COMPAQ

AlphaServer DS20

Service Manual

Order Number: EK–AS140–SV. A01

This manual is for anyone who services this system. It includes troubleshooting information, configuration rules, and instructions for removal and replacement of field-replaceable units.

Compaq Computer Corporation

Notice

FCC Notice: The equipment described in this manual generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense will be required to take whatever measures are required to correct the interference.

Shielded Cables: If shielded cables have been supplied or specified, they must be used on the system in order to maintain international regulatory compliance.

Warning! This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Achtung! Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Avertissement! Cet appareil est un appareil de Classe A. Dans un environnement résidentiel, cet appareil peut provoquer des brouillages radioélectriques. Dans ce cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.

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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 online and printed reference. Each topic begins with an abstract, followed by an illustration or example, and ends with descriptive text.

This manual has four chapters and three appendixes, as follows:

- **Chapter 1, System Overview,** introduces the Compaq AlphaServer DS20 system. It describes each system component.
- **Chapter 2, Troubleshooting,** describes troubleshooting during power-up and booting, as well as the **test** command.
- **Chapter 3, Error Registers,** describes the error registers used to hold error information.
- **Chapter 4, Removal and Replacement,** describes removal and replacement procedures for field-replaceable units (FRUs).
- **Appendix A, Halts, Console Commands, and Environment Variables,** summarizes the commands used to examine and alter the system configuration.
- **Appendix B, Managing the System Remotely**, describes how to use the Remote Console Manager (RCM) to monitor and control the system remotely.
- **Appendix C, Firmware Update,** describes how to update system firmware.

Documentation Titles

Table 1 lists books in the documentation set.

Table 1 AlphaServer DS20 Documentation

Title	Order Number
User and Installation Documentation Kit	QZ–014AA–G8
User's Guide	EK–AS140–UG
Basic Installation	EK–AS140–IN
Service Information	
Service Manual	EK–AS140–SV

Information on the Internet

Using a Web browser you can access the AlphaServer InfoCenter at:

http://www.digital.com/info/alphaserver/products.html

Access the latest system firmware either with a Web browser or via FTP as follows:

ftp://ftp.digital.com/pub/Digital/Alpha/firmware/

Interim firmware released since the last firmware CD is located at:

ftp://ftp.digital.com/pub/Digital/Alpha/firmware/interim/

Chapter 1

System Overview

The Compaq AlphaServer DS20 system consists of up to two CPUs, up to 4 Gbytes of memory, 6 I/O slots, and up to 7 SCSI storage devices. AlphaServer DS20 systems can be mounted in a standard 19" rack.

AlphaServer DS20 systems support OpenVMS, Compaq Tru64 UNIX, Windows NT, and Linux.

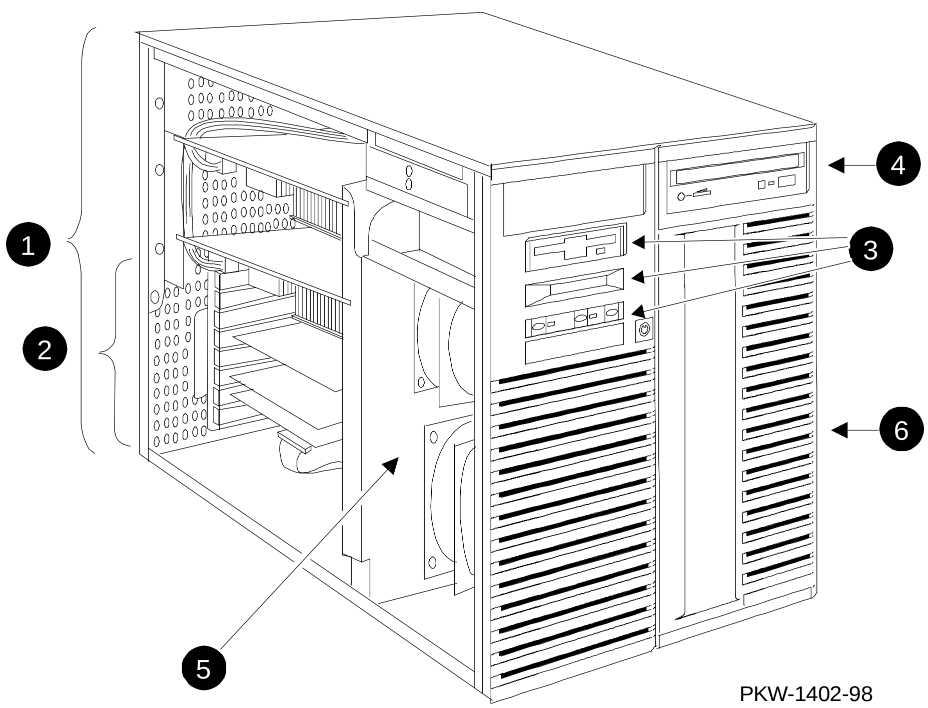
Topics in this chapter include the following:

- System Enclosure
- Operator Control Panel and Drives
- System Consoles
- System Architecture
- CPU Types
- Memory
- Memory Addressing and Data Location
- System Board
- Server Feature Module
- Power Circuit and Cover Interlock
- Power Supply
- Power Up/Down Sequence
- TIG Bus
- Maintenance Bus (I^2C Bus)
- StorageWorks Drives

1.1 System Enclosure

The system has up to two CPU modules and up to 4 Gbytes of memory. A single fast wide UltraSCSI StorageWorks shelf provides up to 128 Gbytes of storage.

Figure 1-1 System Enclosure



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

❶ System card cage, which holds the system board and the CPU, memory, and system I/O.

❷ PCI/ISA 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.

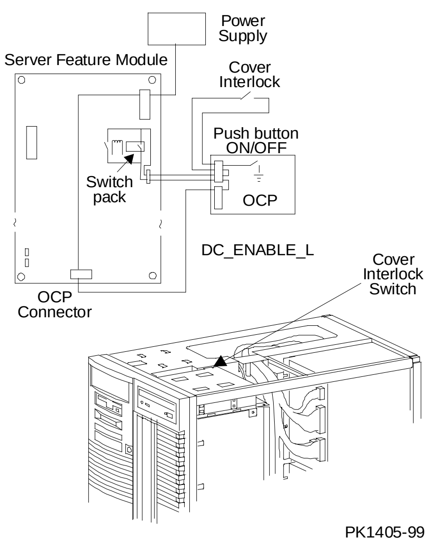
❺ Cooling section containing two fans and the server feature module.

❻ StorageWorks shelf.

Cover Interlock

The system has a single cover interlock switch tripped by the top cover.

Figure 1-2 Cover Interlock Circuit



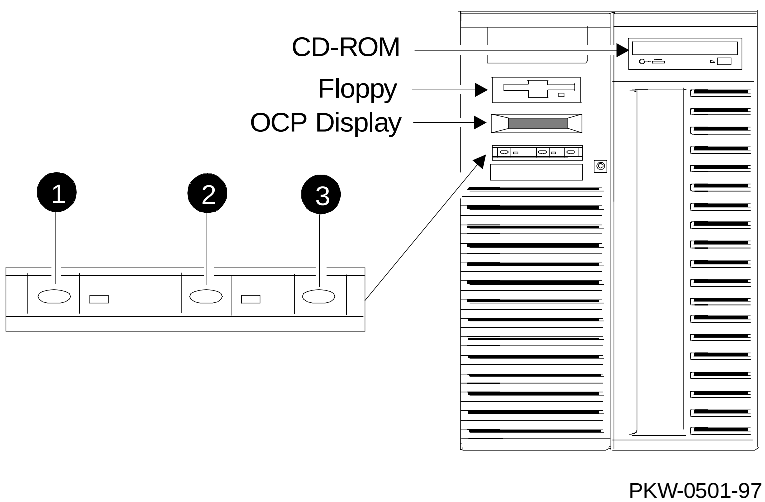
NOTE: The cover interlock must be engaged to enable power-up.

