	COM1	VGA, though a subset is sent to the OCP

## Console Power-Up Display

---

The entire power-up display prints to a serial terminal (if the console environment variable is set to serial), and parts of it print to the control panel display. The last several lines print to either a serial terminal or a graphics monitor.

---

### Example 2-3 Power-Up Display

```
SROM V3.0 on cpu0 ❶  
SROM V3.0 on cpul  
XSROM V5.0 on cpu0 ❷  
XSROMb V5.0 on cpul  
BCache testing complete on cpul ❸  
BCache testing complete on cpu0  
mem_pair0 - 256 MB ❹  
mem_pair1 - 256 MB  
mem_pair2 - 64 MB  
mem_pair3 - 64 MB  
20..21..20..21..23..24..24.. ❺  
Memory testing complete on cpu0  
Memory testing complete on cpul
```

- ❶ At power-up or reset, the SRAM code on each CPU module is loaded into that module's I-cache and tests the module. If all tests pass, the processor's LED lights. If any test fails, the LED remains off and power-up testing terminates on that CPU.

The first determination of the primary processor is made, and the primary processor executes a loopback test to each PCI bridge. If this test passes, the bridge LED lights. If it fails, the LED remains off and power-up continues. The EISA system controller, PCI-to-EISA bridge, COM1 port, and control panel port are all initialized thereafter.

Each CPU prints an SRAM banner to the device attached to the COM1 port and to the control panel display. (The banner prints to COM1 if the console environment variable is set to serial. If it is set to graphics, nothing prints to the console terminal, only to the control panel display, until ❷ occurs.)

- ❷ Each processor's S-cache is initialized, and the XSROM code in the FEPRAM on the PCI 0 is unloaded into them. (If the unload is not successful, a copy is unloaded from a different FEPRAM sector. If the second try fails, the CPU hangs.)

Each processor jumps to the XSROM code and sends an XSROM banner to the COM1 port and to the control panel display.

- ❸ The three S-cache banks on each processor are enabled, and then the B-cache is tested. If a failure occurs, a message is sent to the COM1 port and to the control panel display.

Each CPU sends a B-cache completion message to COM1.

- ❹ The primary CPU is again determined, and memory is sized using code in sector 1 of FEPRAM 0.

The information on memory pairs is sent to COM1. If an illegal memory configuration is detected, a warning message is sent to COM1 and the control panel display.

- ❺ Memory is initialized and tested, and the test trace is sent to COM1 and the control panel display. Each CPU participates in the memory testing. The numbers for tests 20 and 21 might appear interspersed, as in Example 2-3. This is normal behavior. Test 24 can take several minutes if the memory is very large. The message "P0 TEST 24 MEM\*\*" is displayed on the control panel display; the second asterisk rotates to indicate that testing is continuing. If a failure occurs, a message is sent to the COM1 port and to the control panel display.

Each CPU sends a test completion message to COM1.

## Power-Up

### Example 2-3 Power-Up Display (Continued)

```
starting console on CPU 0 ⑥
sizing memory ⑦
  0    256 MB DIMM
  1    256 MB DIMM
64 MB DIMM
64 MB DIMM
starting console on CPU 1
probing IOD1 hose 1 ⑧
  bus 0 slot 1 - NCR 53C810
  bus 0 slot 2 - DECchip 21041-AA
  bus 0 slot 3 - NCR 53C810
probing IOD0 hose 0
  bus 0 slot 1 - PCEB
    probing EISA Bridge, bus 1
  bus 0 slot 2 - S3 Trio64/Trio32
  bus 0 slot 3 - DECchip 21140-AA
Configuring I/O adapters...
  Ncr0, hose 1, bus 0, slot 1
  Tulip0, hose 1, bus 0, slot 2
  Ncr1, hose 1, bus 0, slot 3
  Floppy0, hose 0, bus 1 slot 0
  Mc0, hose 0 bus 0, slot 2
  tulip1, hose 0, bus 0, slot 3
System temperature is 31 degrees C
DIGITAL Server 5300 Console V5.0, 02-SEP-1997 18:18:26 ⑨
P00>>>
```

- ⑥ The final primary CPU determination is made. The primary CPU unloads PALcode and decompression code from the FEPR0M on PCI 0 to its B-cache. The primary CPU then jumps to the PALcode to start the SRM console.

The primary CPU prints a message indicating that it is running the console. Starting with this message, the power-up display is printed to the default console terminal, regardless of the state of the console environment variable. (If console is set to graphics, the display from here to the end is saved in a memory buffer and printed to the graphics monitor after the PCI buses are sized and the graphics device is initialized.)

- ⑦ The size and type of each memory pair is determined.  
The console is started on each of the secondary CPUs. A status message prints for each CPU.
- ⑧ The PCI bridges (indicated as IOD $n$ ) are probed and the devices are reported. I/O adapters are configured.
- ⑨ The SRM console banner and prompt are printed. (The SRM prompt is shown in this manual as P00>>>. It can, however, be P01>>>.)

The SRM console loads and starts the AlphaBIOS console.

## Fail-Safe Loader

---

**The fail-safe loader is a software routine that loads the SRM console image from floppy. Once the console is running you will want to run LFU to update FEPROM 0 with a new image.**

---

---

### NOTE

---

FEPROM 0 contains images of the SROM, XSROM, PAL, decompression, and SRM console code.

---

If the fail-safe loader loads, the following conditions exist on the machine:

- The SROM has passed its tests and successfully unloaded the XSROM. If the SROM fails to unload both copies of XSROM, it reports the failure to the control panel display and COM1 if possible, and the system hangs.
- The XSROM has completed its B-cache and memory tests but has failed to unload the PALcode in FEPROM 0 sector 1 or the SRM console code.
- The XSROM reports the errors encountered and loads the fail-safe loader.

# 3

---

## Troubleshooting

This chapter describes troubleshooting during power-up and booting. It also describes the console test command and other useful commands. The following topics are covered:

- Troubleshooting with LEDs
- Troubleshooting Power Problems
- Running Diagnostics—Test Command
- Releasing Secure Mode
- Testing an Entire System
- Other Useful Console Commands



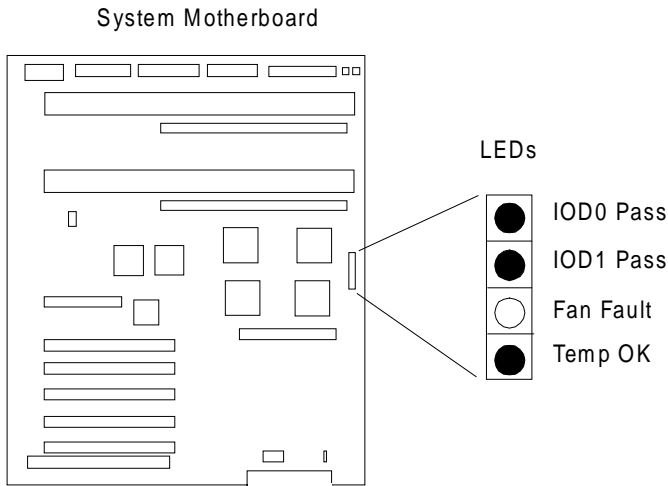
## Troubleshooting with LEDs

---

**During power-up, reset, initialization, or testing, diagnostics are run on CPUs, memories, I/O bridges, and the PCI backplane and its embedded options. This section describes possible problems that can be identified by checking LEDs. Unfortunately LEDs on the CPU module are not visible; the only visible LEDs are on the system motherboard.**

---

**Figure 3-1 System Motherboard LEDs**



## System Motherboard LEDs

You see the system motherboard LEDs by looking through the grate at the back of the machine. The normal state of the LEDs is shown in Figure 3-1.

- If one of the IOD LEDs is off, the system bus to PCI bus bridge has failed. Replace the system motherboard.
- If the Fan Fault LED is ON, at least one of the four fans is broken. If this condition occurs while the system is up and running, an error message identifying the FRU is printed to the console. If this condition occurs during a cold start, to identify which fan caused the fan fault, reset the system and watch the OCP display. During the first 30 seconds, one of the following message should occur:
  - SYSx Fan Failed where x = 0 or 1
  - CPUx Fan Failed where x = 0 or 1

Replace the failing FRU.

- If the Temp OK LED is OFF, an overtemperature condition exists. Several things can cause this condition: blocked airflow, temperature in the room where the system is located is too high, the system card cage is open and air is not channeled properly over the system. Fix any of these conditions, if possible. The overtemperature threshold is programmable and is controlled by the environment variable **over\_temp**. Its default is 55 degrees C. After the system has cooled down and can be powered up, you can change the threshold. If you do this and the temperature inside the system gets too hot, it is likely that system errors will occur and the system may crash.

## Troubleshooting Power Problems

---

**Power problems can occur before the system is up or while the system is running.**

---

### Power Problem List

The system will halt for the following reasons:

1. A CPU fan failure
2. A system fan failure
3. An overtemperature condition
4. Power supply failure
5. Circuit breaker(s) tripped
6. AC problem
7. Interlock switch activation or failure
8. Environmental electrical failure or unrecoverable system fault with auto\_action ev = halt or boot
9. Cable failure

Indication of failure:

1. LEDs indicate fan and overtemperature condition
2. The OCP display
3. Circuit breaker(s) tripped

There is no obvious indication for failures 7 – 10 from the power system.

## Halt Caused by Power, Fan, or Overtemperature Condition

If a system is stopped because of a power, fan, or overtemperature problem, the console and the OCP should report the problem.

### If Power Problem Occurs at Power-Up

If the system has a power problem on a cold start, the motherboard LEDs and the OCP display will indicate a problem. Causes of power problems are:

- Broken system fan
- Broken CPU fan
- A power supply could be broken and the system could still power up momentarily. (During power-up, an overcurrent condition occurs with two power supplies and is tolerated for a short period but a persistent overcurrent is not.)
- Power control logic on the motherboard could fail
- Interlock failure
- Wire problems
- Temperature problem (unlikely)

### Recommended Order for Troubleshooting Failure at Power-Up

If the SRM console does not come all the way up, restart the system if the system runs NT and watch for an error message on the OCP display. Replace the FRU indicated.

1. If you can get to the SRM console, use the show power command. It will show the last power fault.
2. If neither step one nor step 2 identifies a FRU, replace the motherboard.

## Running Diagnostics — Test Command

---

**The test command runs diagnostics on the entire system, CPU devices, memory devices, and the PCI I/O subsystem. The test command runs only from the SRM console. Ctrl/C stops the test. The console cannot be secure.**

---

### Example 3-1 Test Command Syntax

```
P00>>> help test
FUNCTION
```

#### SYNOPSIS

```
test ([-q] [-t <time>] [option])
where option is:
cpun
memn
pcin
```

where *n* = 0, 1 or \* for CPUs and PCIs

where *n* = 0 through 7 or \* for MEM

The entire system is tested by default if no *is* option is specified.

---

#### NOTE

---

If you are running the Microsoft Windows NT operating system, switch from AlphaBIOS to the SRM console in order to enter the test command. From the AlphaBIOS console, press in the Halt button (the LED will light) and reset the system.

---

**test** [-t *time*] [-q] [*option*]

**-t** *time* Specifies the run time in seconds. The default for system test is 600 seconds (10 minutes).

**-q** Disables the display of status messages as exerciser processes are started and stopped during testing.

*option* Either **cpun**, **memn**, or **pcin**, where *n* is 0, 1, or \* for CPUs and PCIs; or where *n* is 0 through 7 or \* for memory. If nothing is specified, the entire system is tested.

## Releasing Secure Mode

---

**The console cannot be secure for most SRM console commands to run. If the console is not secure, user mode console commands can be entered. See the system manager if the system is secure and you do not know the password.**

---

### Example 3-2 Releasing/Reestablishing Secure Mode

```
P00>>> login
Please enter password: xxxx
P00>>>

                [User mode SRM console commands are now available.]

P00>>> set secure
```

The console command **login** clears secure.

If the password has been forgotten and the system is in secure mode, the procedure for regaining control is:

1. Enter the **login** command    P00>>> login
2. At the `please enter password:` prompt, press the Halt button and then press the Return key.

The password is now cleared and the console is in user mode. A new password must be set to put the console into secure mode again.

For a full discussion of securing the console, see your system User's Guide.

# Testing an Entire System

---

**A test command with no modifiers runs all exercisers for subsystems and devices on the system. I/O devices tested are supported boot devices. The test runs for 10 minutes.**

---

### Example 3-3 Sample Test Command

```
P00>>> test
```

```
Console is in diagnostic mode
```

```
System test, runtime 600 seconds
```

```
Type ^C to stop testing
```

```
Configuring system..
```

```
polling ncr0 (NCR 53C810) slot 1, bus 0 PCI, hose 1 SCSI Bus ID 7  
dka500.5.0.1.1 DKa500 RRD45 1645
```

```
polling ncr1 (NCR 53C810) slot 3, bus 0 PCI, hose 1 SCSI Bus ID 7  
dkb200.2.0.3.1 DKb200 RZ29B 0007
```

```
dkb400.4.0.3.1 DKb400 RZ29B 0007
```

```
polling floppy0 (FLOPPY) PCEB - XBUS hose 0
```

```
dva0.0.0.1000.0 DVA0 RX23
```

```
polling tulip0 (DECchip 21040-AA) slot 2, bus 0 PCI, hose 1
```

```
ewa0.0.0.2.1: 08-00-2B-E5-B4-1A
```

```
Testing EWA0 network device
```

```
Testing VGA (alphanumeric mode only)
```

```
Starting background memory test, affinity to all CPUs..
```

```
Starting processor/cache thrasher on each CPU..
```

```
Starting processor/cache thrasher on each CPU..
```

```
Testing SCSI disks (read-only)
```

```
No CD-ROM present, skipping embedded SCSI test
```

```
Testing other SCSI devices (read-only)..
```

```
Testing floppy drive (dva0, read-only)
```

## Troubleshooting

ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read	
00003047	memtest	memory	1	0	0	134217728	134217728
00003050	memtest	memory	205	0	0	213883392	213883392
00003059	memtest	memory	192	0	0	200253568	200253568
00003062	memtest	memory	192	0	0	200253568	200253568
00003084	memtest	memory	80	0	0	82827392	82827392
000030d8	exer_kid	dkb200.2.0.3	26	0	0	0	13690880
000030d9	exer_kid	dkb400.4.0.3	26	0	0	0	13674496
0000310d	exer_kid	dva0.0.0.100	0	0	0	0	0

ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read	
00003047	memtest	memory	1	0	0	432013312	432013312
00003050	memtest	memory	635	0	0	664716032	664716032
00003059	memtest	memory	619	0	0	647940864	647940864
00003062	memtest	memory	620	0	0	648989312	648989312
00003084	memtest	memory	263	0	0	274693376	274693376
000030d8	exer_kid	dkb200.2.0.3	90	0	0	0	47572992
000030d9	exer_kid	dkb400.4.0.3	90	0	0	0	47523840
0000310d	exer_kid	dva0.0.0.100	0	0	0	0	327680

ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read	
00003047	memtest	memory	1	0	0	727711744	727711744
00003050	memtest	memory	1054	0	0	1104015744	1104015744
00003059	memtest	memory	1039	0	0	1088289024	1088289024
00003062	memtest	memory	1041	0	0	1090385920	1090385920
00003084	memtest	memory	447	0	0	467607808	467607808
000030d8	exer_kid	dkb200.2.0.3	155	0	0	0	81488896
000030d9	exer_kid	dkb400.4.0.3	155	0	0	0	81472512
0000310d	exer_kid	dva0.0.0.100	1	0	0	0	607232

Testing aborted. Shutting down tests.

Please wait..

System test complete

^C

P00>>>



## Testing Memory

---

**The test mem command tests individual memory devices or all memory.  
The test shown in Example 3-4 runs for 2 minutes.**

---

### Example 3-4 Sample Test Memory Command

```
P00>>> test memory
Console is in diagnostic mode
System test, runtime 120 seconds
```

Type ^C to stop testing

Starting background memory test, affinity to all CPUs..

Starting memory thrasher on each CPU..

Starting memory thrasher on each CPU..

ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read
000046d7	memtest	memory	1	0 0	48234496	48234496
000046e0	memtest	memory	122	0 0	126862208	126862208
000046e9	memtest	memory	111	0 0	115329280	115329280
000046f2	memtest	memory	109	0 0	113232384	113232384
000046fb	memtest	memory	41	0 0	41937920	41937920
ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read
000046d7	memtest	memory	1	0 0	226492416	226492416
000046e0	memtest	memory	566	0 0	592373120	592373120
000046e9	memtest	memory	555	0 0	580840192	580840192
000046f2	memtest	memory	554	0 0	579791744	579791744
000046fb	memtest	memory	211	0 0	220174080	220174080
ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read
000046d7	memtest	memory	1	0 0	404750336	404750336
000046e0	memtest	memory	1011	0 0	1058932480	1058932480
000046e9	memtest	memory	1000	0 0	1047399552	1047399552
000046f2	memtest	memory	999	0 0	1046351104	1046351104
000046fb	memtest	memory	381	0 0	398410240	398410240

## Troubleshooting

ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read	
000046d7	memtest	memory	1	0	0	583008256	583008256
000046e0	memtest	memory	1456	0	0	1525491840	1525491840
000046e9	memtest	memory	1446	0	0	1515007360	1515007360
000046f2	memtest	memory	1444	0	0	1512910464	1512910464
000046fb	memtest	memory	550	0	0	575597952	575597952
ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read	
000046d7	memtest	memory	1	0	0	761266176	761266176
000046e0	memtest	memory	1901	0	0	1992051200	1992051200
000046e9	memtest	memory	1892	0	0	1982615168	1982615168
000046f2	memtest	memory	1889	0	0	1979469824	1979469824
000046fb	memtest	memory	720	0	0	753834112	753834112
ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read	
000046d7	memtest	memory	1	0	0	937426944	937426944
000046e0	memtest	memory	2346	0	0	2458610560	2458610560
000046e9	memtest	memory	2337	0	0	2449174528	2449174528
000046f2	memtest	memory	2333	0	0	2444980736	2444980736
000046fb	memtest	memory	890	0	0	932070272	932070272

Memory test complete

Test time has expired...

P00>>>

## Troubleshooting

### Testing PCI

The test pci command tests PCI buses and devices. The test runs for 2 minutes.