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.**

1.2 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



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 board.

Floppy disk. The floppy drive is used to load software and firmware updates. The floppy controller is on the XBUS on the PCI backplane on the system board.

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.

The major function of the Halt button is to stop whatever the machine is doing and return the system to the SRM console.

To get to the SRM console, for systems running OpenVMS or Compaq Tru64 UNIX, press the Halt button.

To get to the SRM console, for systems running Windows NT, 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.)

The function of the Halt button is complex; it depends upon the state of the machine when the button is pressed. See Section B.1 for a full discussion of the Halt button.

1.3 System Consoles

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

SRM Console Prompt

On systems running the Compaq Tru64 UNIX or OpenVMS operating system, the following console prompt is displayed after system startup messages are displayed, or whenever the SRM console is invoked:

```
P00>>>
```

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:

SRM Console

The SRM console is a command-line interface used to boot the Compaq Tru64 UNIX and OpenVMS operating systems. It also 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.

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 ISA Configuration Utility and the RAID Standalone Configuration Utility are run from the AlphaBIOS console. AlphaBIOS runs on either a serial terminal 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. The **os_type** environment variable, which can be set to VMS, UNIX, or NT, determines which of the two consoles is used. The SRM console is always brought into memory, but AlphaBIOS is loaded if **os_type** is set to **NT** and the Halt LED is not lit.

Refer to Appendix A of this guide for a list of the environment variables used to configure a system.

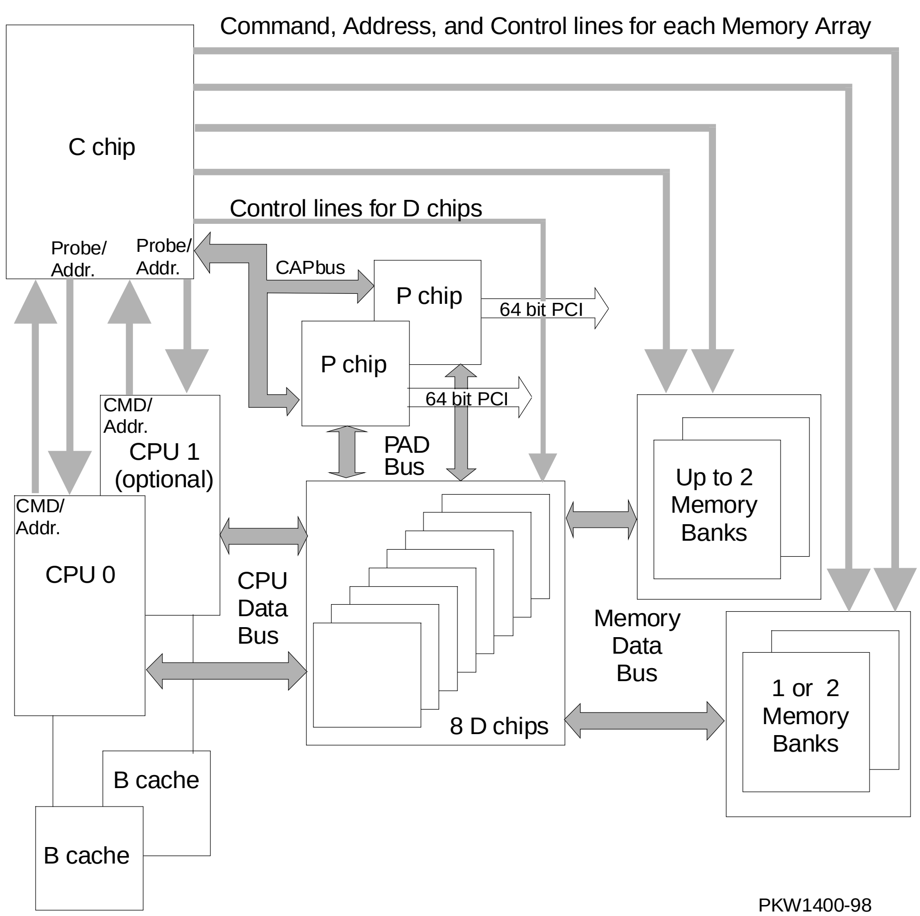
Refer to your system *User's Guide* for information on setting environment variables.

Most environment variables are stored in the NVRAM area of the flash ROM on the system board. 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 Appendix A for a convenient worksheet for recording environment variable settings.

1.4 System Architecture

An Alpha microprocessor chip is used in this system. The CPU, memory, and the I/O modules are physically connected to the system board and logically connected through a switch-based interconnect implemented in a cross-bar switch chipset.

Figure 1-4 Block Diagram



The AlphaServer DS20 is a switch-based interconnect system; it uses a cross-bar switch chipset that allows data to move directly from place to place in the system. The CPU, memory, and I/O devices physically connect to the system board and each has one or two logical connections to the switch. The arrows on the block diagram shown in Figure 1-4 indicate the flow of data, command/address, and control signals.

On the system board is:

- A system switch consisting of a control chip (C-chip) and 8 data chips (D-chips)
- Three buses to the D-chips: the memory data bus, the CPU data bus, and the P-chip address and data bus (PAD bus)
- One bus from the C-chip to the P-chips (CAP bus)
- Two 60 command/address and control connections between each CPU and the C-chip: the command/address line from the CPUs to the C-chip and the probe address lines from the C-chip to the CPUs
- A TIG bus connected to the C-chip
- Control lines from the C-chip to the D-chips
- Control, timing, and address lines from the C-chip to each memory array
- Two 64-bit PCI buses with three PCI option slots each
- One ISA bus bridged on PCI0 and two SCSI ports (unused at FRS) also on PCI0 (If an ISA option is used, PCI 1 slot 9 cannot be used for a PCI option.)
- One ISA to XBUS bridge to the built-in XBUS options

A fully configured pedestal system can have two CPUs, sixteen DIMMs, a total of six I/O options, and seven 18 Gbyte UltraSCSI disks. Maximum memory is 4 Gbytes. The I/O options can be all PCI options or five PCI options and a single ISA option.

Other major lines in the system are used for command, addresses, and control.

For information on CPUs, see Section 1.5.

For information on memory, see Sections 1.6 and 1.7.