#### Example 3-5 Sample Test Command for PCI

```
P00>>> test pci*
```

```
Console is in diagnostic mode
```

```
System test, runtime 120 seconds
```

```
Type ^C to stop testing
```

```
Configuring all PCI buses..
```

```
polling ncr0 (NCR 53C810) slot 1, bus 0 PCI, hose 1   SCSI Bus ID 7
```

```
dka500.5.0.1.1      DKa500                      RRD45  1645
```

```
polling ncr1 (NCR 53C810) slot 3, bus 0 PCI, hose 1   SCSI Bus ID 7
```

```
dkb200.2.0.3.1     DKb200                      RZ29B  0007
```

```
dkb400.4.0.3.1     DKb400                      RZ29B  0007
```

```
polling tulip0 (DECchip 21040-AA) slot 2, bus 0 PCI, hose 1
```

```
ewa0.0.0.2.1: 08-00-2B-E5-B4-1A
```

```
polling floppy0 (FLOPPY) PCEB - XBUS hose 0
```

```
dva0.0.0.1000.0    DVA0                          RX23
```

```
Testing all PCI buses..
```

```
Testing EWA0 network device
```

```
Testing VGA (alphanumeric mode only)
```

```
Testing SCSI disks (read-only)
```

```
Testing floppy (dva0, read-only)
```

## Troubleshooting

ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read
00002c29	exer_kid	dkb200.2.0.3	27	0 0	0	14642176
00002c2a	exer_kid	dkb400.4.0.3	27	0 0	0	14642176
00002c5e	exer_kid	dva0.0.0.100	0	0 0	0	0

ID	Program	Device	Pass	Hard/Soft	Bytes Written	Bytes Read
00002c29	exer_kid	dkb200.2.0.3	92	0 0	0	48689152
00002c2a	exer_kid	dkb400.4.0.3	92	0 0	0	48689152
00002c5e	exer_kid	dva0.0.0.100	0	0 0	0	286720

Testing aborted. Shutting down tests.

Please wait..

Testing complete

^C

P00>>>

## Other Useful Console Commands

---

**There are several console commands that help diagnose the system.**

---

The **show power** command can be used to identify power, temperature, and fan faults.

### Example 3-6 Show Power

```
P00>>> show power
```

```

                                Status
Power Supply 0                   good
Power Supply 1                   good
System Fans                      good
CPU Fans                        good
Temperature                      good
```

```
Current ambient temperature is 20 degrees C
System shutdown temperature is set to 55 degrees C
```

```
The system was last reset via a system software reset
```

```
0 Environmental events are logged in nvram
```

The **show memory** command shows memory DIMMs and their starting addresses.

### Example 3-7 Show Memory

```
P00>>> show memory
```

```
Slot      Type      MB      Base
----      -
0         DIMM      256     0
1         DIMM      256     20000000
2         DIMM      256     40000000
3         DIMM      256     60000000

Total                    1.2GB
```

The **show fru** command lists all FRUs in the system.

**Example 3-8 Show FRU**

P00>>> show fru

Digital Equipment Corporation  
DIGITAL Server 5300

```

Console V5.0-2
Module                Part #    Type    Rev    Name        Serial #
System Motherboard    25147-01  0       0000    mthbrd0
NI72000047
Memory 256 MB DIMM    N/A      0       0000    mem0       N/A
Memory 256 MB DIMM    N/A      0       0000    mem1       N/A
Memory 256 MB DIMM    N/A      0       0000    mem2       N/A
Memory 256 MB DIMM    N/A      0       0000    mem3       N/A
CPU (4MB Cache)      B3007-AA  3       0000    cpu0
KA705TRVNS
Bridge (IOD0/IOD1)   25147-01  600     0032    iod0/iod1
NI72000047
PCI Motherboard       25147-01  a       0003    saddle0
NI72000047

Bus 0  iod0 (PCI0)
Slot  Option Name                Type    Rev    Name
1    PCEB                      4828086 0005    pceb0
2    S3 Trio64/Trio32         88115333 0054    vga0
3    DECchip 21041-AA         141011  0011    tulip0

Bus 1  pceb0 (EISA Bridge connected to iod0, slot 1)
Slot  Option Name                Type    Rev    Name

Bus 0  iod1 (PCI1)
Slot  Option Name                Type    Rev    Name
1    NCR 53C810                11000  0002    ncr0
4    QLogic ISP1020            10201077 0005    isp0

```

---

# Error Registers

This chapter describes the registers used to hold error information. These registers include:

- External Interface Status Register
- External Interface Address Register
- MC Error Information Register 0
- MC Error Information Register 1
- CAP Error Register
- PCI Error Status Register 1

## External Interface Status Register - EI\_STAT

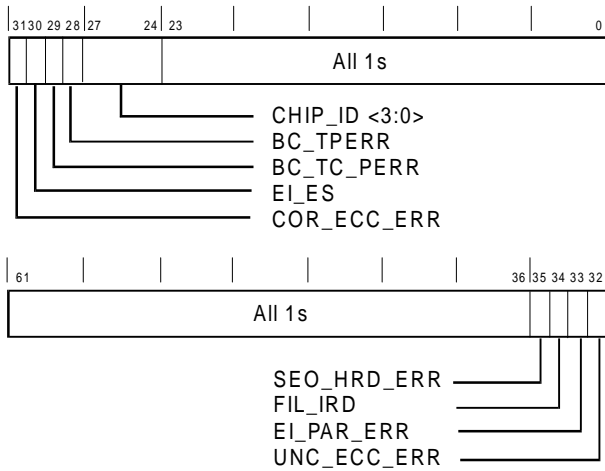
---

The EI\_STAT register is a read-only register that is unlocked and cleared by any PALcode read. A read of this register also unlocks the EI\_ADDR, BC\_TAG\_ADDR, and FILL\_SYN registers subject to some restrictions. The EI\_STAT register is not unlocked or cleared by reset.

---

**Address**        FF FFF0 0168

**Type**            R



PKW0453-96



Fill data from B-cache or main memory could have correctable or uncorrectable errors in ECC mode. System address/command parity errors are always treated as uncorrectable hard errors, irrespective of the mode. The sequence for reading, unlocking, and clearing EI\_STAT, EI\_ADDR, BC\_TAG\_ADDR, and FILL\_SYN is as follows:

1. Read the EI\_ADDR, BC\_TAG\_ADDR, and FIL\_SYN registers in any order. Does not unlock or clear any register.
2. Read the EI\_STAT register. This operation unlocks the EI\_ADDR, BC\_TAG\_ADDR, and FILL\_SYN registers. It also unlocks the EI\_STAT register subject to conditions given in Table 4-1, which defines the loading and locking rules for external interface registers.

---

### NOTE

---

If the first error is correctable, the registers are loaded but not locked. On the second correctable error, the registers are neither loaded nor locked. Registers are locked on the first uncorrectable error except the second hard error bit. This bit is set only for an uncorrectable error that follows an uncorrectable error. A correctable error that follows an uncorrectable error is not logged as a second error. B-cache tag parity errors are uncorrectable in this context.

---

## Error Registers

**Table 4-1 External Interface Status Register**

Name	Bits	Type	Description
COR_ECC_ERR	<31>	R	<b>Correctable ECC Error.</b> Indicates that fill data received from outside the CPU contained a correctable ECC error.
EI_ES	<30>	R	<b>External Interface Error Source.</b> When set, indicates that the error source is fill data from main memory or a system address/command parity error. When clear, the error source is fill data from the B-cache.  This bit is only meaningful when <COR_ECC_ERR>, <UNC_ECC_ERR>, or <EI_PAR_ERR> is set in this register. This bit is not defined for a B-cache tag error (BC_TPERR) or a B-cache tag control parity error (BC_TC_ERR).
BC_TC_PERR	<29>	R	<b>B-Cache Tag Control Parity Error.</b> Indicates that a B-cache read transaction encountered bad parity in the tag control RAM.
BC_TPERR	<28>	R	<b>B-Cache Tag Address Parity Error.</b> Indicates that a B-cache read transaction encountered bad parity in the tag address RAM.
CHIP_ID	<27:24>  <23:0>  <63:36>	R	<b>Chip Identification.</b> Read as “5.” Future update revisions to the chip will return new unique values.  All ones.  All ones.
SEO_HRD_ERR	<35>	R	<b>Second External Interface Hard Error.</b> Indicates that a fill from B-cache or main memory, or a system address/command received by the CPU has a hard error while one of the hard error bits in the EI_STAT register is already set.
FIL_IRD	<34>	R	<b>Fill I-Ref D-Ref.</b> When set, indicates that the error occurred during an I-ref fill. When clear, indicates that the error occurred during a D-ref fill. This bit has meaning only when one of the ECC or parity error bits is set. This bit is not defined for a B-cache tag parity error (BC_TPERR) or a B-cache tag control parity error (BC_TC_ERR).
EI_PAR_ERR	<33>	R	<b>External Interface Command/Address Parity Error.</b> Indicates that an address and command received by the CPU has a parity error.
UNC_ECC_ERR	<32>	R	<b>Uncorrectable ECC Error.</b> Indicates that fill data received from outside the CPU contained an uncorrectable ECC error. In parity mode, this bit indicates a data parity error.

## External Interface Address Register - EI\_ADDR

---

**The EI\_ADDR register contains the physical address associated with errors reported by the EI\_STAT register. It is unlocked by a read of the EI\_STAT Register. This register is meaningful only when one of the error bits is set.**

---

**Address**           FF FFF0 0148

**Access**            R

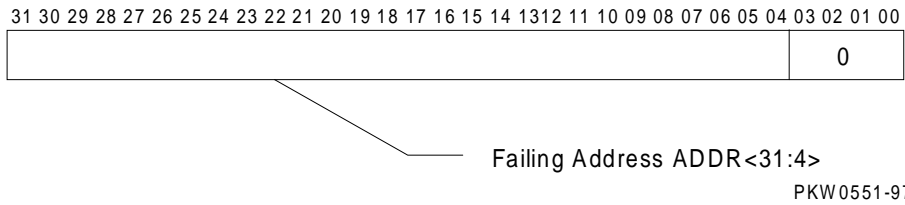
**Table 4-2 Loading and Locking Rules for External Interface Registers**

Correctable Error	Uncorrectable Error	Second Hard Error	Load Register	Lock Register	Action When EI_STAT Is Read
0	0	Not possible	No	No	Clears and unlocks all registers
1	0	Not possible	Yes	No	Clears and unlocks all registers
0	1	0	Yes	Yes	Clears and unlocks all registers
1 <sup>1</sup>	1	0	Yes	Yes	Clear bit (c) does not unlock. Transition to "0,1,0" state.
0	1	1	No	Already locked	Clears and unlocks all registers
1 <sup>1</sup>	1	1	No	Already locked	Clear bit (c) does not unlock. Transition to "0,1,1" state.

<sup>1</sup>These are special cases. It is possible that when EI\_ADDR is read, only the correctable error bit is set and the registers are not locked. By the time EI\_STAT is read, an uncorrectable error is detected and the registers are loaded again and locked. The value of EI\_ADDR read earlier is no longer valid. Therefore, for the "1,1,x" case, when EI\_STAT is read correctable, the error bit is cleared and the registers are not unlocked or cleared. Software must reexecute the IPR read sequence. On the second read operation, error bits are in "0,1,x" state, all the related IPRs are unlocked, and EI\_STAT is cleared.

## MC Error Information Register 0 (MC\_ERR0 - Offset = 800)

The low-order MC bus (system bus) address bits are latched into this register when the system bus to PCI bus bridge detects an error event. If the event is a hard error, the register bits are locked. A write to clear symptom bits in the CAP Error Register unlocks this register. When the valid bit (MC\_ERR\_VALID) in the CAP Error Register is clear, the contents are undefined.

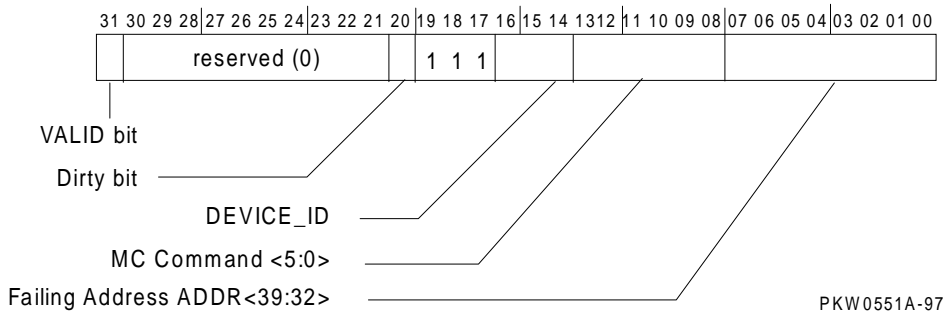


**Table 4-3 MC Error Information Register 0**

Name	Bits	Type	Initial State	Description
ADDR<31:4>	<31:4>	RO	0	Contains the address of the transaction on the system bus when an error is detected.
Reserved	<3:0>	RO	0	

## MC Error Information Register 1 (MC\_ERR1 - Offset = 840)

The high-order MC bus (system bus) address bits and error symptoms are latched into this register when the system bus to PCI bus bridge detects an error. If the event is a hard error, the register bits are locked. A write to clear symptom bits in the CAP Error Register unlocks this register. When the valid bit (MC\_ERR\_VALID) in the CAP Error Register is clear, the contents are undefined.



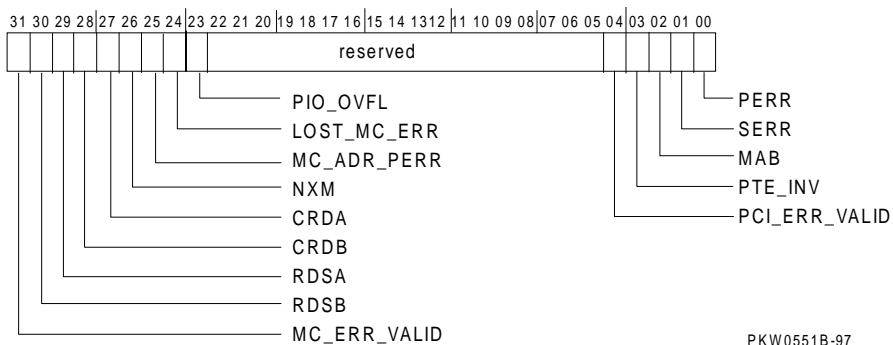
## Error Registers

**Table 4-4 MC Error Information Register**

<b>Name</b>	<b>Bits</b>	<b>Type</b>	<b>Initial State</b>	<b>Description</b>
VALID	<31>	RO	0	Logical OR of bits <30:23> in the CAP_ERR Register. Set if MC_ERR0 and MC_ERR1 contain a valid address.
Reserved	<30:21>	RO	0	
Dirty	<20>	RO	0	Set if the system bus error was associated with a Read/Dirty transaction. When set, the device ID field <19:14> does not indicate the source of the data.
Reserved	<19:17>		1	All ones.
DEVICE_ID	<16:14>	RO	0	Slot number of bus master at the time of the error.
MC_CMD<5:0>	<13:8>	RO	0	Active command at the time the error was detected.
ADDR<39:32>	<7:0>	RO	0	Address bits <39:32> of the transaction on the system bus when an error is detected.

## CAP Error Register (CAP\_ERR - Offset = 880)

**CAP\_ERR** is used to log information pertaining to an error detected by the CAP or MDP ASIC. If the error is a hard error, the register is locked. All bits, except the LOST\_MC\_ERR bit, are locked on hard errors. CAP\_ERR remains locked until the CAP error is written to clear each individual error bit.



PKW0551B-97

**Table 4-5 CAP Error Register**

Name	Bits	Type	Initial State	Description
MC_ERR_VALID	<31>	RO	0	Logical OR of bits <30:23> in this register. When set MC_ERR0 and MC_ERR1 are latched.
RDSB	<30>	RW1C	0	Uncorrectable ECC error detected by MDPB. Clear state in MDPB before clearing this bit.
RDSA	<29>	RW1C	0	Uncorrectable ECC error detected by MDPA. Clear state in MDPA before clearing this bit.
CRDB	<28>	RW1C	0	Correctable ECC error detected by MDPB. Clear state in MDPB_STAT before clearing this bit.

*continued on next page*

## Error Registers

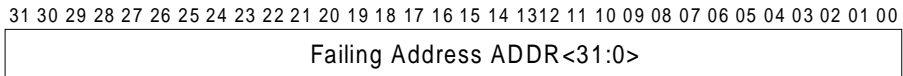
**Table 4-5 CAP Error Register (continued)**

CRDA	<27>	RW1C	0	Correctable ECC error detected by MDPA. Clear state in MDPA_STAT before clearing this bit.
NXM	<26>	RW1C	0	System bus master transaction status NXM (Read with Address bit <39> set but transaction not pended or transaction target above the top of memory register.) CPU will also get a fill error on reads.
MC_ADR_PERR	<25>	RW1C	0	Set when a system bus command/address parity error is detected.
LOST_MC_ERR	<24>	RW1C	0	Set when an error is detected but not logged because the associated symptom fields and registers are locked with the state of an earlier error.
PIO_OVFL	<23>	RW1C	0	Set when a transaction that targets this system bus to PCI bus bridge is not serviced because the buffers are full. This is a symptom of setting the PEND_NUM field in CAP_CNTL to an incorrect value.
Reserved	<22:5>	RO	0	
PCI_ERR_VALID	<4>	RO	0	Logical OR of bits <3:0> of this register. When set, the PCI error address register is locked.
PTE_INV	<3>	RW1C	0	Invalid page table entry on scatter/gather access.
MAB	<2>	RW1C	0	PCI master state machine detected PCI Target Abort (likely cause: NXM) (except Special Cycle). On reads fill error is also returned.
SERR	<1>	RW1C	0	PCI target state machine observed SERR#. CAP asserts SERR when it is master and detects target abort.
PERR	<0>	RW1C	0	PCI master state machine observed PERR#.



## PCI Error Status Register 1 (PCI\_ERR1 - Offset = 1040)

**PCI\_ERR1 is used by the system bus to PCI bus bridge to log bus address <31:0> pertaining to an error condition logged in CAP\_ERR. This register always captures PCI address <31:0>, even for a PCI DAC cycle. When the PCI\_ERR\_VALID bit in CAP\_ERR is clear, the contents are undefined.**



PKW0551C-97

**Table 4-6 PCI Error Status Register**

Name	Bits	Type	Initial State	Description
ADDR<31:0>	<31:0>	RO	0	Contains address bits <31:0> of the transaction on the PCI bus when an error is detected.

---

## Removal and Replacement

This chapter describes removal and replacement procedures for field-replaceable units (FRUs).

### System Safety

---

**Observe the safety guidelines in this section to prevent personal injury.**

---

---

#### **CAUTION**

---

Wear an antistatic wrist strap whenever you work on a system.

---

---

#### **WARNING**

---

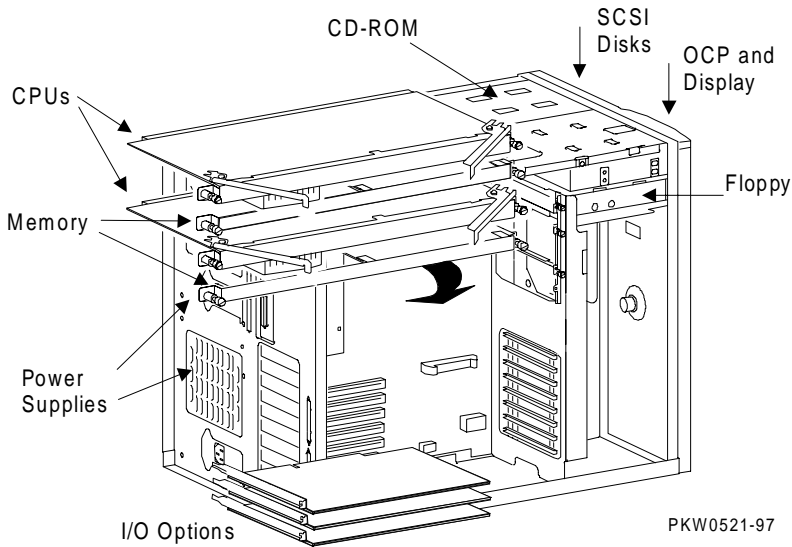
When the system interlocks are disabled and the system is still powered on, voltages are low in the system, but current is high. Observe the following guidelines to prevent personal injury.

1. Remove any jewelry that may conduct electricity before working on the system.
  2. If you need to access the system card cage, power down the system and wait 2 minutes to allow components in that area to cool.
-

## FRU List

Figure 5-1 shows the locations of FRUs, and Table 5-1 lists the part numbers of all field-replaceable units.

**Figure 5-1 System FRU Locations**



**Table 5-1 Field-Replaceable Unit Part Numbers**

<b>CPU Modules</b>	
B3107-AA	400 MHz CPU 4 Mbyte cache
B3107-CA	533 MHz CPU, 4 Mbyte cache
<b>Memory Modules</b>	
54-25084-DA	32 Mbyte DIMM (synchronous)
20-47405-D3	
54-25092-DA	128 Mbyte DIMM (synchronous)
20-45619-D3	
54-25149-01	Memory riser card

*continued on next page*

**Table 5-1 Field-Replaceable Unit Part Numbers (continued)**

<b>System Backplane, Display, and Support Hardware</b>	
54-25147-02	System motherboard
RX23L-AB	Floppy
RRD46-AB or 30-48116-02	CD-ROM
54-23302-02	OCP assembly
70-31349-01	Speaker assembly
Fans	
70-31351-01	Cooling fan 120x120
70-31350-01	Cooling fan 92x92
12-24701-34	CPU fan
<b>Power System Components</b>	
30-43120-02	Power supply
<b>SCSI Hardware</b>	
54-23365-01	SCSI backplane
30-48985-01	Ultra SCSI bus extender
<b>Power Cords</b>	
BN35B-02	North America, Japan 12V, 75-inches long
BN35S-02	Australia, New Zealand, 2.5m long
BN35R-02	Central Europe, 2.5m long
BN35J-02	UK, Ireland, 2.5m long
BN35K-02	Switzerland 2.5m long
BN35P-02	Denmark, 2.5m long
BN35M-02	Italy, 2.5m long
BN35L-02	Egypt, India, South Africa, 2.5m long
BN35N-02	Israel, 2.5m long

*continued on next page*

## Removal and Replacement

**Table 5-1 Field-Replaceable Unit Part Numbers (continued)**

<b>Ultra SCSI Cables and Jumpers</b>		<b>From</b>	<b>To</b>
17-31346-01	68 pin con cable	SCSI controller	Ultra SCSI bus extender
17-04022-03	68 pin con cable	Ultra SCSI bus extender	SCSI backpln signal con
17-04021-01	68 pin con jumpr	SCSI backpln	SCSI backpln
17-04019-02	68 pin con cable	External prt on SCSI backpln	Terminator
12-41768-03	68 pin terminator		End or 17-04019-02
<b>System Cables and Jumpers</b>		<b>From</b>	<b>To</b>
17-01495-01	Current share cable	Current share conn on PS0	Current share conn on PS1
17-03970-02	Floppy signal cable (34 pin)	Floppy conn on mbrd	Floppy
17-03971-01	OCP signal	OCP conn on mbrd	OCP signal
	Twisted pair (yellow and green)	J2 RCM conn on mbrd	Power conn on OCP
	Twisted pair (red and black)	OCP	Interlock switch pigtail
70-31348-01	Interlock switch and pigtail cable	Interlock switch assy	Twisted pair (red and black) OCP DC enable pwr cable from OCP conn
17-04685-01	SCSI CD-ROM sig cable	CD-ROM conn on motherbrd	CD-ROM sig conn
70-37346-01	Power harness	Power supply(s)	3 conns. On system motherbrd. CD-ROM/floppy drv pwr

*continued on next page*

**Table 5-1 Field-Replaceable Unit Part Numbers (continued)**

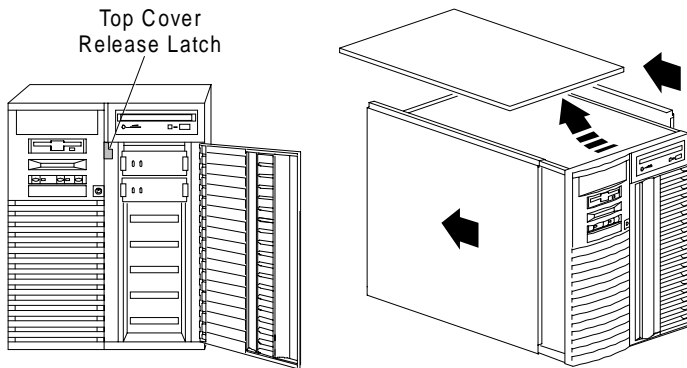
<b>System Cables and Jumpers</b>		<b>From</b>	<b>To</b>
			Optional drive above floppy
			Single ultra SCSI config StorageWorks backpln and pwr cable to Ultra SCSI bus extender
			Dual Ultra SCSI config two pwr cables to two SCSI bus extenders
17-04700-01	Power cable to Ultra SCSI bus extndr(s) Y cable(s)	Ultra SCSI bus extndr(s) pwr and StrWrks backpln	Power harness

## Removal and Replacement

### System Exposure

The system has three sheet metal covers, one on top and one on each side. The covers are removed to expose the system card cage and the power/SCSI sections.

**Figure 5-2 Exposing the System**



IP00206

## Exposing the System

---

### Caution

---

Be sure the system On/Off button is in the “off” position before removing system covers.

---

1. Shutdown the operating system.
2. Press the On/Off button to turn the system off.
3. Unlock and open the door that exposes the storage shelf.
4. Pull down the top cover latch shown in Figure 5-2 until it latches in the down position.
5. Grasp the finger groove at the rear of the top cover and pull it straight back about 2 inches and then lift it off the cabinet.
6. Pull a side panel back a few inches, tilt the top away from the machine, and lift it off. (Repeat for the other side)

## Dressing the System

Reverse the steps in the exposure process.



## CPU Removal and Replacement

---

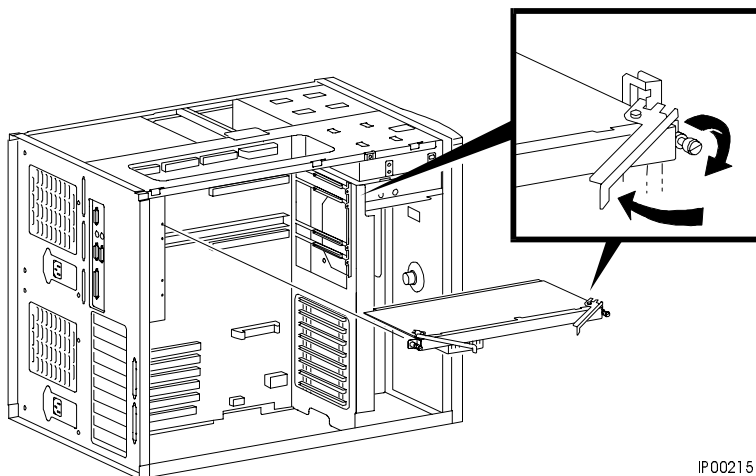
### CAUTION

---

Several different CPU modules work in these systems. Unless you are upgrading the system be sure you are replacing the CPU you are removing with the same variant of CPU.

---

**Figure 5-3 Removing CPU Module**



IP00215

---

### WARNING

---

CPU modules and memory modules have parts that operate at high temperatures. Wait 2 minutes after power is removed before touching any module.

---

### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. Remove the memory riser card next to the CPU you are removing (see “Memory Riser Card Removal and Replacement” later in this chapter).
4. Loosen the two captive screws holding the module to the card cage.
5. The CPU is held in place with levers at both ends; simultaneously pull the levers away from the module handle and pull the CPU from the cage.

### Replacement

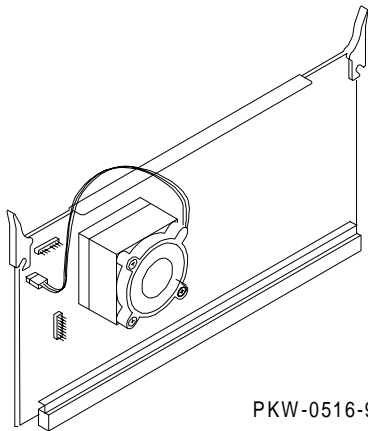
1. Reverse the steps in the Removal procedure.

### Verification

1. Start AlphaBIOS Setup, select Display System Configuration, and press Enter.
2. Using the arrow keys, select MC Bus Configuration to display the status of the new module.

## CPU Fan Removal and Replacement

**Figure 5-4** Removing CPU Fan



PKW-0516-97

### **Removal**

1. Follow the CPU Removal and Replacement procedure.
2. Unplug the fan from the module.
3. Remove the four Phillips head screws holding the fan to the Alpha chip's heatsink.

### **Replacement**

Reverse the above procedure.

### **Verification**

If the system powers up, the CPU fan is working.

## Memory Riser Card Removal and Replacement

---

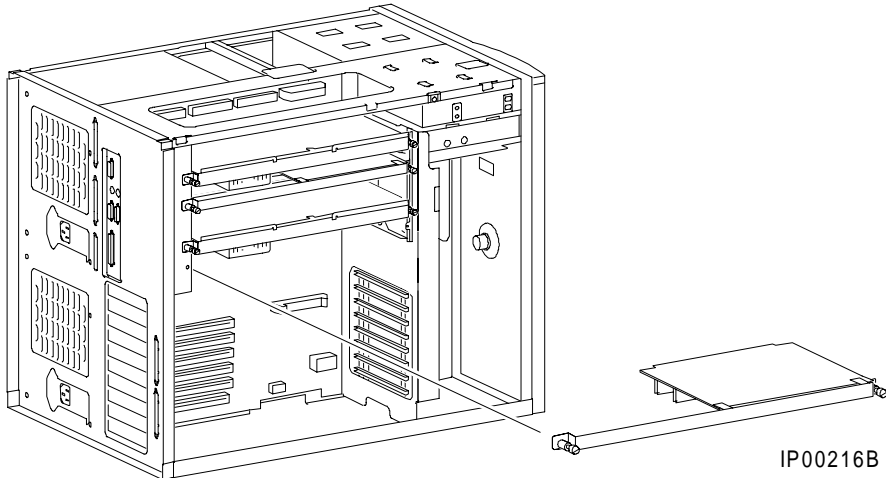
**CAUTION**

---

Several different memory DIMMs work in these systems. Be sure you are replacing the broken DIMM with the same variant.

---

**Figure 5-5 Removing Memory Riser Card**



---

**WARNING**

---

CPU modules and memory riser cards have parts that operate at high temperatures. Wait 2 minutes after power is removed before touching any module.

---

### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. There are two riser cards, one High and one Low. After you have determined which should be removed, loosen the two captive screws that secure the riser card to the card cage.
4. Lift the riser card from the card cage.

### Replacement

Reverse the steps in the Removal procedure.

---

#### NOTE

---

Memory DIMMs are installed in pairs and it is important that the pairs are the same size. When you replace a bad DIMM, be sure to replace it with the same size DIMM as the one you removed.

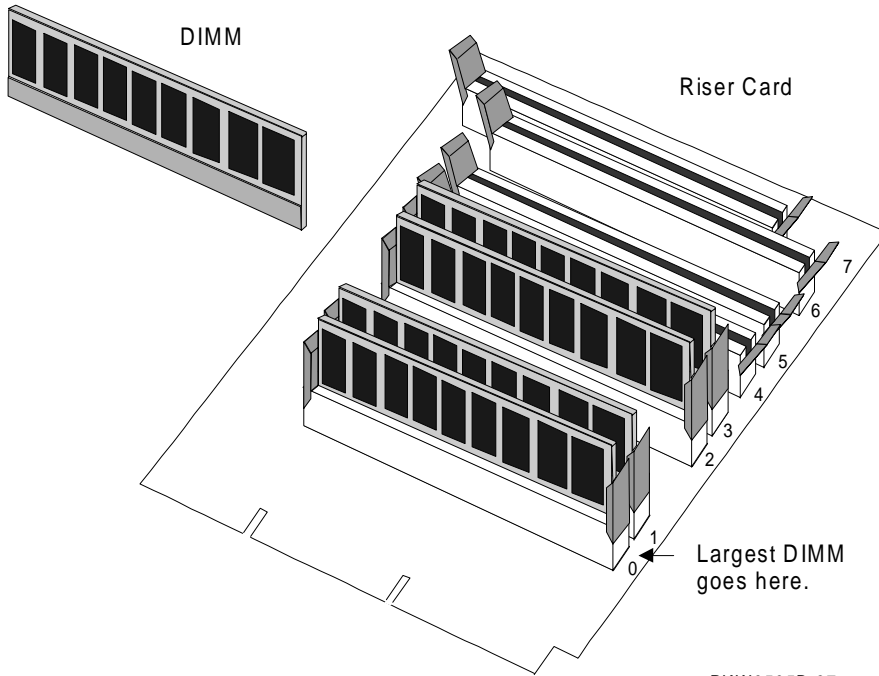
---

### Verification

1. Start AlphaBIOS Setup, select Display System Configuration, and press Enter.
2. Using the arrow keys, select Memory Configuration to display the status of the new memory.
3. Switch to the SRM console (press and hold the Halt button in; press the Reset button and continue holding the Halt button until the SRM prompt is displayed). Verify the functioning of the new memory by issuing the command **test mem*n***, where *n* is 0, 1, 2, 3, or \*.

## DIMM Removal and Replacement

Figure 5-6 Removing a DIMM from a Memory Riser Card



### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. Remove the memory riser card that has the broken memory DIMM (see “Memory Card Riser Removal and Replacement” in this chapter).
4. There are prying/retaining levers on the connectors in each slot on the riser card. Press both levers in an arc away from the DIMM and gently pull the DIMM from the connector.

### Replacement

Reverse the steps in the Removal procedure.

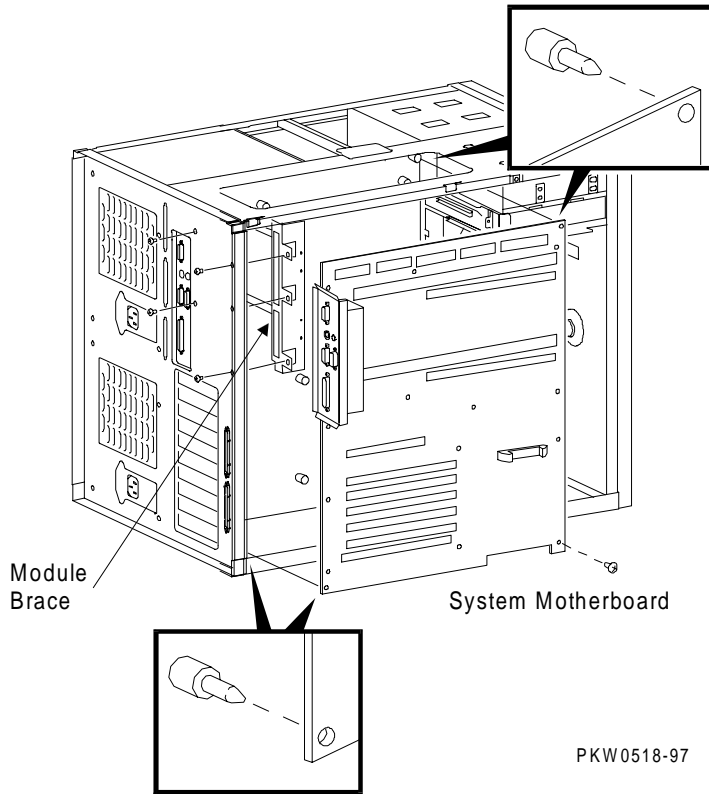
### Verification

Follow the verification procedure recommended for the memory riser card, “Memory Card Riser Removal and Replacement” in this chapter.



# System Motherboard Removal and Replacement

Figure 5-7 Removing System Motherboard



PKW0518-97

### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. Remove both memory riser cards.
4. Remove all CPUs.
5. Remove all PCI and EISA options.
6. From the back of the cabinet, using a Phillips head screwdriver, unscrew the four screws holding the CPU and memory riser card brace from the system frame. Remove the brace.
7. Unplug all cables connected to the motherboard and clear access to all screws holding the motherboard in place.
8. Using a Phillips head screwdriver unscrew the eleven screws holding the motherboard in place and remove it from the system. Note the two guide studs, one in the upper right corner and the other in the lower left corner, that protrude through holes in the motherboard.