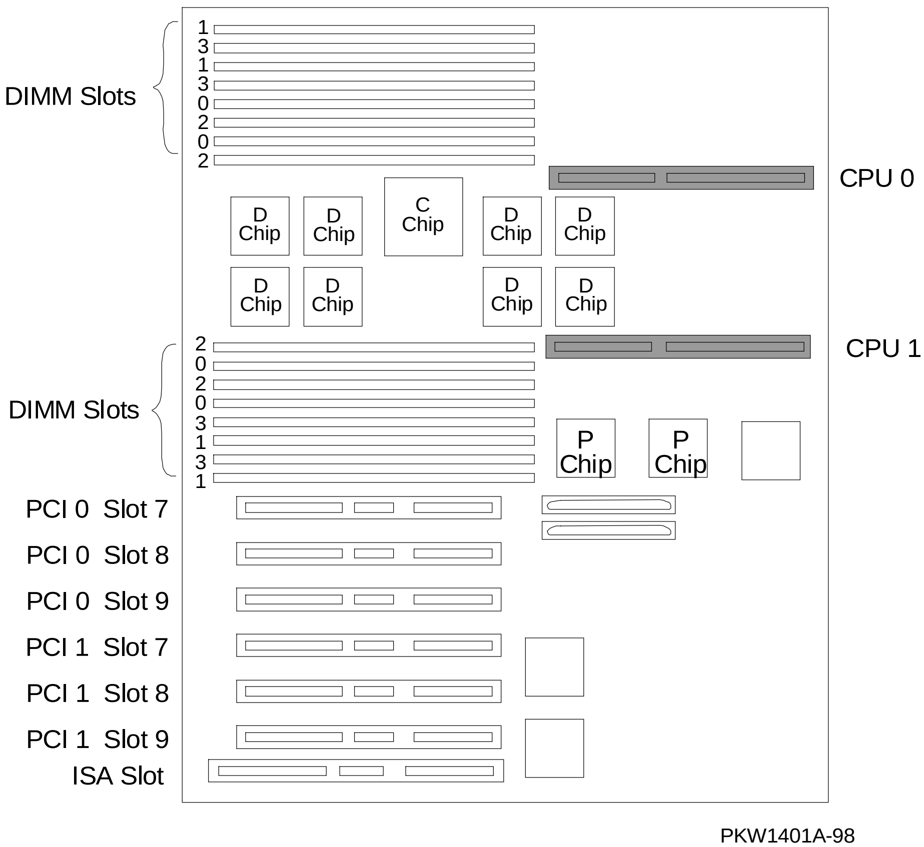
There are two 64-bit PCI buses connected to the cross-bar switch chipset by two PAD buses and a single CAP bus. Each bus has three PCI slots for I/O devices. PCI bus 0 has an ISA bridge and a SCSI adapter with two ports (not used) embedded on the bus. A single ISA slot is available on PCI bus 0 that, when used, eliminates the use of one PCI slot on PCI bus 1.

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

1.5 CPU Types

There is a single CPU variant.

Figure 1-5 CPU Module Placement



Alpha Chip Composition

The Alpha 21264 chip uses 0.35 micron chip technology, has a transistor count of 15.2 million, consumes 50 watts of power, and is air cooled (a fan is on the chip). The default cache system is write-back.

Chip Description

Unit	Description
Instruction	64-Kbyte I-cache
Execution	4-way execution; four integer units, two of which can perform memory address calculations for load and store instructions; dedicated units for floating-point add, multiply, divide, and square root operations.
Memory	Merge logic, 64-Kbyte write-through first-level data cache, bus interface unit that consists of two ports, one a 16-byte B-cache port and the other an 8-byte system port.

CPU Variants

Module Variant	Clock Frequency	Onboard Cache
KN310-Ax	500 MHz	4 Mbytes

CPU Configuration Rules

- The first CPU must be in CPU slot 0.
- Both CPUs must have the same Alpha chip clock speed selected.

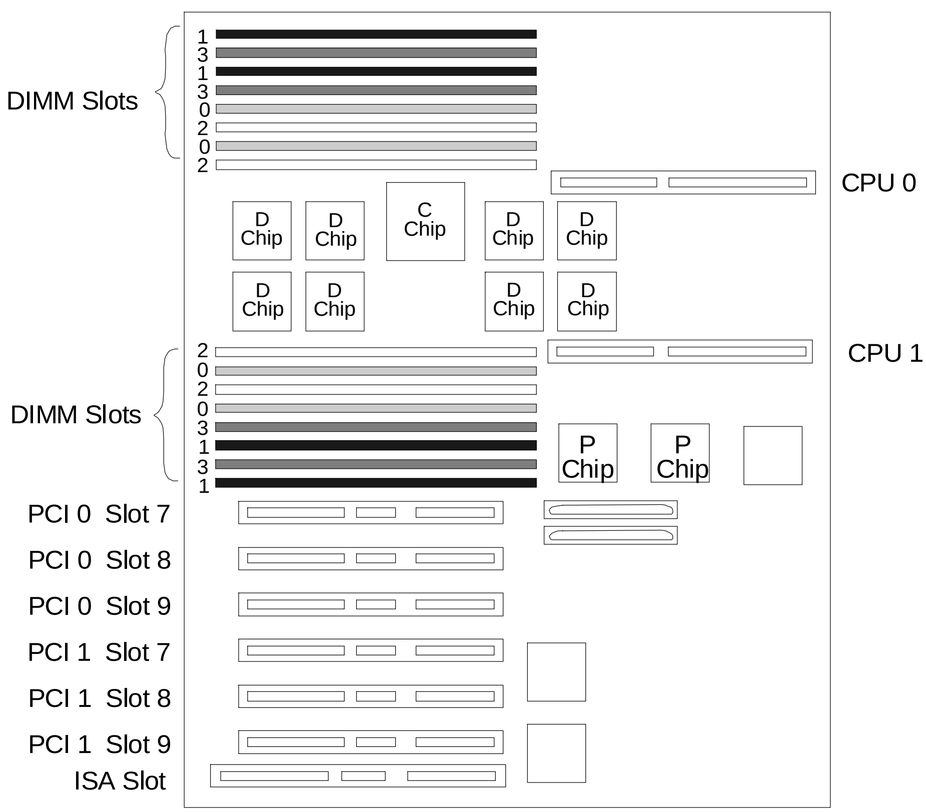
Module LEDs

LED Name	Description (read LEDs from right to left on the module)
2V_PWRGOOD_LED	Normally on. Indicates the presence of 2.XV.
SROM_CLK_LED	Normally off. Toggles on and off rapidly during the SROM load phase.
DC_OK_LED	Normally on. Indicates the presence of DC_OK.
CPU_SELF_TEST_LED	Normally on. Indicates the status of self-test. If the LED is off, there was an error or timeout after the SROM load.

1.6 Memory

Memory consists of up to four memory options, each consisting of four DIMMs. There are four option variants: 128 Mbytes, 256 Mbytes, 512 Mbytes, and 1 Gbyte.

Figure 1-6 Memory Placement



Memory Variants

Memory is organized on two 256 plus ECC bit buses. Each bus can hold up to two memory banks (a memory option) made up of four DIMM modules. Memory can be configured from a minimum of 128 Mbytes (1 MS340-BA) to 4 Gbytes (4 MS340-EA). All memory is synchronous.

			DRAM		
Option	**Size**	**Module**	**Type**	**Number/ option**	**Size**
MS340-BA	128 MB	54-25066-BA	Synch.	36	4 x 32MB
MS340-CA	256 MB	54-25053-BA	Synch.	36	4 x 64MB
MS340-DA	512 MB	54-25941-KA	Synch.	36	4 x 128MB
MS340-EA	1 GB	54-25941-BA	Synch.	36	4 x 256MB

Memory Operation

Two 256-bit memory buses transfer data between the cross-bar chipset switch and main memory. Each DIMM bank, made up of four DIMM modules, provides the data, or 256 bits plus 32 ECC bits, of the 32 bytes transferred. Two modules in the bank provide the odd bytes of data, and the other two modules provide the even bytes of data.

Memory Configuration Rules

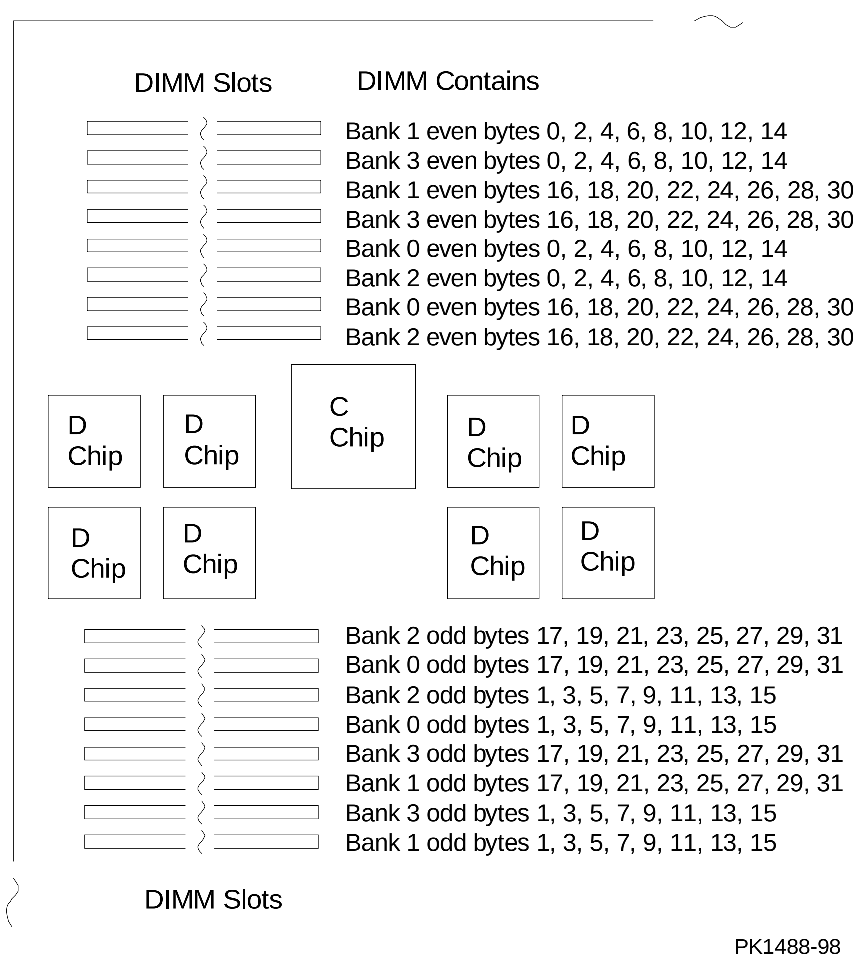
In a system, memories of different sizes are permitted, but:

- A memory option consists of four DIMMs all of which must be the same size.
- Convention places the largest memory option in slots marked 0 on the system board. See Figure 1-6.
- Memory options must be installed in slots designated for each bank. The first bank goes into slots marked 0, the second bank into slots marked 1, and so on.

1.7 Memory Addressing and Data Location

Memory addressing is contiguous beginning with memory bank 0. The first address of each bank is one above the ending address of the previous bank. Data is located in DIMMs as described by Figure 1-7.

Figure 1-7 Contents of DIMMs



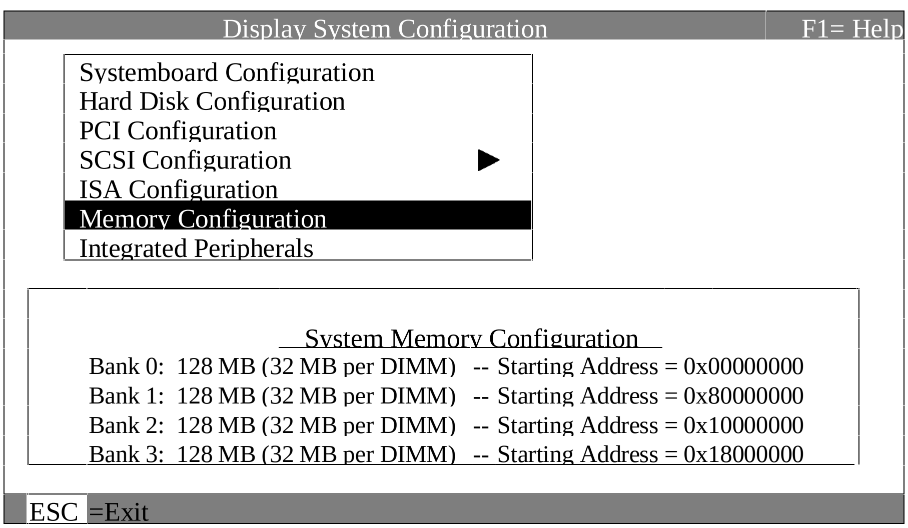
Memory Addressing

The first address of each bank is one above the ending address of the previous bank. Example 1–1 and Figure 1-8 show the starting address of each memory bank using either the SRM console or AlphaBIOS.

Example 1–1 Show Memory

```
P00>>> show memory

Array #       Size      Base Addr
-------    ----------   ---------
   0         128 MB     000000000
   1         128 MB     008000000
   2         128 MB     010000000
   3         128 MB     018000000

Total Bad Pages = 0
Total Good Memory = 512 MBytes
P00>>>
```