### Replacement

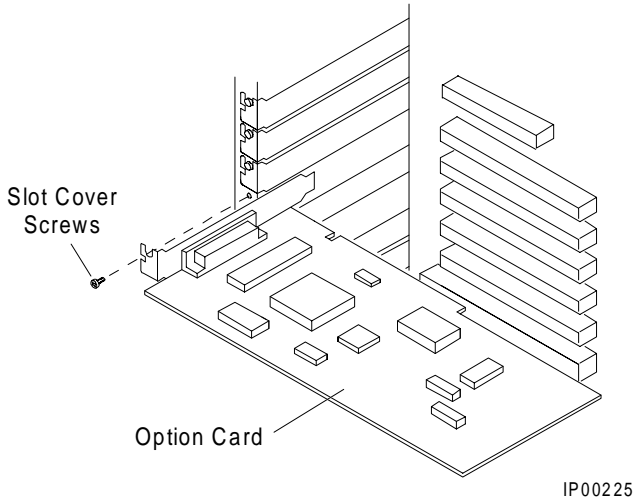
Reverse the steps in the Removal procedure.

### Verification

Power up the system (press and hold the Halt button in; press the Reset button and continue holding the Halt button until the SRM prompt is displayed). Issue the **show device** command at the console prompt to verify that the system sees all system options and peripherals.

## PCI/EISA Option Removal and Replacement

Figure 5-8 Removing PCI/EISA Option



---

### WARNING

---

To prevent fire, use only modules with current limited outputs. See National Electrical Code NFPA 70 or Safety of Information Technology Equipment, Including Electrical Business Equipment EN 60 950.

---

### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. To remove the faulty option: Disconnect cables connected to the option. Remove cables to other options that obstruct the option you are removing. Unscrew the small Phillips head screw securing the option to the card cage. Slide it from the system.

### Replacement

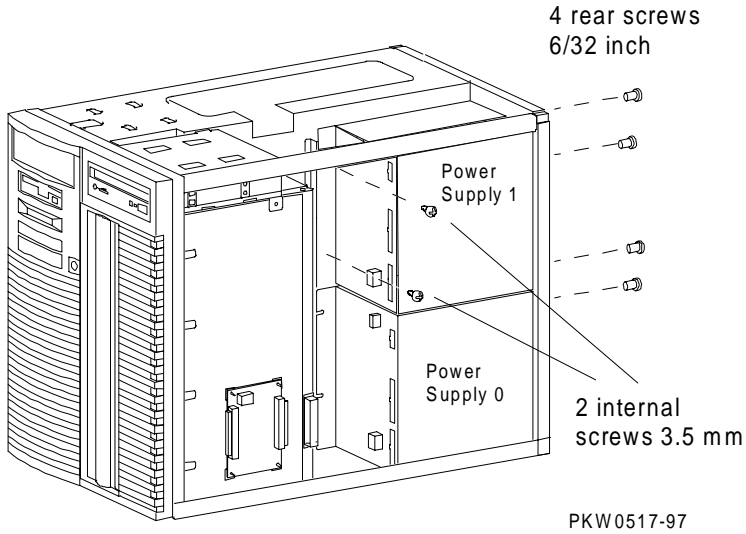
Reverse the steps in the Removal procedure.

### Verification

1. Start AlphaBIOS Setup, select Display System Configuration, and press Enter.
2. Using the arrow keys, select PCI Configuration or EISA Configuration to determine that the new option is listed.

# Power Supply Removal and Replacement

Figure 5-9 Removing Power Supply



### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. Unplug the power supply you are replacing.
4. Remove the four screws at the back of the system cabinet and the two screws at the back of the power supply that hold the power supply in place.
5. If you are removing power supply 0, slide the supply out the side of the cabinet. If you are removing power supply 1, lift the supply out the top of the cabinet.

### Replacement

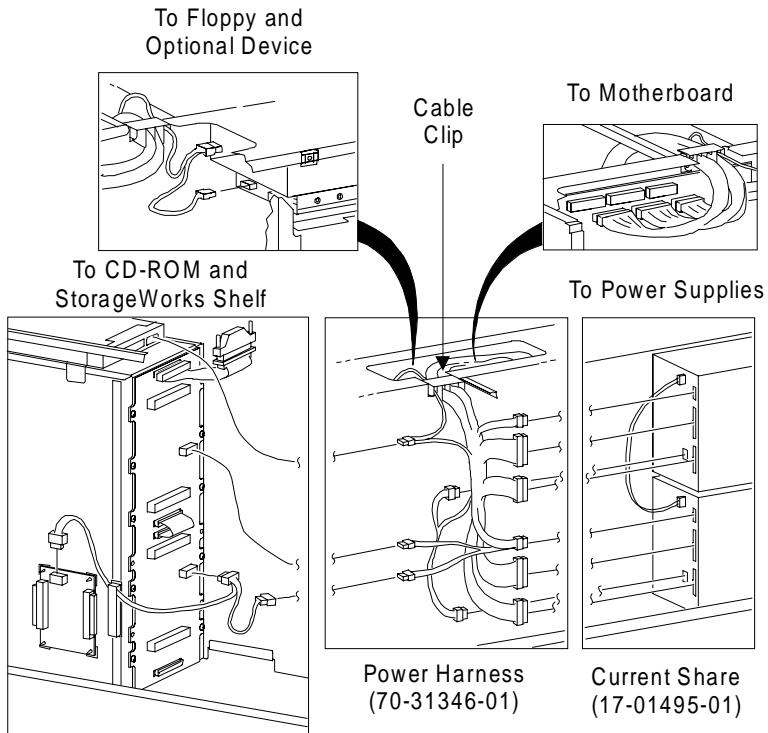
Reverse the steps in the Removal procedure.

### Verification

Power up the system.

# Power Harness Removal and Replacement

**Figure 5-10 Removing Power Harness**



PKW0522-97

### Removal

1. Shut down the operating system and power down the system.
2. Remove the AC power cords.
3. Expose both the card cage section and the power section of the system (see “System Exposure” earlier in this chapter).
4. Remove the cable clip between the two sections of the system.
5. Unplug the three cable connections to the motherboard and bend the cable back over the power section of the system.
6. Unplug the cable connection to the floppy and, if applicable, to the optional device above the floppy. Bend the cable back over the power section of the system.
7. Unplug the cable connection to the CD-ROM.
8. Unplug the cable connection to the StorageWorks backplane.
9. Remove the power harness from the system.

### Replacement

Reverse the steps in the Removal procedure.

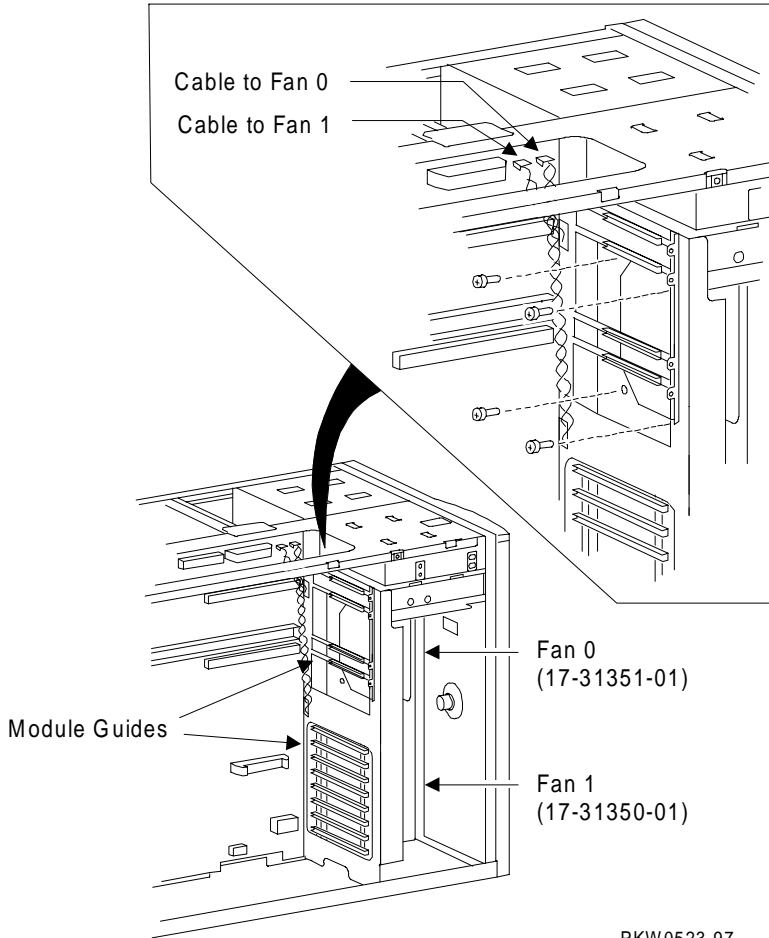
### Verification

Power up the system.



# System Fan Removal and Replacement

Figure 5-11 Removing System Fan



PKW0523-97

### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).

#### Removing Fan 0

3. Remove the CPU module(s).
4. Remove memory.
5. Trace the wire from the fan to the motherboard to determine which power cord to unplug. Unplug the power cord to fan 0 and pass it through the sheet metal to the fan compartment.
6. Remove the plastic module guides that interfere with access to the four Phillips head screws holding the fan in place.
7. Unscrew the fan from the frame and remove it from the system.

#### Removing Fan 1

3. Remove any PCI modules that prevent access to the four Phillips head screws that hold fan 1 in place.
4. Remove any plastic module guides that prevent access to the Phillips head screws that hold fan 1 in place.
5. Trace the wire from the fan to the motherboard to determine which power cord to unplug. Unplug the power cord to fan 1 and pass it through the sheet metal to the fan compartment.
6. Unscrew the fan from the frame and remove it from the system.

### Replacement

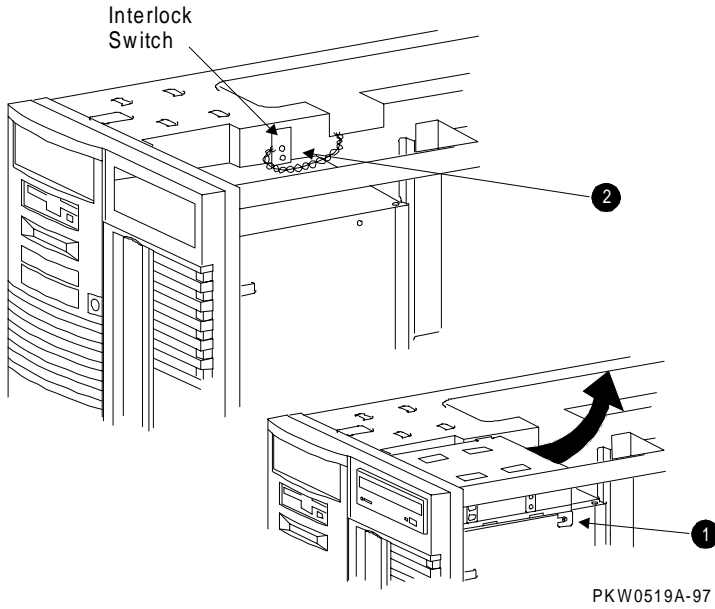
Reverse the steps in the Removal procedure.

### Verification

Power up the system. If the fan you installed is faulty, the system will not power up.

## Cover Interlock Removal and Replacement

Figure 5-12 Removing Cover Interlock



### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. Loosen the screw that holds the CD-ROM bracket to the system (❶ in Figure 5-12).
4. Detach both the power and the signal connectors at the rear of the CD-ROM.
5. Pull the CD-ROM and the bracket a short distance toward the rear of the system and lift them out of the cabinet.
6. Unplug the interlock switch’s pigtail cable from the cable it is connected to.
7. Remove the two screws holding the interlock in place and remove the interlock (❷).

### Replacement

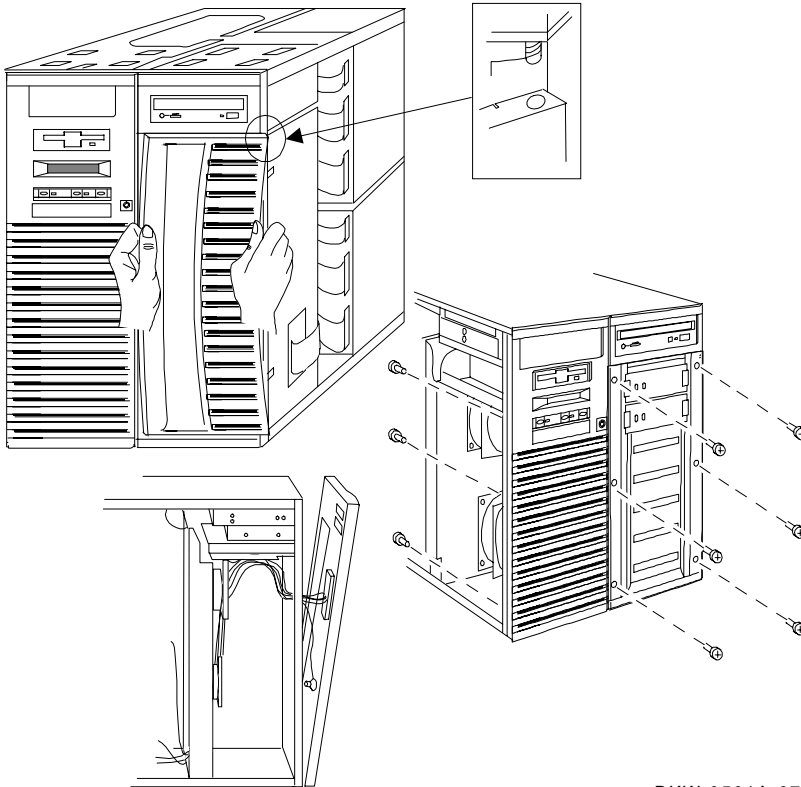
Reverse the steps in the Removal procedure.

### Verification

Power up the system. If the switch is faulty, the system will not power up.

# Operator Control Panel Removal and Replacement

Figure 5-13 Removing the OCP



PKW-0501A-97

### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. To remove the StorageWorks door:
  - a. Open the door slightly and grab the left edge of the door with your left hand and the right edge of the door with your right hand.
  - b. While pushing the door up, bend it by pulling it away from the system. The door compresses enough so its bottom post slips out of its retaining hole.
  - c. Once the bottom of the door is free, gently pull the top down to release it from the post on the door jam and release it from the spring.
  - d. Put the door aside.
4. Using a Phillips head screwdriver, remove the nine screws holding the molded plastic front panel to the system. (Six screws are accessed from the front of the system and three through the fan compartment of the system.)
5. Tilt the front panel away from the system and disconnect all the cables from the OCP.
6. Once the front panel is removed, unscrew the four screws holding the OCP to the front panel.

### Replacement

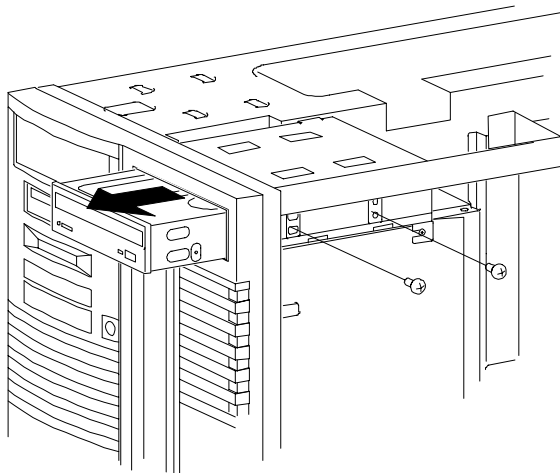
Reverse the steps in the Removal procedure.

### Verification

Power up the system. If the OCP you installed is faulty, the system will not power up.

## CD-ROM Removal and Replacement

Figure 5-14 Removing CD-ROM



PKW0519-97

### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. Loosen the two screws holding the CD-ROM to its bracket (see Figure 5-14).
4. Detach both the power and signal connectors at the rear of the CD-ROM.
5. Pull the CD-ROM forward out of the system.

### Replacement

Reverse the steps in the Removal procedure.

### Verification

Power up the system. Use the following SRM console commands to test the floppy:

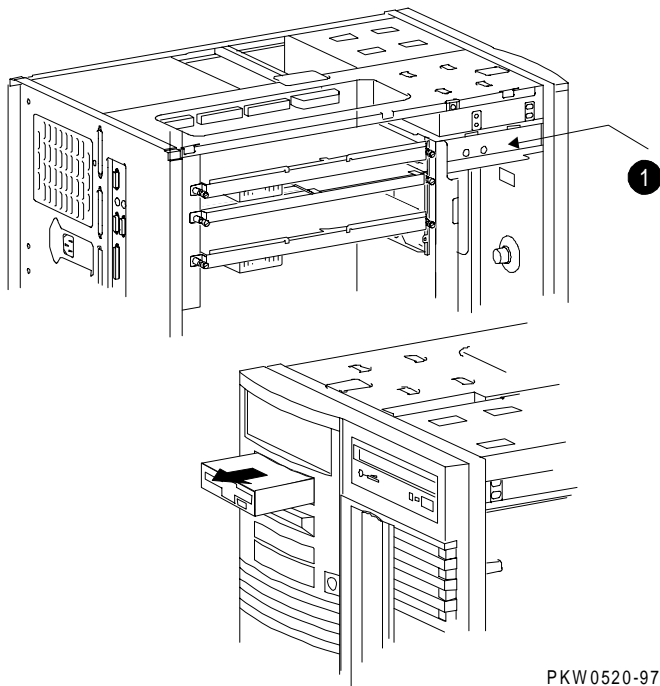
```
P00>>> show dev ncr0  
P00>>> HD buf/dka nnn
```

where *nnn* is the device number; for example, dka500.



## Floppy Removal and Replacement

Figure 5-15 Removing Floppy



PKW0520-97

### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. Remove the two Phillips head screws holding the floppy in the system (❶ in Figure 5-15).
4. Slide the floppy out the front of the system.

### Replacement

Reverse the steps in the Removal procedure.