Figure 1-8 Memory Configuration



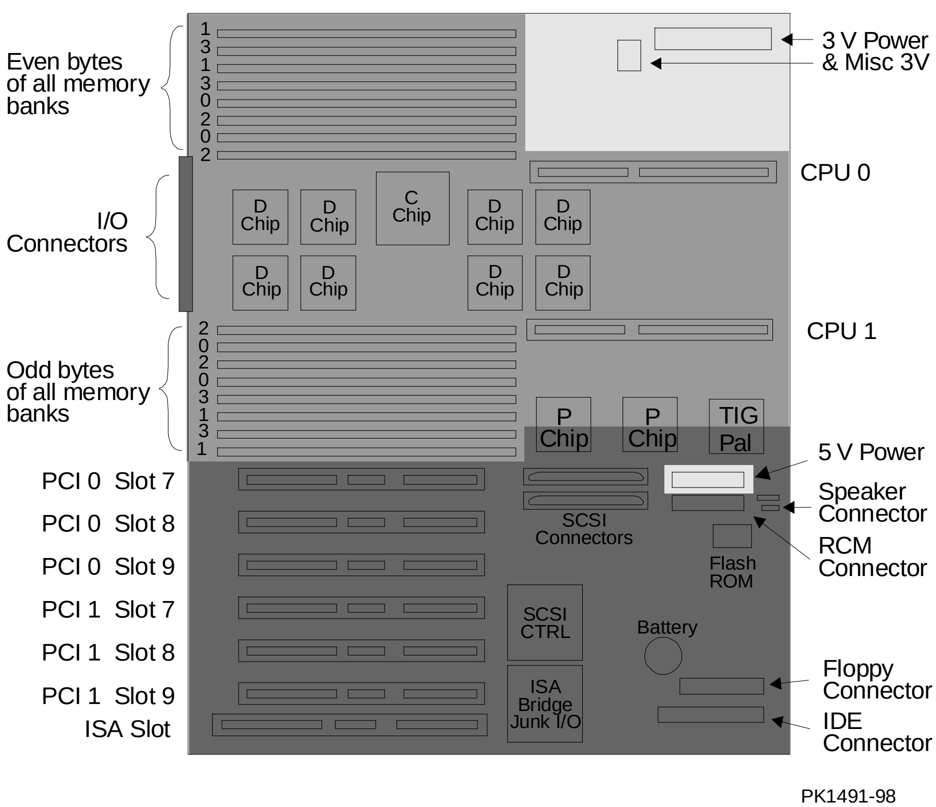
DIMM Contents

Figure 1-7 shows the data contents of each DIMM in memory. Odd data bytes are in DIMMs below the cross-bar switch chipset, and the even data bytes are in the DIMMs above the cross-bar switch chipset.

1.8 System Board

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

Figure 1-9 System Board



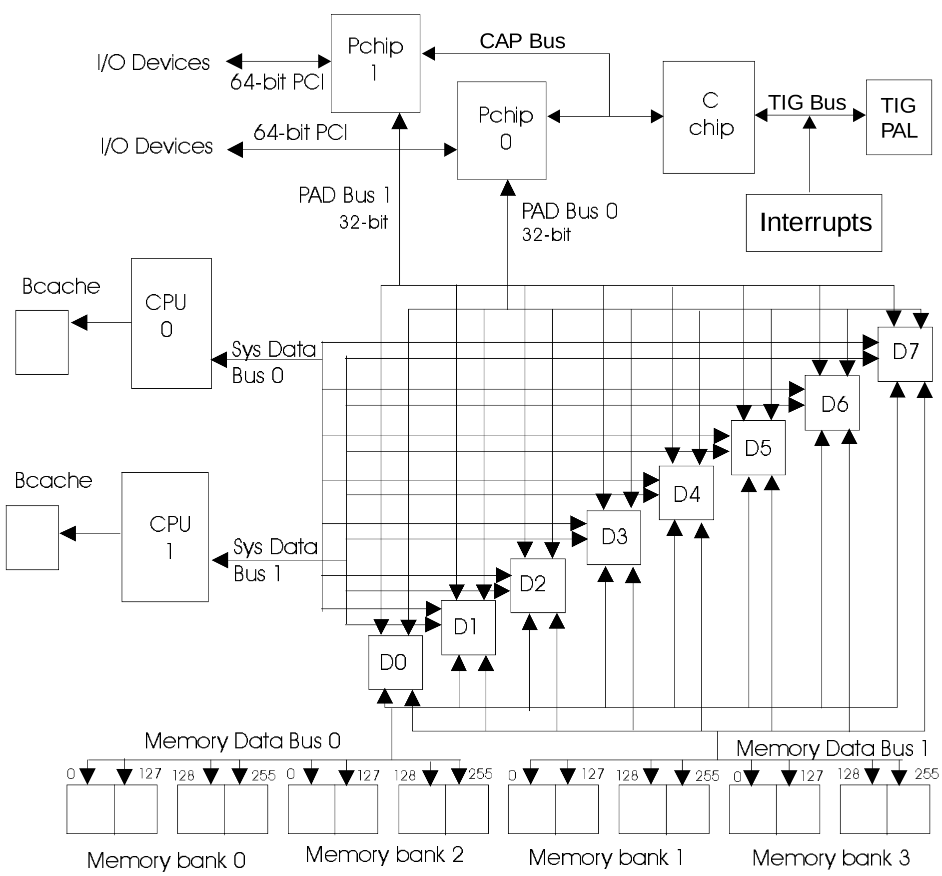
Three major sections on the system board are:

- The cross-bar switch chipset and the system components attached to it (CPU(s), memory, PCI chips, and the TIG bus)
- The power connections and voltage regulator
- The I/O subsystem

1.8.1 Cross-Bar Switch and System Components

The cross-bar switch chipset consists of a single control chip, the C-chip, and eight data chips, the D-chips. Into and out of the D-chips are two system buses to CPUs, two PAD buses to PCI chips, and two memory data buses that connect to up to four memory banks.

Figure 1-10 Cross-Bar Switch Data Block Diagram



Each type of bus in the system is unique:

- The two memory data buses operate in 256-bit mode passing two hex words (32 bytes) of data between memory and the D-chips per cycle. The bus operates at 83.3 MHz.
- The two CPU data buses operate in “64-bit mode” passing a quadword (8 bytes) of data between CPU and the D-chips per cycle. Though the CPU data bus is narrower than the memory data bus, it operates at four times the speed of the memory data bus at 333 MHz.
- The single CAP bus is a 24-bit wide bidirectional bus that carries commands and addresses and is also used for transmitting data to and from the C-chip CSRs and the TIG bus.
- The two PAD buses operate in 32-bit mode passing 8 nibbles per cycle. Two cycles are required to pass 8 bytes of data. The PAD bus runs at 83.3 MHz.
- The TIG bus handles flash ROM data (system diagnostics and console programs) and system interrupts.

The cross-bar switch is controlled by the C-chip which synchronizes, along with the clock, the D-chips, the CPUs, memory, and the P-chips. Figure 1-10 shows the major data paths through the system.

The C-chip contains:

- Buffers for requests for the P-chips (shared), and each CPU
- Request queues for each memory bank
- A CPU interface for probe and fill requests and issues
- A P-chip interface controller and bridge between PCI commands and addresses and CPU PIO commands and addresses
- D-chip controllers, one for the PAD bus and one for everything else

The D-chip contains:

- Queues to and from the P-chip, to and from the CPUs, and to and from memory
- Control from the C-chip

The P-chip contains:

- Upstream (away from the PCI) and downstream (toward the PCI) data queues
- Upstream and downstream address queues
- An upstream address state machine for DMA and peer-to-peer reads and writes
- A scatter/gather table for direct mapped and scatter/gather DMA memory access

1.8.2 I/O Subsystem

The I/O subsystem consists of two 64-bit PCI buses. One has an embedded ISA bridge, three PCI option slots, and a single ISA slot; the other bus has three PCI option slots.