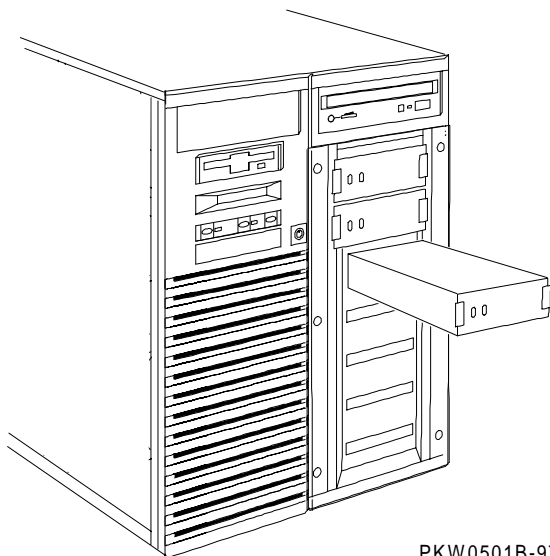
### Verification

Power up the system (press the Halt button if necessary to bring up the SRM console). Use the following SRM console commands to test the CD-ROM:

```
P00>>> show dev floppy
P00>>> HD buf/dva0
```

## SCSI Disk Removal and Replacement

Figure 5-16 Removing StorageWorks Disk



PKW0501B-97

### **Removal**

1. Shut down the operating system and power down the system.
2. Open the front door exposing the StorageWorks disks.
3. Pinch the clips on both sides of the disk and slide it out of the shelf.

### **Replacement**

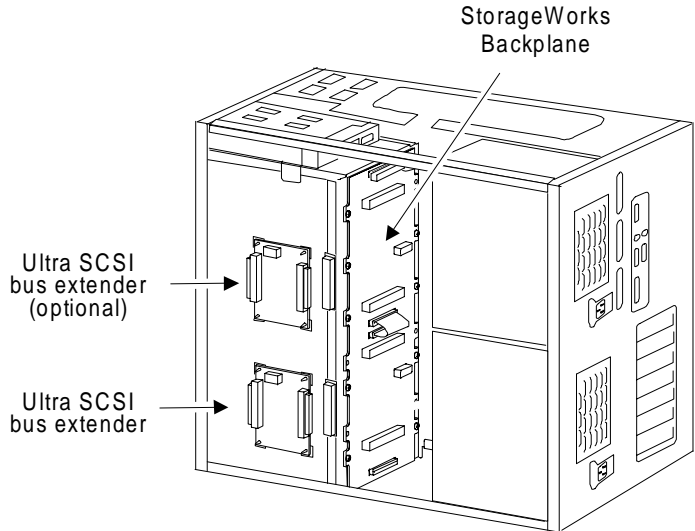
Reverse the steps in the Removal procedure.

### **Verification**

Power up the system. Use the show device console commands to verify that the system sees the disk you replaced.

## StorageWorks Backplane Removal and Replacement

Figure 5-17 Removing StorageWorks Backplane



PKW0522B-97

### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system (see “System Exposure” earlier in this chapter).
3. Remove the power and signal cables from the Ultra SCSI bus extender on the side of the StorageWorks shelf.
4. Remove the power harness and all signal cables from the StorageWorks backplane.
5. Using a short Phillips head screwdriver, remove the screws holding the backplane to the back of the shelf and remove from the system.

### Replacement

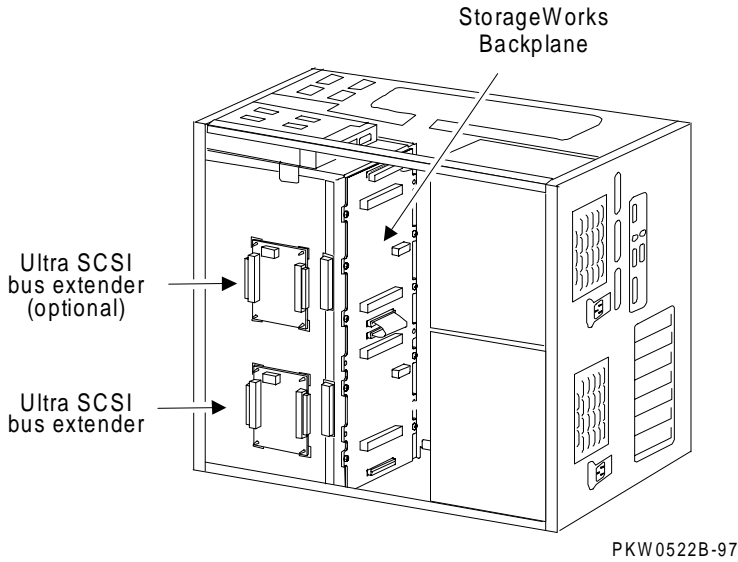
Reverse the steps in the Removal procedure.

### Verification

Power up the system. Use the show device console command to verify that the StorageWorks shelf is configured into the system.

# StorageWorks Ultra SCSI Bus Extender Removal and Replacement

Figure 5-18 Removing StorageWorks Ultra SCSI Bus Extender



### Removal

1. Shut down the operating system and power down the system.
2. Expose the card cage side of the system. See “System Exposure” earlier in this chapter.
3. Remove the power and signal cables from the Ultra SCSI bus extender on the side of the StorageWorks shelf.
4. On early systems the Ultra SCSI bus extender is stuck to the side of the StorageWorks enclosure with adhesive standoffs; in later systems it is mounted on plastic standoffs to which it snaps. If the system has the adhesive, simply pry each corner of the extender free and remove it. If the system has plastic mounts, pinch each with a pair of pliers, free the corner, and pull the bus extender from the enclosure.

### Replacement

Reverse the steps in the Removal procedure.

### Verification

Power up the system. Use the show device console command to verify that the StorageWorks shelf is configured into the system.



# 6

---

## Running Utilities

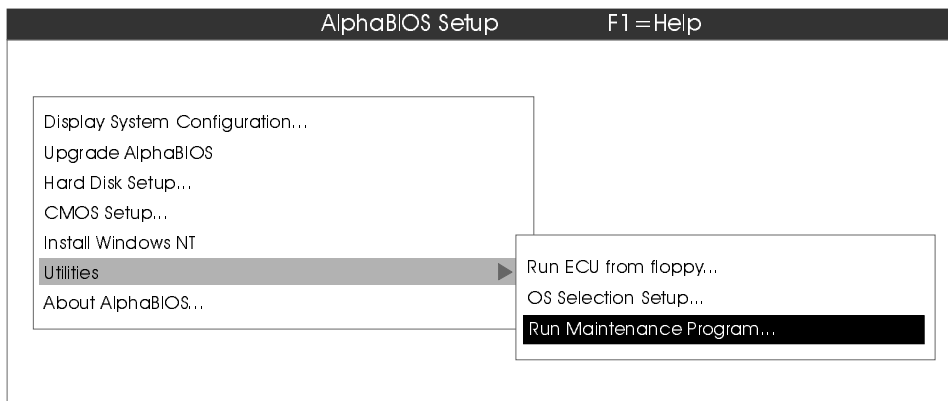
This chapter provides a brief overview of how to load and run utilities. The following topics are covered:

- Running Utilities from a Graphics Monitor
- Running Utilities from a Serial Terminal
- Running ECU
- Running RAID Standalone Configuration Utility
- Updating Firmware with LFU
- Updating Firmware from AlphaBIOS
- Upgrading AlphaBIOS

## Running Utilities from a Graphics Monitor

Start AlphaBIOS and select Utilities from the menu. The next selection depends on the utility to be run. For example, to run ECU, select Run ECU from floppy. To run RCU, select Run Maintenance Program.

**Figure 6-1** Running a Utility from a Graphics Monitor



PK-0729-96

## Running Utilities from a Serial Terminal

Utilities are run from a serial terminal in the same way as from a graphics monitor. The menus are the same, but some keys are different.

**Table 6-1 AlphaBIOS Option Key Mapping**

<b>AlphaBIOS Key</b>	<b>VTxxx Key</b>
F1	Ctrl/A
F2	Ctrl/B
F3	Ctrl/C
F4	Ctrl/D
F5	Ctrl/E
F6	Ctrl/F
F7	Ctrl/P
F8	Ctrl/R
F9	Ctrl/T
F10	Ctrl/U
Insert	Ctrl/V
Delete	Ctrl/W
Backspace	Ctrl/H
Escape	Ctrl/[

### Running ECU

The EISA Configuration Utility (ECU) is used to configure EISA options on these systems. The ECU can be run either from a graphics monitor or a serial terminal.

1. Start AlphaBIOS Setup. If the system is in the SRM console, issue the command `alphabios`. (If the system has a graphics monitor, you can set the SRM console environment variable to graphics.)
2. From AlphaBIOS Setup, select Utilities, then select Run ECU from floppy... from the submenu that displays, and press Enter.

---

#### NOTE

---

The EISA Configuration Utility is supplied on diskettes shipped with the system.

---

3. Insert the correct ECU diskette for the operating system and press Enter to run it.

The ECU main menu displays the following options:

```
EISA Configuration Utility
Steps in configuring your computer

STEP 1:  Important EISA configuration information
STEP 2:  Add or remove boards
STEP 3:  View or edit details
STEP 4:  Examine required details
STEP 5:  Save and exit
```

---

#### NOTE

---

Step 1 of the ECU provides online help. It is recommended that you select this step and become familiar with the utility before proceeding.

---

## Running RAID Standalone Configuration Utility

The RAID Standalone Configuration Utility is used to set up RAID disk drives and logical units. The Standalone Utility is run from the AlphaBIOS Utility menu.

These systems support the KZPSC-xx PCI RAID controller (SWXCR). The KZPSC-xx kit includes the controller, RAID Array 230 Subsystems software, and documentation.

1. Start AlphaBIOS Setup. If the system is in the SRM console, issue the command `alphabios`. (If the system has a graphics monitor, you can set the SRM console environment variable to graphics.)
2. At the Utilities screen, select Run Maintenance Program. Press Enter.
3. In the Run Maintenance Program dialog box, type `swxcrmgr` in the Program Name: field.
4. Press Enter to execute the program. The Main menu displays the following options:

```
[01.View/Update Configuration]
02.Automatic Configuration
03.New Configuration
04.Initialize Logical Drive
05.Parity Check
06.Rebuild
07.Tools
08.Select SWXCR
09.Controller Setup
10.Diagnostics
```

Refer to the RAID Array Subsystems documentation for information on using the Standalone Configuration Utility to set up RAID drives.

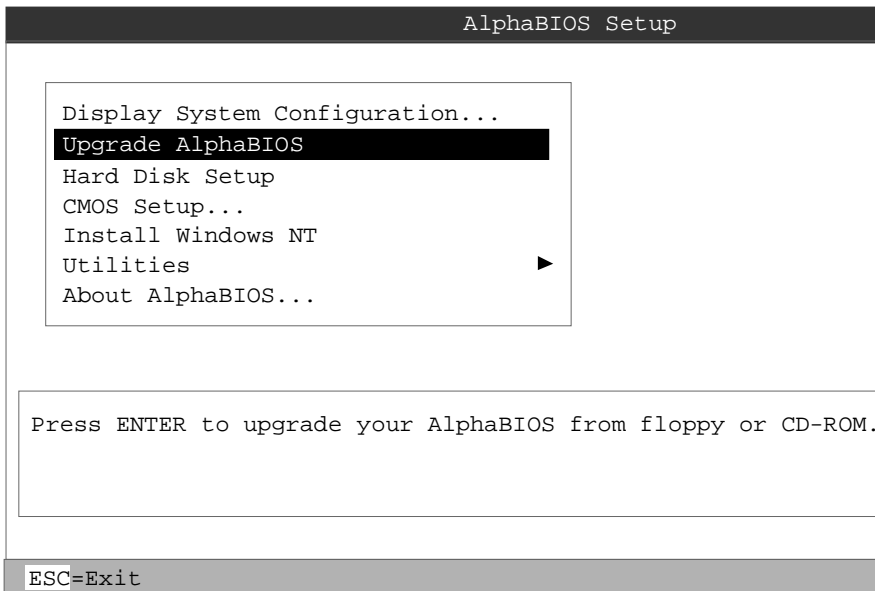
## Updating Firmware with LFU

Start the Loadable Firmware Update (LFU) utility by issuing the lfu command at the SRM console prompt or by selecting Update AlphaBIOS in the AlphaBIOS Setup screen. LFU is part of the SRM console.

### Example 6-1 Starting LFU from the SRM Console

```
P00>>> lfu  
  
***** Loadable Firmware Update Utility *****  
  
Select firmware load device (cda0, dva0, ewa0), or  
Press <return> to bypass loading and proceed to LFU: cda0  
  
.   
UPD>
```

Figure 6-2 Starting LFU from the AlphaBIOS Console



PK-0726A-96

Use the Loadable Firmware Update (LFU) utility to update system firmware.

You can start LFU from either the SRM console or the AlphaBIOS console.

- From the SRM console, start LFU by issuing the `lfu` command.
- From the AlphaBIOS console, select Upgrade AlphaBIOS from the AlphaBIOS Setup screen (see Figure 6-2).

A typical update procedure is:

1. Start LFU.
2. Use the LFU `list` command to show the revisions of modules that LFU can update and the revisions of update firmware.
3. Use the LFU `update` command to write the new firmware.
4. Use the LFU `exit` command to exit back to the console.

The sections that follow show examples of updating firmware from the local CD-ROM, the local floppy, and a network device. Following the examples is an LFU command reference.

### Example 6-2 Booting LFU from the CD-ROM

```
P00>>> show dev ncr0
polling ncr0 (NCR 53C810) slot 1, bus 0 PCI, hose 1   SCSI Bus ID 7
dka500.5.0.1.1      DKa500                          RRD46  1645
P00>>> boot dka500
(boot dka500.5.0.1.1 -flags 0,0)
block 0 of dka500.5.0.1.1 is a valid boot block
.
.
.
jumping to bootstrap code
```

The default bootfile for this platform is

```
[AS1200]AS1200_LFU.EXE
```

Hit <RETURN> at the prompt to use the default bootfile.

## Updating Firmware from the CD-ROM

Insert the update CD-ROM, start LFU, and select cda0 as the load device

### Example 6-3 Updating Firmware from the CD-ROM

```
***** Loadable Firmware Update Utility *****

Select firmware load device (cda0, dva0, ewa0), or
Press <return> to bypass loading and proceed to LFU: cda0 ❶
Please enter the name of the options firmware files list, or press
<rtrn> to use the default filename [AS1200FW]: AS1200CP ❷
Copying [as1200]TCREADME from DKA500.5.0.1.1 .....
Copying [as1200]TCSRMRROM from DKA500.5.0.1.1
.....
Copying [as1200]TCARCROM from DKA500.5.0.1.1 .....

-----
Function  Description  ❸
-----
Display   Displays the system's configuration table.
Exit Done exit LFU (reset).
List Lists the device, revision, firmware name, and update
      revision.
Lfu Restarts LFU.
Readme Lists important release information.
Update Replaces current firmware with loadable data image.
Verify Compares loadable and hardware images.
? or Help Scrolls this function table.

-----
UPD> list  ❹
Device      Current Revision  Filename  Update
Revision
AlphaBIOS   V5.32-0          arcrom    V6.40-1
srmflash    V5.0-1           srmrom    6.0-3
***** Loadable Firmware Update Utility *****
```

*Continued on next page*



- ❶ Select the device from which firmware will be loaded. The choices are the internal CD-ROM, or a network device. In this example, the internal CD-ROM is selected.
- ❷ Select the file that has the firmware update, or press Enter to select the default file. The file options are:  
AS1200FW (default) SRM console, AlphaBIOS console, and I/O adapter firmware  
AS1200CP SRM console and AlphaBIOS console firmware only  
AS1200IO I/O adapter firmware only  
In this example the file for console firmware (AlphaBIOS and SRM) is selected.
- ❸ The LFU function table and prompt (UPD>) display.
- ❹ Use the LFU listcommand to determine the revision of firmware in a device and the most recent revision of that firmware available in the selected file. In this example, the resident firmware for each console (SRM and AlphaBIOS) is at an earlier revision than the firmware in the update file.

*Continued on next page*

## Running Utilities

### Example 6–3 Updating Firmware from the CD-ROM (Continued)

```
UPD> update * ⑤  
WARNING: updates may take several minutes to complete for each device.  
  
Confirm update on: AlphaBIOS      [Y/(N)] y ⑥  
  
DO NOT ABORT!  
AlphaBIOS      Updating to V6.40-1... Verifying V6.40-1... PASSED.  
  
Confirm update on: srmflash       [Y/(N)] y  
  
DO NOT ABORT!  
srmflash       Updating to V6.0-3... Verifying V6.0-3... PASSED.  
  
UPD> exit ⑦
```

- ⑤ The update command updates the device specified or all devices. In this example, the wildcard indicates that all devices supported by the selected update file will be updated.
- ⑥ For each device, you are asked to confirm that you want to update the firmware. The default is no. Once the update begins, do not abort the operation. Doing so will corrupt the firmware on the module.
- ⑦ The exit command returns you to the console from which you entered LFU (either SRM or AlphaBIOS).

## Running Utilities

### Updating Firmware from a Network Device

Copy files to the local MOP server's MOP load area, start LFU, and select ewa0 as the load device.

#### Example 6-4 Updating Firmware from a Network Device

```
***** Loadable Firmware Update Utility *****

Select firmware load device (cda0, dva0, ewa0), or
Press <return> to bypass loading and proceed to LFU: ewa0 ❶

Please enter the name of the options firmware files list, or
Press <return> to use the default filename [AS1200FW]: ❷

Copying AS1200FW from EWA0 .
Copying TCREADME from EWA0 .
Copying TCSRMR0M from EWA0 .....
Copying TCARCROM from EWA0 .....
Copying CIPCA315 from EWA0 .
Copying DFPAA310 from EWA0 ...
Copying KZPSAA11 from EWA0 ...

.
. [The function table displays, followed by the UPD> prompt, as
shown in Example A-3.]
.
UPD> list ❸
```

Device	Current Revision	Filename	Update Revision
AlphaBIOS	V5.12-2	arcrom	V6.40-1
kzpsa0	A10	kzpsa_fw	A11
kzpsal	A10	kzpsa_fw	A11
srmflash	V1.0-9	srmrom	V6.0-3
		cipca_fw	A315
		dfpaa_fw	2.46

*Continued on next page*

Before starting LFU, download the update files from the Internet (see Preface). You will need the files with the extension .SYS. Copy these files to your local MOP server's MOP load area.

- ❶ Select the device from which firmware will be loaded. The choices are the internal CD-ROM, the internal floppy disk, or a network device. In this example, a network device is selected.
- ❷ Select the file that has the firmware update, or press Enter to select the default file. The file options are:

AS1200FW (default)	SRM console, AlphaBIOS console, and I/O adapter firmware
AS1200CP	SRM console and AlphaBIOS console firmware only
AS1200IO	I/O adapter firmware only

In this example the default file, which has both console firmware (AlphaBIOS and SRM) and I/O adapter firmware, is selected.

- ❸ Use the LFU list (LFU)command to determine the revision of firmware in a device and the most recent revision of that firmware available in the selected file. In this example, the resident firmware for each console (SRM and AlphaBIOS) and I/O adapter is at an earlier revision than the firmware in the update file.

*Continued on next page*

## Running Utilities

### Example 6-4 Updating Firmware from a Network Device• (Continued)

```
UPD> update * -all ④  
WARNING: updates may take several minutes to complete for each  
device.  
  
DO NOT ABORT!  
AlphaBIOS Updating to V6.40-1... Verifying V6.40-1... PASSED.  
  
DO NOT ABORT!  
kzpsa0 Updating to All ... Verifying All... PASSED.  
  
DO NOT ABORT!  
kzpsal Updating to All ... Verifying All... PASSED.  
  
DO NOT ABORT!  
srmflash Updating to V6.0-3... Verifying V6.0-3... PASSED.  
  
UPD> exit ⑤
```

- ④ The `update (LFU)` command updates the device specified or all devices. In this example, the wildcard indicates that all devices supported by the selected update file will be updated. Typically, LFU requests confirmation before updating each console's or device's firmware. The `-all` option removes the update confirmation requests.
- ⑤ The `exit` command returns you to the console from which you entered LFU (either SRM or AlphaBIOS).

### LFU Commands

The commands summarized in Table 6-2 are used to update system firmware.

**Table 6-2 LFU Command Summary**

<b>Command</b>	<b>Function</b>
<b>display</b>	Shows the system physical configuration.
<b>exit</b>	Terminates the LFU program.
<b>help (LFU)</b>	Displays the LFU command list.
<b>lfu</b>	Restarts the LFU program.
<b>list</b>	Displays the inventory of update firmware on the selected device.
<b>readme</b>	Lists release notes for the LFU program.
<b>update</b>	Writes new firmware to the module.
<b>verify</b>	Reads the firmware from the module into memory and compares it with the update firmware.

These commands are described in the following pages.



**display**

The **display** command shows the system physical configuration. **Display** is equivalent to issuing the SRM console command **show configuration**. Because it shows the slot for each module, **display** can help you identify the location of a device.

**exit**

The **exit** command terminates the LFU program, causes system initialization and testing, and returns the system to the console from which LFU was called.

**help**

The **help** (or **?**) command displays the LFU command list, shown below.

Function	Description
Display	Displays the system's configuration table.
Exit	Done exit LFU (reset).
List	Lists the device, revision, firmware name, and update revision.
Lfu	Restarts LFU.
Readme	Lists important release information.
Update	Replaces current firmware with loadable data image.
Verify	Compares loadable and hardware images.
? or Help	Scrolls this function table.

**lfu**

The **lfu** command restarts the LFU program. This command is used when the update files are on a floppy disk. The files for updating both console firmware and I/O firmware are too large to fit on a 1.44 MB disk, so only one type of firmware can be updated at a time. Restarting LFU enables you to specify another update file.

## Running Utilities

### **list**

The **list** command displays the inventory of update firmware on the CD-ROM, network, or floppy. Only the devices listed at your terminal are supported for firmware updates.

The **list** command shows three pieces of information for each device:

- Current Revision — The revision of the device's current firmware
- Filename — The name of the file used to update that firmware
- Update revision — The revision of the firmware update image

### **readme**

The **readme** command lists release notes for the LFU program.

### **update**

The **update** command writes new firmware to the module. Then LFU automatically verifies the update by reading the new firmware image from the module into memory and comparing it with the source image.

To update more than one device, you may use a wildcard but not a list. For example, **update k\*** updates all devices with names beginning with k, and **update \*** updates all devices. When you do not specify a device name, LFU tries to update all devices; it lists the selected devices to update and prompts before devices are updated. (The default is no.) The **-all** option removes the update confirmation requests, enabling the update to proceed without operator intervention.

---

### **CAUTION**

---

Never abort an **update** operation. Aborting corrupts the firmware on the module.

---

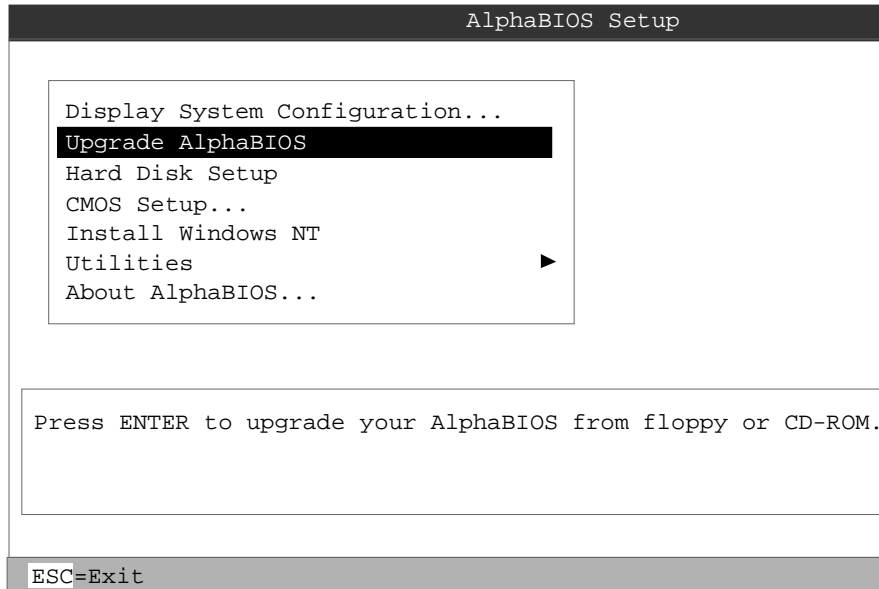
### **verify**

The verify command reads the firmware from the module into memory and compares it with the update firmware. If a module already verified successfully when you updated it, but later failed tests, you can use verify to tell whether the firmware has become corrupted.

## Updating Firmware from AlphaBIOS

Insert the CD-ROM or diskette with the updated firmware and select Upgrade AlphaBIOS from the main AlphaBIOS Setup screen. Use the Loadable Firmware Update (LFU) utility to perform the update. The LFU exit command causes a system reset.

**Figure 6-3 AlphaBIOS Setup Screen**



PK-0726A-96

### Upgrading AlphaBIOS

It may become necessary to upgrade AlphaBIOS to work with new versions of Windows NT or when enhancements are made.

Use this procedure to upgrade from an earlier version of AlphaBIOS:

1. Insert the diskette or CD-ROM containing the AlphaBIOS upgrade.
2. If you are not already running **AlphaBIOS Setup**, start it by restarting your system and pressing F2 when the **Boot** screen is displayed.
3. In the main **AlphaBIOS Setup** screen, select **Upgrade AlphaBIOS** and press Enter.
4. The system is reset and the Loadable Firmware Update (LFU) utility is started. See Chapter 6 for LFU commands.
5. When the upgrade is complete, issue the LFU **exit** command. The system is reset and you are returned to AlphaBIOS.
6. If you press the Reset button instead of issuing the LFU **exit** command, the system is reset and you are returned to LFU.

# 7

---

## Halts, Console Commands, and Environment Variables

This chapter discusses halting the system and provides a summary of the SRM console commands and environment variables. The **test** command is described in Chapter 3 of this document. For complete reference information on other SRM commands and environment variables, see your system *User's Guide*.

---

### NOTE

---

It is recommended that you keep a list of the environment variable settings for systems that you service, because you will need to restore certain environment variable settings after swapping modules. Refer to Table 7-4 for a convenient worksheet.

---

### Halt Button Functions

The Halt button causes the system to perform in various ways depending upon the system state at the time the button is pressed.

When the Halt button is pressed, results differ depending upon the state of the machine. Table 7-1 describes the full function of the Halt button.

**Table 7-1 Results of Pressing the Halt Button**

Machine State	Result
Windows NT running/hung	Nothing
AlphaBIOS running/hung	Nothing
SRM console running	Sets halt assertion flag: the SRM console continues to run
SROM (1st 2 secs. of pwr-up)	Nothing
XSROM power-up	Sets halt assertion flag, auto boot ignored
SRM console power-up	Sets halt assertion flag, auto boot ignored

A simple halt causes suspension of a system that is hung and starts the SRM console.

The halt assertion flag is set in the TOY NVRAM; it is read and cleared by the console only during power-up or reset.

### Using the Halt Button

Press the Halt button, followed by the Reset button, when you want to use the SRM console. Use the Halt and Reset buttons to force the system to bring up the SRM console rather than booting or halting in AlphaBIOS.

### Using Halt to Clear the Console Password

The SRM console firmware allows you to set a password to prevent unauthorized access to the console. If you forget the password, the Halt button, with the login command, lets you clear the password and regain control of the console. See Chapter 3 of your system *User's Guide*.

## Halt Assertion

A halt assertion allows you to disable automatic boots of the operating system so that you can perform tasks from the SRM console.

Under certain conditions, you might want to force a “halt assertion.” A halt assertion differs from a simple halt in that the SRM console “remembers” the halt. The next time you power up, the system ignores the SRM power-up script (nvram) and ignores any environment variables that you have set to cause an automatic boot of the operating system. The SRM console displays this message:

```
Halt assertion detected
NVRAM power-up script not executed
AUTO_ACTION=BOOT/RESTART and OS_TYPE=NT ignored, if applicable
```

Halt assertion is useful for disabling automatic boots of the operating system when you want to perform tasks from the SRM console. It is also useful for disabling the SRM power-up script if you have accidentally inserted a command in the script that will cause a system problem. These conditions are described in the sections “Disabling Autoboot” and “Disabling the SRM Power-Up Script.”

You can force a halt assertion using the Halt button, the RCM halt command, or the RCM **haltin** command. Observe the following guidelines for forcing a halt assertion.

### Halt Assertion with Halt Button or RCM Halt Command

Press the Halt button on the local system (or enter the RCM halt command from a remote system) while the system is powering up or the SRM console is running. The system halts at the SRM console, and the halt status is saved. The next time the system powers up, the saved halt status is checked.

---

#### NOTE

---

Wait 5 seconds after the system begins powering up before pressing the Halt button or remotely entering the RCM **halt** command.

---

### Halt Assertion with RCM Haltin Command

Enter the RCM **haltin** command at any time except during power-up. For example, enter **haltin** during an operating system session or when the AlphaBIOS console is running.

If you enter the RCM **haltin** command when Windows NT or AlphaBIOS is running, the interrupt is ignored. However, you can enter the RCM **haltin** command followed by the RCM **reset** command to force a halt assertion. Upon reset, the system powers up to the SRM console, but the SRM console does not load the AlphaBIOS console.

## Halts, Console Commands, and Environment Variables

### **Clearing a Halt Assertion**

Clear a halt assertion as follows:

If the halt assertion was caused by pressing the Halt button or remotely entering the RCM halt command, the console uses the halt assertion once, then clears it.

If the halt assertion was caused by entering the RCM haltin command, enter the RCM haltout command or cycle power on the local system.

### **Disabling Autoboot**

The system automatically boots the operating system at power-up or reset if the Auto Start selection in the AlphaBIOS Standard CMOS Setup screen is set.

You might want to prevent the system from autobooting so you can perform tasks from the SRM console. Use one of the methods described previously to force a halt assertion.

When the SRM console prompt is displayed, you can enter commands to configure or test the system. Chapter 4 of your system User's Guide describes the SRM console commands and environment variables.

### **Disabling the SRM Power-Up Script**

The system has a power-up script (file) named "nvram" that runs every time the system powers up. If you accidentally insert a command in the script that will cause a system problem, disable the script by using one of the methods described previously to force a halt assertion. When the SRM console prompt is displayed, edit the script to delete the offending command. See "Creating a Power-Up Script" in Chapter 4 of your system User's Guide for more information on editing the nvram script.



## Summary of SRM Console Commands

The SRM console commands are used to examine or modify the system state.

**Table 7-2 Summary of SRM Console Commands**

Command	Function
<b>alphabios</b>	Loads and starts the AlphaBIOS console.
<b>clear envar</b>	Resets an environment variable to its default value.
<b>clear password</b>	Sets the password to 0.
<b>deposit</b>	Writes data to the specified address
<b>edit</b>	Invokes the console line editor on a RAM file or on the nvrnm file (power-up script).
<b>examine</b>	Displays the contents of a memory location, register, or device.
<b>halt</b>	Halts the specified processor. (Same as stop.)
<b>help</b>	Displays information about the specified console command.
<b>info num</b>	Displays various types of information about the system: <b>Info</b> shows a list describing the num qualifier. <b>Info 3</b> reads the impure area that contains the state of the CPU before it entered PAL mode. <b>Info 5</b> reads the PAL built logout area that contains the data used by the operating system to create the error entry <b>Info 8</b> reads the IOD and IOD 1 registers.
<b>initialize</b>	Resets the system.
<b>lfu</b>	Runs the Loadable Firmware Update Utility

*continued on next page*

**Table 7-2 Summary of SRM Console Commands (Continued)**

<b>Command</b>	<b>Function</b>
<b>login</b>	Turns off secure mode, enabling access to all SRM console commands during the current session.
<b>man</b>	Displays information about the specified console command.
<b>more</b>	Displays a file one screen at a time.
<b>prcache</b>	Initializes and displays status of the PCI NVRAM.
<b>set envvar</b>	Sets or modifies the value of an environment variable.
<b>set password</b>	Sets the console password or changes an existing password.
<b>set rcm_dialout</b>	Sets a modem dialout string.
<b>set secure</b>	Enables secure mode without requiring a restart of the console.
<b>show envvar</b>	Displays the state of the specified environment variable.
<b>show config</b>	Displays the configuration at the last system initialization.
<b>show cpu</b>	Displays the state of each processor in the system.
<b>show device</b>	Displays a list of controllers and their devices in the system.
<b>show fru</b>	Displays the serial number and revision level of all options.
<b>show memory</b>	Displays memory module information.
<b>show network</b>	Displays the state of network devices in the system.
<b>show pal</b>	Displays the version of the privileged architecture library code (PALcode).
<b>show power</b>	Displays information about the power supplies, system fans, CPU fans, and temperature.
<b>show rcm_dialout</b>	Displays the modem dialout string.
<b>show version</b>	Displays the version of the console program.
<b>start</b>	Starts a program previously loaded on the processor specified.
<b>stop</b>	Halts the specified processor. (Same as halt.)
<b>test</b>	Runs firmware diagnostics for the system.

## Summary of SRM Environment Variables

Environment variables pass configuration information between the console and the operating system. Their settings determine how the system powers up and operates. Environment variables are set or changed with the **set\_envvar** command and returned to their default values with the **clear\_envvar** command. Their values are viewed with the **show\_envvar** command. The SRM environment variables are specific to the SRM console.

**Table 7-3 Environment Variable Summary**

<b>Environment Variable</b>	<b>Function</b>
com*_baud	Changes the default baud rate of the COM1 or the COM2 serial port.
console	Specifies the device on which power-up output is displayed (serial terminal or graphics monitor).
cpu_enabled	Enables or disables a specific secondary CPU.
kzpsa*_host_id	Specifies the default value for the KZPSA host SCSI bus node ID.
ocp_text	Overrides the default OCP display text with specified text.
pci_parity	Disables or enables parity checking on the PCI bus.
pk*0_fast	Enables fast SCSI mode.
pk*0_host_id	Specifies the default value for a controller host bus node ID.
pk*0_soft_term	Enables or disables SCSI terminators on systems that use the QLogic ISP1020 SCSI controller.
sys_model_num	Displays the system model number and computes certain information passed to the operating system. Must be restored after a PCI motherboard is replaced.
sys_serial_num	Restores the system serial number. Must be set if the system motherboard is replaced.
sys_type	Displays the system type and computes certain information passed to the operating system. Must be restored after a PCI motherboard is replaced.
tga_sync_green	Specifies the location of the SYNC signal generated by the DIGITAL ZLXp-E PCI graphics accelerator option.
tt_allow_login	Enables or disables login to the SRM console firmware on other console ports.

## Recording Environment Variables

This worksheet lists all environment variables. Copy it and record the settings for each system. Use the `show*` command to list environment variable settings.

**Table 7-4 Environment Variables Worksheet**

Environment Variable	System Name	System Name	System Name
com1_baud			
com2_baud			
console			
cpu_enabled			
kzpsa*_host_id			
memory_test			
ocp_text			
pci_parity			
pk*0_fast			
pk*0_host_id			
pk*0_soft_term			
sys_model_num			
sys_serial_num			
sys_type			
tga_sync_green			
tt_allow_login			

---

## Managing the System Remotely

This chapter describes how to manage the system from a remote location using the remote console manager (RCM). You can use the RCM from a console terminal at a remote location. You can also use the RCM from the local console terminal.

- Sections in this chapter are:
- RCM Overview
- First-Time Setup
- RCM Commands
- Dial-Out Alerts
- Using the RCM Switchpack
- Troubleshooting Guide
- Modem Dialog Details

### RCM Overview

The remote console manager (RCM) monitors and controls the system remotely. The control logic resides on the system board.

The RCM is a separate console from the SRM and AlphaBIOS consoles. The RCM is run from a serial console terminal or terminal emulator. A command interface lets you reset, halt, and power the system on or off, regardless of the state of the operating system or hardware. You can also use RCM to monitor system power and temperature.

You can invoke the RCM either remotely or through the local serial console terminal. Once in RCM command mode, you can enter commands to control and monitor the system. Only one RCM session can be active at a time.

- To connect to the RCM remotely, you dial in through a modem, enter a password, and then type an escape sequence that invokes RCM command mode. You must set up the modem before you can dial in remotely.
- To connect to the RCM locally, you type the escape sequence at the SRM console prompt on the local serial console terminal.

When you are not monitoring the system remotely, you can use the RCM dial-out alert feature. With dial-out alerts enabled, the RCM dials a paging service to alert you about a power failure within the system.