Figure 1-11 PCI Block Diagram

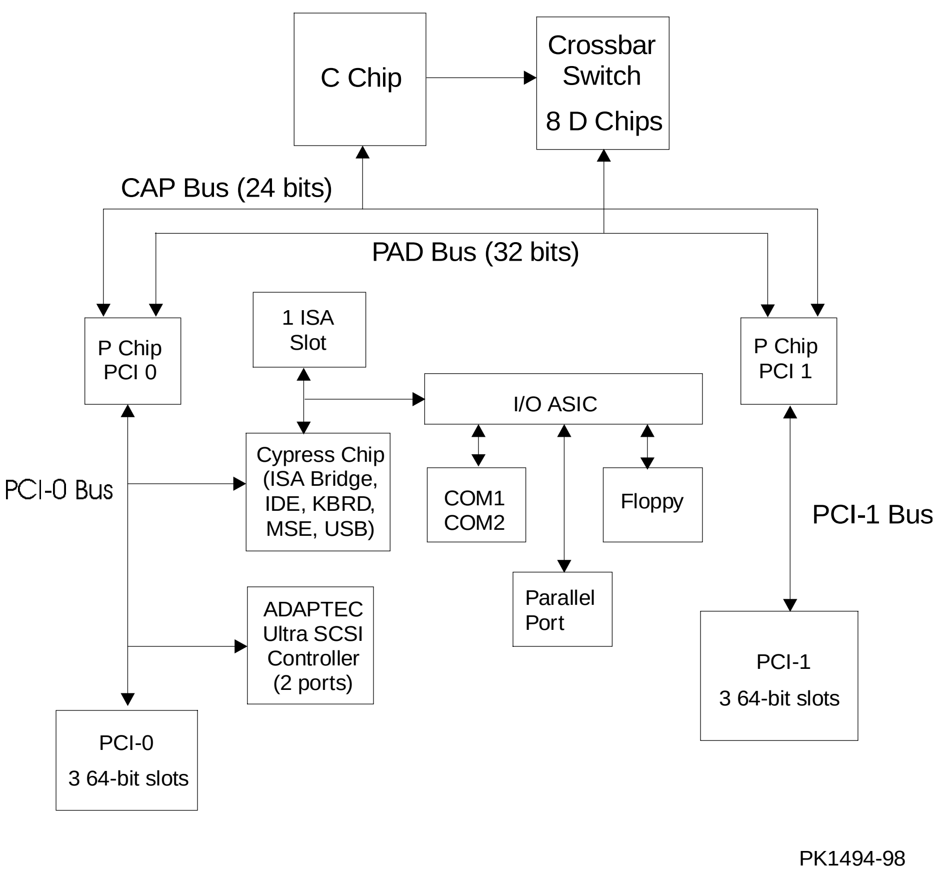


Table 1-1 PCI Slot Numbering

Slot	PCI0	PCI1	ISA	Shared
5	PCI to ISA bridge		ISA device	logically
6	Adaptec SCSI			
7	PCI slot	PCI slot		
8	PCI slot	PCI slot		
9	PCI slot	PCI slot	ISA device	physically

The logic for two PCI buses is on the system board.

- PCI0 is a 64-bit bus with three PCI slots, a Cypress chip, and an Adaptec SCSI controller. The Cypress chip is the PCI to ISA bus bridge and controls the following: the keyboard, mouse, IDE bus, real-time clock, and the USB bus. (The IDE bus and the USB bus are not used.) Connected to the ISA bus is an Adaptec UltraSCSI controller with two ports (also not used).
- PCI1 is a 64-bit bus with three PCI slots.

The cable connector to the floppy is on the system board. Connectors for the mouse, keyboard, and COM2 are on the bulkhead and are connected directly to the Cypress chip. The connector for COM1 is also on the bulkhead, but its path is from the Cypress chip to the RCM connector out to the server feature module and back through the RCM connector and then to the bulkhead. The path to the OCP is also carried through the RCM connector to the server feature module and then on to the OCP.

1.8.3 System Board Switchpacks

There are two switchpacks on the system board. They control the writing of the flash ROM and the speed of the crossbar switch among other things.

Figure 1-12 Switchpack Location

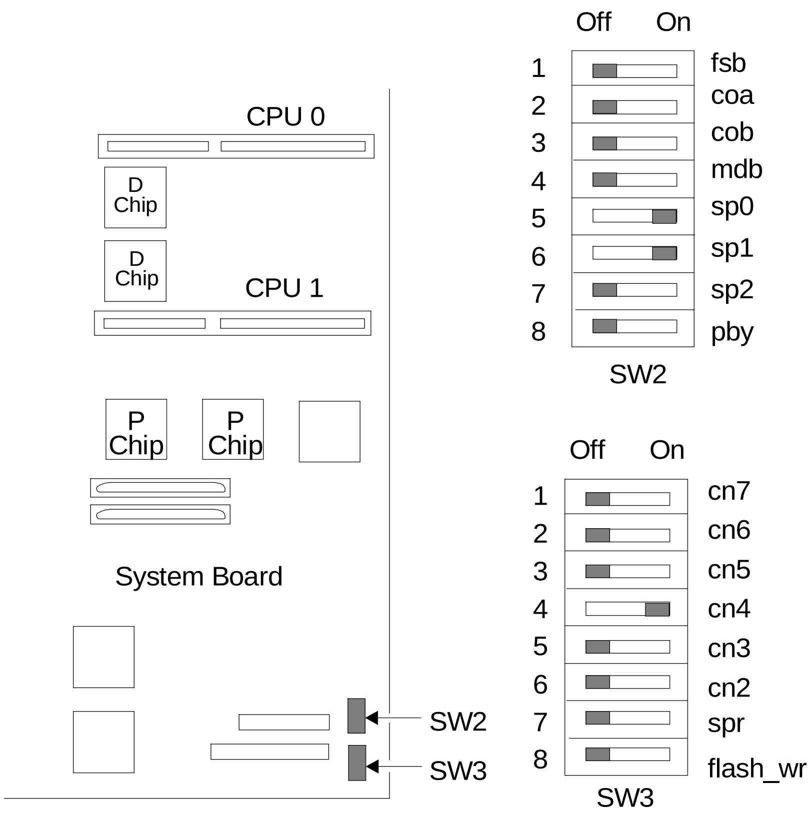


Figure 1-12 shows the location of the switchpacks and Table 1-2 and Table 1-3 describe what each switch controls.

Table 1-2 Switchpack 2

Switch	Description
1	Fail safe boot. Off (default) = normal boot. On = boot the fail safe booter
2	Reserved. Must be off.
3	Reserved. Must be off.
4	Reserved. Must be off.
5 6 7	Switches 5, 6, and 7 create a field that defines the speed at which the cross bar switch runs. Switches 5 and 6 are on and switch 7 is off.
8	AlphaBIOS Password bypass: Off (default) = Normal operation; On = Bypass AlphaBIOS password

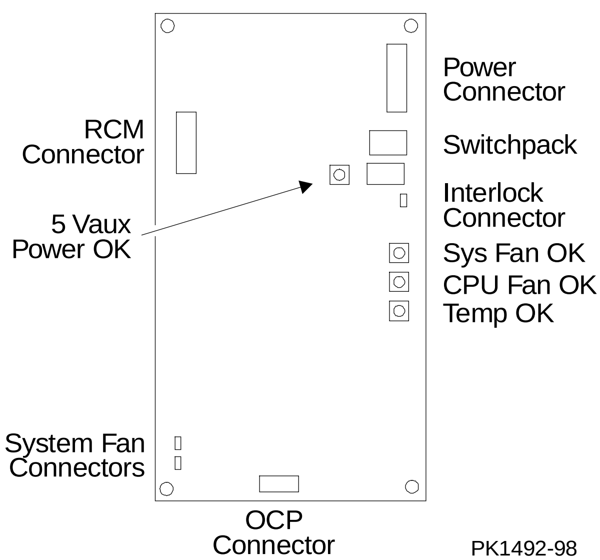
Table 1-3 Switchpack 3

Switch	Description
1	Reserved. Must be off.
2	Reserved. Must be off.
3	Reserved. Must be off.
4	Reserved. Must be on.
5	Reserved. Must be off.
6	Reserved. Must be off.
7	Reserved. Must be off.
8	Flash write protect: Off (default) = Write enable the flash ROM On = Write disable the flash ROM

1.9 Server Feature Module

The server feature module provides remote control operation of the system. A four-switch switchpack enables or disables remote control features.