---

#### CAUTION

---

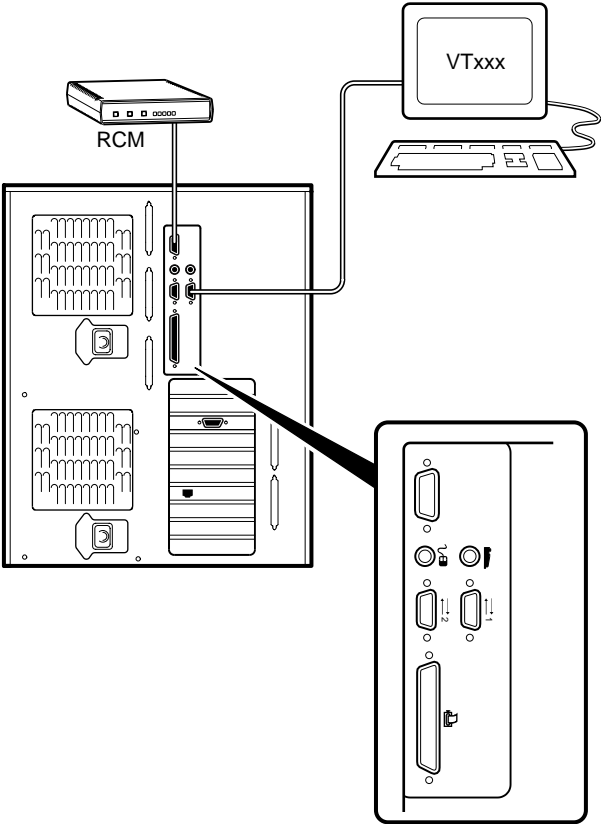
Do not issue RCM commands until the system has powered up. If you enter certain RCM commands during power-up or reset, the system may hang. In that case you would have to disconnect the power cord at the power outlet. You can, however, use the RCM **halt** command during power-up to force a halt assertion. Refer to Chapter 7 for information on halt assertion.

---

# First-Time Setup

To set up the RCM to monitor a system remotely, connect the console terminal and modem to the ports at the back of the system, configure the modem port for dial-in, and dial in.

**Figure 8-1 RCM Connections**



PK-0906-97

## Managing the System Remotely

### Configuring the Modem

The RCM requires a Hayes-compatible modem. The controls that the RCM sends to the modem are acceptable to a wide selection of modems. After selecting the modem, connect it and configure it.

#### Qualified Modems

The modems that have been tested and qualified with this system are:

- Motorola 3400 Lifestyle 28.8
- AT&T Dataport 14.4/FAX
- Hayes Smartmodem Optima 288 V-34/V.FC + FAX

#### Modem Configuration Procedure

1. Connect a Hayes-compatible modem to the RCM as shown in Figure 8-1 and power up the modem.
2. From the local serial console terminal, type the following escape sequence to invoke the RCM:

```
P00>>> ^]^[rcm
```

The character “^” is created by simultaneously holding down the Ctrl key and pressing the ] key (right square bracket). The SRM prompt, RCM>, is displayed.

3. Use the setpass command to set a modem password.
4. Enable the modem port with the enable command.
5. Enter the quit command to leave the RCM.
6. You are now ready to dial in remotely.



## Dialing In and Invoking RCM

To dial in to the RCM modem port, dial the modem, enter the modem password at the # prompt, and type the escape sequence. Use the hangup command to terminate the session.

A sample dial-in dialog would look similar to the following:

### Example 8-1 Sample Remote Dial-In Dialog

```
ATQ0V1E1S0=0      ❶
OK
ATDT30167
CONNECT 9600
#                  ❷
RCM V2.0           ❸
RCM> "
```

## Dialing In and Invoking RCM

1. Dial the number for the modem connected to the modem port. See ❶ in Example 8-1 for an example.

The RCM prompts for a password with a “#” character. See ❷.

2. Enter the password that you set with the setpass command.

You have three tries to correctly enter the password. After three incorrect tries, the connection is terminated, and the modem is not answered again for 5 minutes. When you successfully enter the password, the RCM banner is displayed. See ❸. You are connected to the system COM1 port, and you have control of the SRM console.

---

### NOTE

---

At this point no one at the local terminal can perform any tasks except for typing the RCM escape sequence. The local terminal displays any SRM console output entered remotely.

---

3. Type the RCM escape sequence (not echoed).

```
^]^[rcm
RCM>
```

## Managing the System Remotely

---

### NOTE

---

From RCM command mode, you can change the escape sequence for invoking RCM, if desired. Use the **setesc** command to change the sequence. Be sure to record the new escape sequence.

---

4. To terminate the modem connection, enter the RCM hangup command.

```
RCM> hangup
```

If the modem connection is terminated without using the hangup command or if the line is dropped due to phone-line problems, the RCM will detect carrier loss and initiate an internal hangup command. If the modem link is idle for more than 20 minutes, the RCM initiates an auto hangup.

---

### NOTE

---

Auto hangup can take a minute or more, and the local terminal is locked out until the auto hangup is completed.

---

## Using RCM Locally

Use the default escape sequence to invoke the RCM mode locally for the first time. You can invoke RCM from the SRM console, the operating system, or an application. The RCM quit command reconnects the terminal to the system console port.

1. To invoke the RCM locally, type the RCM escape sequence. See ❶ in Example 8-2 for the default sequence.

The escape sequence is not echoed on the terminal or sent to the system. At the RCM> prompt, you can enter RCM commands.

2. To exit RCM and reconnect to the system console port, enter the quit command. (See ❷). Press Return to get a prompt from the operating system or system console.

### Example 8-2 Invoking and Leaving RCM Locally

```
P00>>> ^]^[rcm ❶  
RCM>
```

```
RCM> quit ❷  
Focus returned to COM port
```

## RCM Commands

The RCM commands given in Figure 8-2 are used to control and monitor a system remotely.

**Table 8-1 RCM Command Summary**

Command	Function
<b>alert_clr</b>	Clears alert flag, stopping dial-out alert cycle
<b>alert_dis</b>	Disables the dial-out alert function
<b>alert_ena</b>	Enables the dial-out alert function
<b>disable</b>	Disables remote access to the modem port
<b>enable</b>	Enables remote access to the modem port
<b>halt</b>	Halts the server. Emulates pressing the Halt button and immediately releasing it.
<b>haltin</b>	Causes a halt assertion. Emulates pressing the Halt button and holding it in.
<b>haltout</b>	Terminates a halt assertion created with <b>haltin</b> . Emulates releasing the Halt button after holding it in.
<b>hangup</b>	Terminates the modem connection
<b>help or ?</b>	Displays the list of commands
<b>poweroff</b>	Turns off power. Emulates pressing the On/Off button to the off position.
<b>poweron</b>	Turns on power. Emulates pressing the On/Off button to the on position.
<b>quit</b>	Exits console mode and returns to system console port
<b>reset</b>	Resets the server. Emulates pressing the Reset button.
<b>setesc</b>	Changes the escape sequence for invoking command mode
<b>setpass</b>	Changes the modem access password
<b>status</b>	Displays system status and sensors

## Managing the System Remotely

### Command Conventions

- The commands are not case sensitive.
- A command must be entered in full.
- You can delete an incorrect command with the Backspace key before you press Enter.
- If you type a valid RCM command, followed by extra characters, and press Enter, the RCM accepts the correct command and ignores the extra characters.
- If you type an incorrect command and press Enter, the command fails with the message:

```
*** ERROR - unknown command ***
```

### **alert\_clr**

The **alert\_clr** command clears an alert condition within the RCM. The alert enable condition remains active, and the RCM will again enter the alert condition if it detects a system power failure.

```
RCM>alert_clr
```

### **alert\_dis**

The **alert\_dis** command disables RCM dial-out. It also clears any outstanding alerts. Dial-out remains disabled until the **alert\_enable** command is issued. See also the **enable** and **disable** commands.

```
RCM>alert_dis
```

### **alert\_ena**

The **alert\_ena** command enables the RCM to automatically dial out when it detects a power failure within the system. The RCM repeats the dial-out alert at 30-minute intervals until the alert is cleared. Dial-out remains enabled until the **alert\_disable** command or the **disable** command is issued. See also the **enable** and **disable** commands.

```
RCM>alert_ena
```

Two conditions must be met for the **alert\_enable** command to work:

- A modem dial-out string must be entered from the system console.
- Remote access to the RCM modem port must be enabled with the enable command.

If the alert\_enable command is entered when remote access is disabled, the following message is displayed:

```
*** error ***
```

### **disable**

The disable command disables remote access to the RCM modem port. It also disables RCM dial-out.

```
RCM>disable
```

When the modem is disabled, it remains disabled until the enable command is issued. If a modem connection is in progress, entering the disable command terminates it.

---

### **NOTE**

---

If the modem has been disabled from the RCM switchpack on the motherboard, the enable command does not work. To enable the modem, reset the switch 2 (MODEM OFF) on the switchpack to OFF (enabled). See Chapter 8 for information on the switchpack.

---

### **enable**

The enable command enables remote access to the RCM modem port. It can take up to 10 seconds for the enable command to be executed.

```
RCM>enable
```

When the modem is enabled, it remains enabled until the **disable** command is issued.

## Managing the System Remotely

The **enable** command can fail for the following reasons:

- No modem access password was set.
- The initialization string or the answer string might not be set properly. (See “Modem Dialog Details,” later in this chapter.)
- The modem is not connected or is not working properly.
- The modem has been disabled from the RCM switchpack. To enable the modem, reset switch 2 (MODEM OFF) on the switchpack to OFF (enabled).

If the **enable** command fails, the following message is displayed:

```
*** ERROR - enable failed ***
```

### hangup

The **hangup** command terminates the modem session. When this command is issued, the remote user is disconnected from the server. This command can be issued from either the local or remote console.

```
RCM>hangup
```

### halt

The **halt** command halts the managed system. The **halt** command is equivalent to pressing the Halt button on the control panel and then immediately releasing it. The RCM firmware exits command mode and reconnects the user’s terminal to the system COM1 serial port.

```
RCM>halt
```

```
Focus returned to COM port
```

The **halt** command can be used to force a halt assertion. See Chapter 7 for information on halt assertion.

---

#### NOTE

---

If you are running Windows NT, the **halt** command has no effect.

---

### haltin

The **haltin** command halts a managed system and forces a halt assertion. The **haltin** command is equivalent to pressing the Halt button on the control panel and holding it in. This command can be used at any time after system power-up to allow you to perform system management tasks. See Chapter 7 for information on halt assertion.

---

#### NOTE

---

If you are running Windows NT, the haltin command does not affect the operating system session, but it does cause a halt assertion.

---

### haltout

The **haltout** command terminates a halt assertion that was done with the haltin command. It is equivalent to releasing the Halt button on the control panel after holding it in (rather than pressing it once and releasing it immediately). This command can be used at any time after system power-up. See Chapter 7 for information on halt assertion.

### help or ?

The **help** or **?** command displays the RCM firmware commands.

### poweroff

The **poweroff** command requests the RCM to power off the system. The **poweroff** command is equivalent to pressing the On/Off button on the control panel to the off position.

```
RCM>poweroff
```

If the system is already powered off or if switch 3 (RPD DIS) on the switchpack has been set to the on setting (disabled), this command has no immediate effect.

To power the system on again after using the **poweroff** command, you must issue the **poweron** command.

If, for some reason, it is not possible to issue the **poweron** command, the local operator can start the system as follows:

Press the On/Off button to the off position and disconnect the power cord.

Reconnect the power cord and press the On/Off button to the on position.

## Managing the System Remotely

### **poweron**

The **poweron** command requests the RCM to power on the system. The **poweron** command is equivalent to pressing the On/Off button on the control panel to the on position. For the system power to come on, the following conditions must be met:

- AC power must be present at the power supply inputs.
- The On/Off button must be in the on position.
- All system interlocks must be set correctly.

The RCM exits command mode and reconnects the user's terminal to the system console port.

```
RCM>poweron  
Focus returned to COM port
```

---

### **NOTE**

---

If the system is powered off with the On/Off button, the system will not power up. The RCM will not override the "off" state of the On/Off button. If the system is already powered on, the **poweron** command has no effect.

---

### **quit**

The **quit** command exits the user from command mode and reconnects the serial terminal to the system console port. The following message is displayed:

```
Focus returned to COM port
```

The next display depends on what the system was doing when the RCM was invoked. For example, if the RCM was invoked from the SRM console prompt, the console prompt will be displayed when you enter a carriage return. Or, if the RCM was invoked from the operating system prompt, the operating system prompt will be displayed when you enter a carriage return.

### **reset**

The **reset** command requests the RCM to reset the hardware. The reset command is equivalent to pressing the Reset button on the control panel.

```
RCM>reset  
Focus returned to COM port
```



The following events occur when the **reset** command is executed:

- The system restarts and the system console firmware reinitializes.
- The console exits RCM command mode and reconnects the serial terminal to the system COM1 serial port.
- The power-up messages are displayed, and then the console prompt is displayed or the operating system boot messages are displayed, depending on how the startup sequence has been defined.

### **setesc**

The **setesc** command resets the default escape sequence for invoking RCM. The escape sequence can be any character string. A typical sequence consists of 2 or more characters, to a maximum of 15 characters. The escape sequence is stored in the module's on-board NVRAM.

---

### **NOTE**

---

Be sure to record the new escape sequence. Although the factory defaults can be restored if you forget the escape sequence, this requires resetting the EN RCM switch on the RCM switchpack.

---

The following sample escape sequence consists of 5 iterations of the Ctrl key and the letter "o".

```
RCM>setesc
^o^o^o^o^o
RCM>
```

If the escape sequence entered exceeds 15 characters, the command fails with the message:

```
*** ERROR ***
```

When changing the default escape sequence, avoid using special characters that are used by the system's terminal emulator or applications.

Control characters are not echoed when entering the escape sequence. Use the status command to verify the complete escape sequence.

### **setpass**

The **setpass** command allows the user to change the modem access password that is prompted for at the beginning of a modem session.

## Managing the System Remotely

```
RCM>setpass
new pass>*****
RCM>
```

The maximum length for the password is 15 characters. If the password exceeds 15 characters, the command fails with the message:

```
*** ERROR ***
```

The minimum password length is one character, followed by a carriage return. If only a carriage return is entered, the command fails with the message:

```
*** ERROR - illegal password ***
```

If you forget the password, you can enter a new password.

### **status**

The status command displays the current state of the system sensors, as well as the current escape sequence and alarm information. The following is an example of the display.

```
RCM>status

Firmware Rev: V2.0
Escape Sequence: ^]^[RCM
Remote Access: ENABLE
Alerts: DISABLE
Alert Pending: NO
Temp (C): 26.0
RCM Power Control: ON
RCM Halt: Deasserted
External Power: ON
Server Power: ON

RCM>
```

The status fields are explained in Figure 8-3.

**Table 8-2 RCM Status Command Fields**

<b>Item</b>	<b>Description</b>
Firmware Rev:	Revision of RCM firmware.
Escape Sequence:	Current escape sequence to invoke RCM.
Remote Access:	Modem remote access state. (ENABLE/DISABLE)
Alerts:	Alert dial-out state. (ENABLE/DISABLE)
Alert Pending:	Alert condition triggered. (YES/NO)
Temp (C):	Current system temperature in degrees Celsius.
RCM Power Control:	Current state of RCM system power control. (ON/OFF)
RCM Halt:	Asserted indicates that halt has been asserted with the haltin command. Deasserted indicates that halt has been deasserted with the haltout command or by cycling power with the On/Off button on the control panel. The RCM Halt: field does not report halts caused by pressing the Halt button.
External Power:	Current state of power to RCM. Always on.
Server Power:	Indicates whether power to the system is on or off.

### Dial-Out Alerts

When you are not monitoring the system remotely, you can use the RCM dial-out feature to notify you of a power failure within the system.

When a dial-out alert is triggered, the RCM initializes the modem for dial-out, sends the dial-out string, hangs up the modem, and reconfigures the modem for dial-in. The modem must continue to be powered, and the phone line must remain active, for the dial-out alert feature to work. Also, if you are connected to the system remotely, the dial-out feature does not work.

### Enabling Dial-Out Alerts

1. Enter the **set rcm\_dialout** command, followed by a dial-out alert string, from the SRM console (see ❶ in Example 8-3). See the next topic for details on composing the modem dial-out string.
2. Invoke the RCM and enter the enable command to enable remote access dial-in. The RCM status command should display “Remote Access: Enable.” See ❷.
3. Enter the **alert\_ena** command to enable outgoing alerts. See ❸.

#### Example 8-3 Configuring the Modem for Dial-Out Alerts

```
P00>>> set rcm_dialout "ATDTstring#;" ❶  
RCM>enable  
RCM>status  
. .  
Remote Access: Enable ❷  
. .  
RCM>alert_ena ❸
```

## Composing the Dial-Out String

Enter the set `rcm_dialout` command from the SRM console to compose the dial-out string. Use the show command to verify the string. See Example 8-4.

### Example 8-4 Typical RCM Dial-Out Command

```
P00>>> set rcm_dialout "ATXDT9,15085553333,,,,,,5085553332#;"
```

```
P00>>> show rcm_dialout
rcm_dialout      ATXDT9,15085553333,,,,,,5085553332#;
```

The dial-out string has the following requirements:

- The string cannot exceed 47 characters.
- Enclose the entire string following the set `rcm_dialout` command in quotation marks.
- Enter the characters ATDT after the opening quotation marks. Do not mix case.
- Enter the character X after “AT” if the line to be used also carries voice mail.
- The valid characters for the dial-out string are the characters on a phone keypad: 0–9, \*, and #. A comma (,) requests that the modem pause for 2 seconds, and a semicolon (;) is required to terminate the string.

The elements of the dial-out string are explained in Figure 8-4.

## Managing the System Remotely

**Table 8-3 Elements of the Dial-Out String**

---

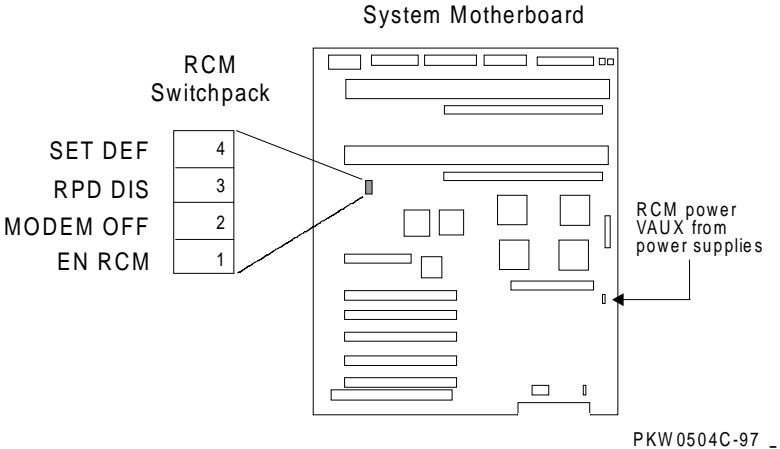
ATXDT	AT = Attention
.	X = Forces the modem to dial “blindly” (not look for a dial tone). Enter X if the dial-out line modifies its dial tone when used for services such as voice mail
	D = Dial
	T = Tone (for touch-tone)
	, = Pause for 2 seconds
9,	In the example, “9” gets an outside line. Enter the number for an outside line if your system requires it.
15085553333	Dial the paging service.
, , , , , , , ,	Pause for 12 seconds for paging service to answer
5085553332#	“Message,” usually a call-back number for the paging service.
;	Return to command mode. Must be entered at end of string.

---

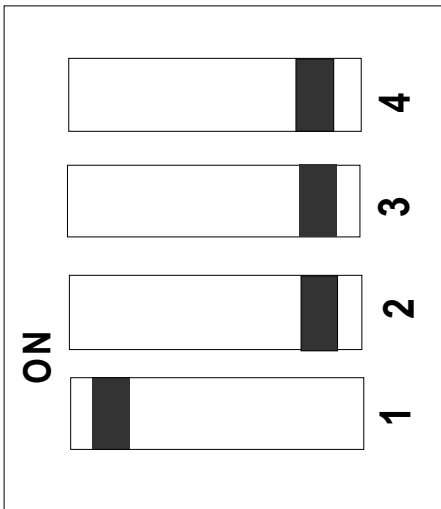
# Using the RCM Switchpack

The RCM operating mode is controlled by a switchpack on the system board. Use the switches to enable or disable certain RCM functions, if desired.

**Figure 8-2 Location of RCM Switchpack on System Board**



**Figure 8-3 RCM Switches (Factory Settings)**



PKW0950-97

**Table 8-4 RCM Switch Settings**

Switch	Name	Description
1	EN RCM	Enables or disables the RCM. The default is ON (RCM enabled). The OFF setting disables RCM.
2	MODEM OFF	Enables or disables the modem. The default is OFF (modem enabled).
3	RPD DIS	Enables or disables remote poweroff. The default is OFF (remote poweroff enabled).
4	SET DEF	Sets the RCM to the factory defaults. The default is OFF (reset to defaults disabled).



## Uses of the Switchpack

You can use the RCM switchpack to change the RCM operating mode or disable the RCM altogether. The following are conditions when you might want to change the factory settings.

- Switch 1 (EN RCM)—Set this switch to OFF (disable) if you want to reset the baud rate of the COM1 port to a value other than the system default of 9600. You must disable RCM to select a baud rate other than 9600.
- Switch 2 (MODEM OFF)—Set this switch to ON (disable) if you want to prevent the use of the RCM for monitoring a system remotely. RCM commands can still be run from the local serial console terminal.
- Switch 3 (RPD DIS). Set this switch to ON (disable) if you want to disable the poweroff command. With poweroff disabled, the monitored system cannot be powered down from the RCM.
- Switch 4 (SET DEF). Set this switch to ON (enable) if you want to reset the RCM to the factory settings. See the section “Resetting the RCM to Factory Defaults.”

## Changing a Switch Setting

The RCM switches are numbered on the system board. The default positions are shown in Figure 8-3. To change a switch setting:

1. Turn off the system.
2. Unplug the AC power cords.

---

### NOTE

---

If you do not unplug the power cords, the new setting will not take effect when you power up the system.

---

3. Remove the system covers. See Chapter 5.
4. Locate the RCM switchpack on the system board and change the switch setting as desired.
5. Replace the system covers and plug in the power cords.
6. Power up the system to the SRM console prompt and type the escape sequence to enter RCM command mode, if desired.

### Resetting the RCM to Factory Defaults

You can reset the RCM to factory settings, if desired. You would need to do this if you forgot the escape sequence for the RCM. Follow the steps below.

1. Turn off the system.
2. Unplug the AC power cords.

---

#### NOTE

---

If you do not unplug the power cords, the reset will not take effect when you power up the system.

---

3. Remove the system covers. See Chapter 5.
4. Locate the RCM switchpack on the system board, and set switch 4 to ON.
5. Replace the system covers and plug in the power cords.
6. Power up the system to the SRM console prompt.  
Powering up with switch 4 set to ON resets the escape sequence, password, and modem enable states to the factory defaults.
7. Power down the system, unplug the AC power cords, and remove the system covers.
8. Set switch 4 to OFF.
9. Replace the system covers and plug in the power cords.
10. Power up the system to the SRM console prompt, and type the default escape sequence to invoke RCM command mode:

```
^ ] ^ ] RCM
```

11. Reset the modem password. Reset the escape sequence, if desired, as well as any other states.

## Troubleshooting Guide

Table 8-5 is a list of possible causes and suggested solutions for symptoms you might see.

**Table 8-5 RCM Troubleshooting**

Symptom	Possible Cause	Suggested Solution
The local console terminal is not accepting input.	Cables not correctly installed.	Check external cable installation.
	Switch 1 on switchpack set to disable.	Set switch 1 to ON.
	Modem session was not terminated with the <b>hangup</b> command.	Wait several minutes for the local terminal to become active again.  Wait for the remote session to be completed.
The console terminal is displaying garbage.	A remote RCM session is in progress, so the local console terminal is disabled.	
	System and terminal baud rate set incorrectly.	Disable RCM and set the system and terminal baud rates to 9600 baud.

*continued on next page*

## Managing the System Remotely

**Table 8-5 RCM Troubleshooting (continued)**

<b>Symptom</b>	<b>Possible Cause</b>	<b>Suggested Solution</b>
RCM does not answer when the modem is called.	Modem cables may be incorrectly installed.	Check modem phone lines and connections.
		Enable remote access.
	RCM remote access is disabled.	Set password and enable remote access.
	RCM does not have a valid modem password set.	Set switch 1 to ON; switch 2 to OFF.
	Switch setting incorrect.	Enter <b>quit</b> on the local terminal.
	The local terminal is currently attached to the RCM.	Wait 30 seconds after powering up the system and RCM before attempting to dial in.
	On power-up, the RCM defers initializing the modem for 30 seconds to allow the modem to complete its internal diagnostics and initialization.	Enter <b>enable</b> command from RCM.
Modem may have had power cycled since last being initialized or modem is not set up correctly.		
After the system and RCM are powered up, the COM port seems to hang briefly.	This delay is normal behavior.	Wait a few seconds for the COM port to start working.

*Continued on next page*

**Table 8-5 RCM Troubleshooting (continued)**

Symptom	Possible Cause	Suggested Solution
RCM installation is complete, but system does not power up.	RCM Power Control: is set to DISABLE.	Invoke RCM and issue the <b>poweron</b> command.
You reset the system to factory defaults, but the factory settings did not take effect.	AC power cords were not removed before you reset switch 4 on the RCM switchpack.	Refer to “Using the RCM Switchpack.”
The remote user sees a “+++” string on the screen.	The modem is confirming whether the modem has really lost carrier. This occurs when the modem sees an idle time, followed by a “3,” followed by a carriage return, with no subsequent traffic. If the modem is still connected, it will remain so.	This is normal behavior.
The message “unknown command” is displayed when the user enters a carriage return by itself.	The terminal or terminal emulator is including a linefeed character with the carriage return.	Change the terminal or terminal emulator setting so that “new line” is not selected.
Cannot enable modem or modem will not answer.	The modem is not configured correctly to work with the RCM.	Modify the modem initialization and/or answer string as described in “Modem Dialog Details.”  Refer to “Using the RCM Switchpack.”
	The modem has been disabled on the RCM switchpack.	

### Modem Dialog Details

This section is intended to help you reprogram your modem if necessary.

#### Default Initialization and Answer Strings

The modem initialization and answer command strings set at the factory for the RCM are:

Initialization string:      AT&F0EVS0=0S12=50<cr>

Answer string              ATXA<cr>

---

#### NOTE

---

All modem commands must be terminated with a <cr> character (0x0d hex).

---

#### Modifying Initialization and Answer Strings

The initialization and answer strings are stored in the RCM's NVRAM. They come pre-programmed to support a wide selection of modems. With some modems, however, you may need to modify the initialization string, answer string, or both. The following SRM **set** and **show** commands are provided for this purpose.

##### To replace the initialization string:

```
P00>>> set rcm_init "new_init_string"
```

##### To replace the answer string:

```
P00>>> set rcm_answer "new_answer_string"
```

##### To display all the RCM strings that can be set by the user:

```
P00>>> show rcm*
rcm_answer  ATXA
rcm_dialout
rcm_init    AT&F0EVS0=0S12=50
P00>>>
```

## Initialization String Substitutions

The following modems require modified initialization strings.

<b>Modem Model</b>	<b>Initialization String</b>
Motorola 3400 Lifestyle 28.8	at&f0e0v0x0s0=2
AT&T Dataport 14.4/FAX	at&f0e0v0x0s0=2
Hayes Smartmodem Optima 288 V-34/V.FC + FAX	at&f0e0v0x0s0=2

## ?

---

? command, RCM, 8–11

## A

---

Architecture, block diagram, 2–6  
alert\_clr command, RCM, 8–8  
alert\_dis command, RCM, 8–8  
alert\_ena command, RCM, 8–8  
Alpha 21164 microprocessor, 1–8  
Alpha chip composition, 1–11  
AlphaBIOS  
    upgrading, 6–22  
AlphaBIOS console, 1–7  
Architecture, block diagram, 1–8

## B

---

B3007-AA CPU module, 1–11  
B3007-CA CPU module, 1–11  
B-cache, 2–21, 2–23

## C

---

CAP chip, 1–21  
CAP Error Register, 4–11  
CAP\_ERR Register, 4–11  
CD-ROM  
    removal and replacement, 5–31  
COM1 port, 2–19  
Command summary (SRM), 7–5  
Console

SRM, 2–23

Console commands

    show fru, 3–17  
    show memory, 3–15  
    show power, 3–15  
    test, 3–8  
    test memory, 3–11  
    test pci, 3–13

Console device determination, 2–18

Console device options, 2–19

console environment variable, SRM, 2–21, 2–23

Console power-up tests, 2–16

Control panel, 2–2

    display, 2–21  
    Halt assertion, 1–5  
    Halt button, 1–5  
    messages in display, 2–3

Control panel:Reset button, 1–5

Controls

    Halt assertion, 1–5  
    Halt button, 1–5, 7–2  
    On/Off button, 1–5  
    Reset button, 1–5

Cover interlock, 1–3, 1–28

    overriding, 1–29  
    removal and replacement, 5–27

CPU module, 1–10

    configuration rules, 1–11  
    fan removal and replacement, 5–11  
    removal and replacement, 5–9  
    variants, 1–11



# Index

CPU modules, 1–9, 5–3

## D

---

Data path chip, 1–21  
Diagnostics, test command, 3–6  
disable command, RCM, 8–9  
display command (LFU), 6–18

## E

---

ECU, running, 6–4  
EL\_ADDR Register, 4–6  
EL\_STAT Register, 4–2  
enable command, RCM, 8–9  
Environment variables  
    SRM console, 7–7  
Environment variables, SRM, 1–7, 2–21, 2–23  
Error registers, 4–1  
exit command (LFU), 6–11, 6–17, 6–18, 6–19  
External Interface Address Register, 4–6  
    loading and locking rules, 4–7  
External Interface Status Register, 4–2

## F

---

Fail-safe loader, 2–24  
Fan  
    removal and replacement (CPU chip), 5–11  
    removal and replacement (system), 5–25  
Fans, 5–3  
FEPROM  
    and XSROM test flow, 2–13  
    contents, 2–5  
    defined, 2–5  
Firmware  
    RCM, 8–7  
    updating, 6–7  
    updating from AlphaBIOS, 6–21  
    updating from CD-ROM, 6–8  
    updating from network device, 6–14  
    updating, AlphaBIOS selection, 6–6  
    updating, SRM command, 6–6  
Floppy  
    removal and replacement, 5–33  
FRU list, 5–2  
FRU part numbers, 5–3

## G

---

Graphics monitor, VGA, 2–19

## H

---

Halt button functions, 7–2  
halt command, RCM, 8–10  
haltin command, RCM, 8–11  
haltout command, RCM, 8–11  
Halts  
    caused by power problem, 3–5  
hangup command, RCM, 8–10  
help command (LFU), 6–18  
help command, RCM, 8–11

## I

---

I squared C bus, 1–34  
Initialization and answer strings  
    default, 8–25  
    modifying for modem, 8–25  
    substitutions, 8–26  
Interlock switches, 5–27  
IOD, 2–23

## L

---

LEDs  
    troubleshooting with, 3–2  
LFU  
    exit command, 6–19  
    starting, 6–6, 6–7  
    starting the utility, 6–6  
    typical update procedure, 6–7  
    update command, 6–20  
    updating firmware from CD-ROM, 6–8  
    updating firmware from network device, 6–14  
lfu command (LFU), 6–18  
LFU commands  
    display, 6–18, 6–19  
    exit, 6–11, 6–17, 6–18, 6–19  
    help, 6–18, 6–19  
    lfu, 6–18, 6–19  
    list, 6–9, 6–15, 6–17, 6–20  
    readme, 6–18, 6–20  
    summary, 6–18  
    update, 6–11, 6–18, 6–20

verify, 6–18, 6–20  
list command (LFU), 6–9, 6–15, 6–18, 6–20

## M

---

Maintenance bus, 1–34  
Maintenance bus controller, 1–34  
MC Error Information Register 0, 4–8  
MC Error Information Register 1, 4–9  
MC\_ERR0 Register, 4–8  
MC\_ERR1 Register, 4–9  
Memory, 1–12  
    addressing, 1–14  
    addressing rules, 1–15  
    DIMM removal and replacement, 5–15  
    DIMMs, 1–15  
    operation, 1–13  
    option configuration rules, 1–13  
        variants, 1–13  
    Riser Card removal and replacement, 5–13  
Memory DIMM, 1–12, 5–3  
Memory pairs, 1–13  
Memory Riser Card, 5–3  
Memory tests, 2–14, 2–21  
Modem  
    Dial-in procedure, 8–5  
    dialog details, 8–25  
    using in RCM, 8–3

## N

---

NVRAM, 2–3, 2–8

## O

---

Operating the system remotely, 8–2  
Operator control panel, 1–4  
    removal and replacement, 5–29

## P

---

PALcode, 2–23  
PCI Error Status Register 1, 4–14  
PCI slot numbering, 1–23  
PCI/EISA option removal and replacement, 5–19  
PCI\_ERR Register, 4–14  
Power circuit, 1–28  
    failures, 1–29  
Power cords, 5–4

Power error conditions, 1–27  
Power faults, 1–33  
Power harness removal and replacement, 5–23  
Power problems  
    at power-up, 3–5  
Power supply, 1–30  
    fault protection, 1–31  
    removal and replacement, 5–21  
    voltages, 1–31  
Power up/down sequence, 1–33  
poweroff command, RCM, 8–11  
poweron command, RCM, 8–12  
Power-up  
    SROM and XSROM messages during, 2–19  
Power-up display, 2–19  
Power-up sequence, 2–4  
Processor  
    determining primary, 2–21

## Q

---

quit command, RCM, 8–12

## R

---

RCM, 8–2, 8–19  
    Changing settings on switchpack, 8–19  
    command summary, 8–7  
    invoking and leaving command mode, 8–6  
    modem dialog details, 8–25  
    modem use, 8–3  
    remote dial-in, 8–5  
    resetting to factory defaults, 8–21  
    switchpack defaults, 8–19  
    switchpack location, 8–19  
    troubleshooting, 8–22  
    typical dialout command, 8–17  
RCM commands  
    ?, 8–11  
    alert\_clr, 8–8  
    alert\_dis, 8–8  
    alert\_ena, 8–8  
    disable, 8–9  
    enable, 8–9  
    halt, 8–10  
    haltin, 8–11  
    haltout, 8–11

# Index

- hangup, 8–10
- help, 8–11
- poweroff, 8–11
- poweron, 8–12
- quit, 8–12
- reset, 8–12
- setesc, 8–13
- setpass, 8–13
- status, 8–14

RCM, dial-out alerts, 8–16

RCM, switchpack, 8–19

readme command (LFU), 6–18, 6–20

Registers, 4–1

Remote Console Manager. *See* RCM

Remote console memory. *See* RCM

Remote control switch, 1–25

Remote dial-in, RCM, 8–5

reset command, RCM, 8–12

## S

---

Safety guidelines, 5–1

SCSI cables, 5–4

SCSI Disk removal and replacement, 5–35

SCSI Repeater removal and replacement, 5–39

Secure mode

- releasing, 3–7

Serial ports, 1–23

Serial terminal, 2–19

setesc command, RCM, 8–13

setpass command, RCM, 8–13

SRM console, 1–6, 2–23

SROM, 2–21

- defined, 2–4
- power-up test flow, 2–8

SROM errors, 2–11

SROM tests, 2–10

status command, RCM, 8–14

StorageWorks

- backplane removal and replacement, 5–37
- disk removal and replacement, 5–35
- repeater removal and replacement, 5–39

System

- architecture, 1–8
- fully configured, 1–9

System bus, 1–9

System bus block diagram, 1–18

System bus to PCI bus bridge, 1–20

System bus to PCI bus bridge module, 1–9

System bus to PCI/EISA bus bridge module, 1–9

System cables and jumpers, 5–5

System components, 1–2

System consoles, 1–6

System drawer

- remote operation, 8–2

System exposure, 5–7

System FRU locations, 5–2

System motherboard, 1–16

- removal and replacement, 5–17
- system bus section, 1–18
- PCI I/O subsystem section, 1–22
- power control logic section, 1–26
- remote control logic section, 1–24
- system bus to PCI bus bridge section, 1–20

System motherboard LEDs, 3–2

## T

---

test command

- for entire system, 3–8

test mem command, 3–11

test pci command, 3–13

Troubleshooting

- failures at power-up, 3–5
- power problems, 3–4

## U

---

Ultra SCSI cables and jumpers, 5–4

update command (LFU), 6–11, 6–17, 6–18, 6–20

Updating firmware

- AlphaBIOS console, 6–21
- from AlphaBIOS console, 6–6
- from SRM console, 6–6

Utility programs

- running from graphics monitor, 6–2

## V

---

verify command (LFU), 6–18, 6–20

## X

---

XBUS, 1–23

XSROM

- defined, 2–4

errors, 2–15  
tests, 2–13

power-up test flow, 2–12