Figure 1-13 Server Feature Module



The system allows both local and remote control. The remote control firmware and a set of switches that enable or disable remote control features reside on the server feature module.

Table 1-4 Remote Control Switch Functions

Switch	Condition	Function
1 EN RCM	On (default) Off	Allows remote system control Does not allow remote system control
2 Reserved	NA	Reserved
3 RPD DIS	On Off (default)	Disables remote power down Enables remote power down
4 SET DEF	On Off (default)	Resets the RCM microprocessor defaults 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 Appendix C for information on controlling the system remotely.

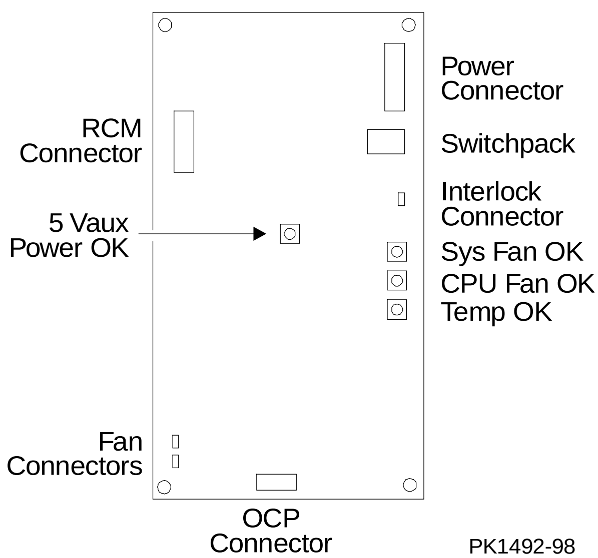
The server feature module connects to COM1 on the bulkhead so that its remote console functions can be accessed. The RCM uses VAUX power provided by the system power supplies.

The interlock circuit runs through the server feature module as does the path to the OCP. See Section 1.1.

1.9.1 Power Control Logic

The power control logic is on the server feature module.

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 = 55^0 C.
- Monitors the system and CPU fans and powers down the system 30 seconds after it detects a fan failure.
- Provides some visual indication of faults through LEDs.
- Provides I^2C 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 0, 1: present
  - Overtemp: Temp OK
  - System fan 0, 1: OK
  - Fan Kit OK

1.10 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

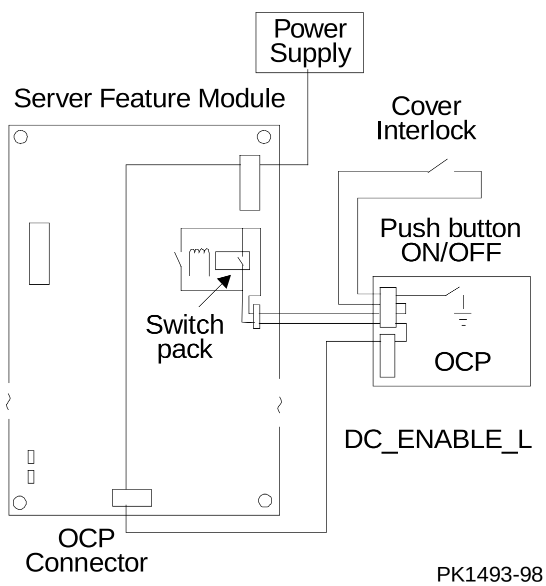


Figure 1-15 shows the distribution of the power enable circuit through the system. Opens in the circuit, or the RCM signal RCM_DC_EN_L, or a power supply detected power fault causes interruption to the DC power applied to the system.

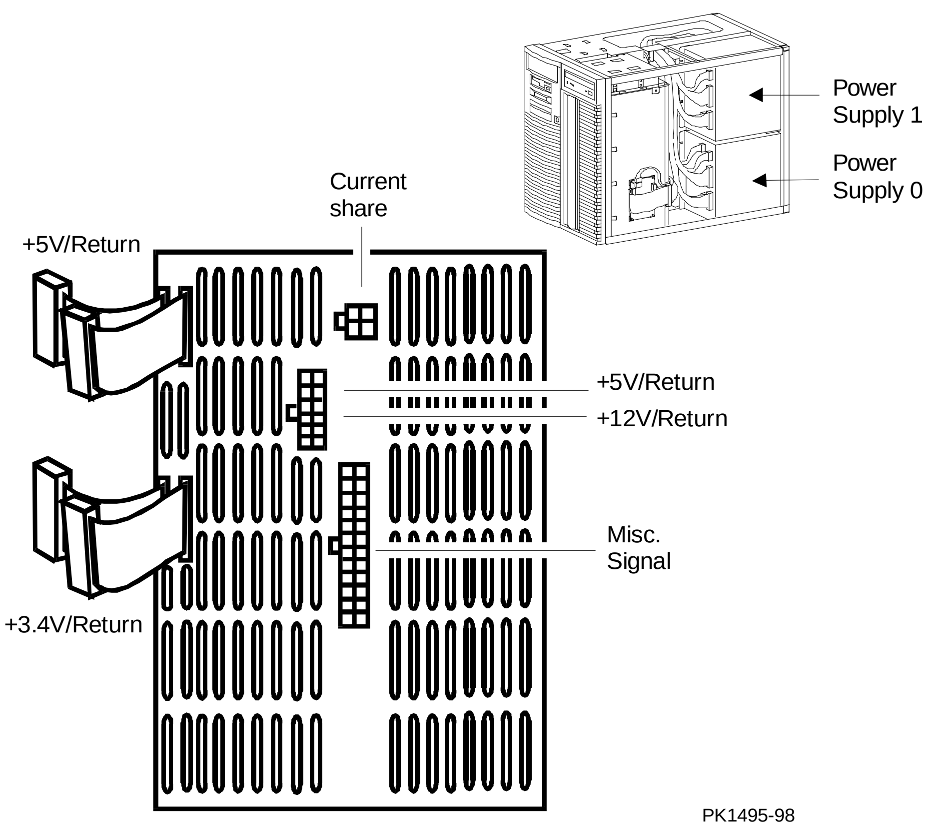
A failure anywhere in the circuit will result in the removal of DC power. A potential failure is the relay used in the remote control logic to control the RCM_DC_EN_L signal.

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.

1.11 Power Supply

Two power supplies provide system power.

Figure 1-16 Back of Power Supply and Location



Description

A single 675 watt power supply provides power to the system. A second power supply (optional) provides redundant power.

Power Supply Features

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

Output Voltage	Min. Voltage	Max. Voltage	Max. Current
+5.0	4.85	5.25	100
+3.3	3.18	3.48	100
+12	11.5	12.6	28
–12	–10.9	–13.2	2
+5 Vaux	4.9	5.4	1.5

- Remote sense on +5.0V and +3.3V

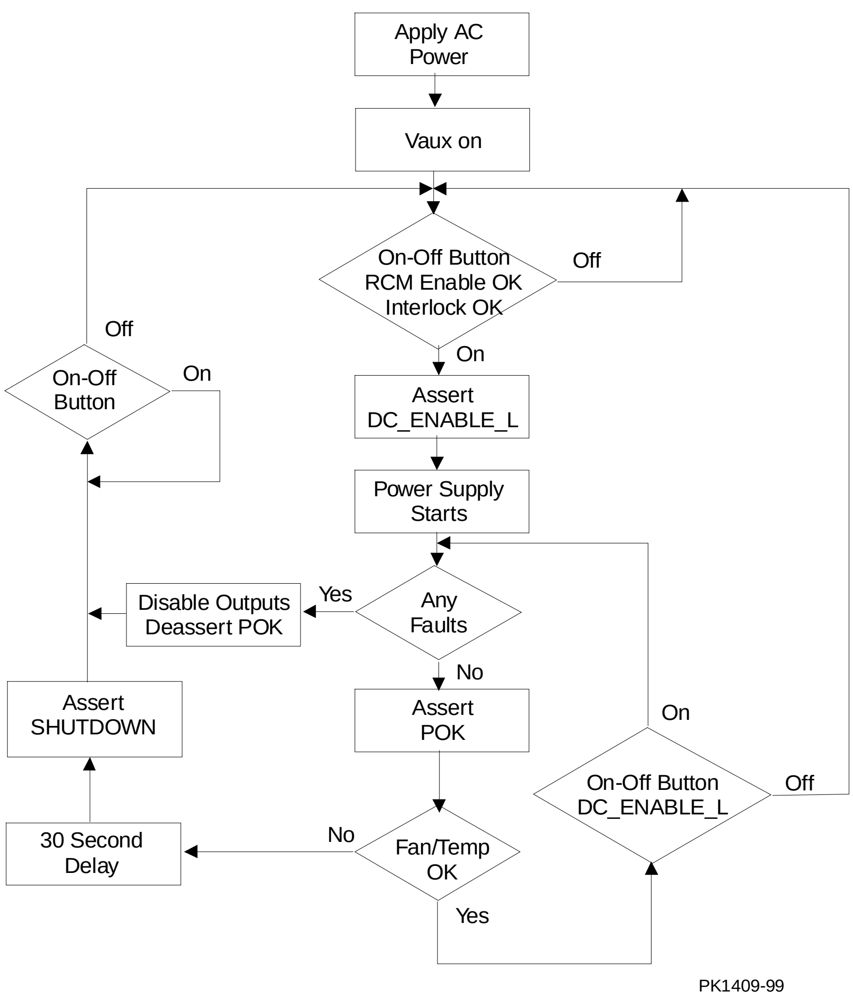
  +5.0V is sensed on the system board.
  +3.3V is sensed on the system board.
- Current share on +5.0V, +3.3V, and +12V.
- 3% regulation on +3.3V.
- Fault protection (latched). If a fault is detected by the power supply, it will shut down. The power supply faults detected are:

  Fan Failure (overtemp)
  Overvoltage
  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, or an overtemp condition detected by the power control logic.
- POK_H output signal indicates that the power supply is operating properly.

1.12 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



When AC is applied to the system, Vaux (auxiliary voltage) is asserted and is sensed on the server feature module. If the On-Off Button is On, and RCM OK and Interlock OK are asserted, the OCP 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 server feature module 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. If the system powers up and shuts off in approximately 30 seconds, the server feature module has sensed a fault and a fan (system or CPU) is likely broken.

1.13 TIG Bus

The Timing, Interrupt, and General bus (TIG) performs a number of functions; it carries all system interrupts, timing signals and provides the path to the diagnostic and console flash ROMs.

Figure 1-18 TIG Bus Block Diagram

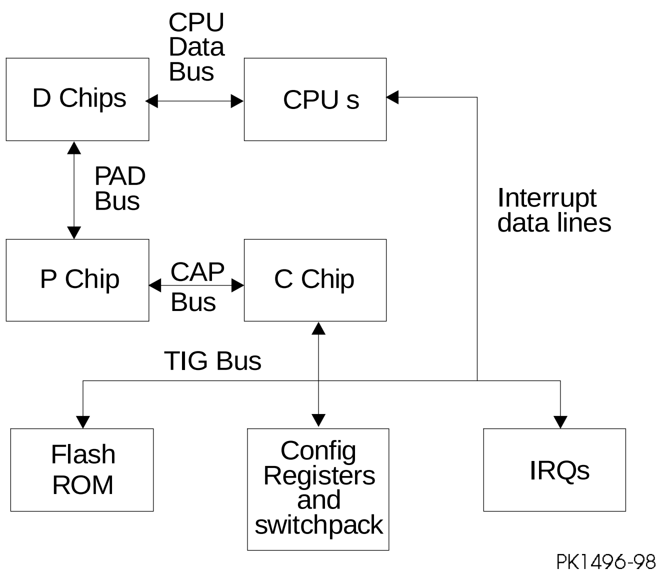


Figure 1-18 is a block diagram of the TIG bus implemented through the TIG chip. Three system functions are carried out on this bus.

Flash ROM

The flash ROM containing the diagnostics, fail-safe loader, and console firmware sits on the TIG bus. (This is different from the AS 1200 where the flash ROM sat on the I^2C bus.) Still a good deal of logic has to function for the diagnostics to run.

Configuration Registers

Registers on the bus include interrupts, module information, and clock information.

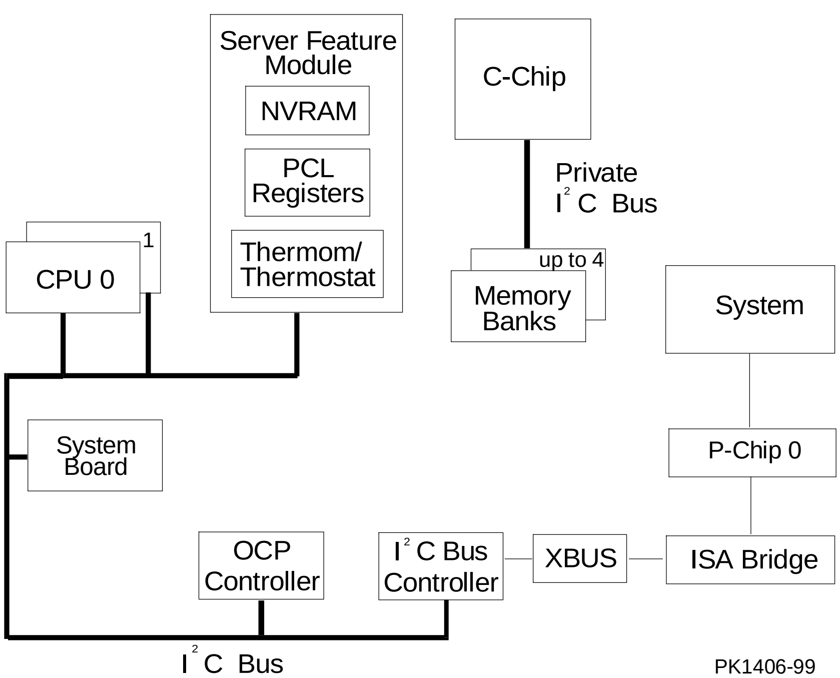
Interrupts

System interrupts are passed through the TIG bus to the C-chip. The bus connects directly to PCI slots and to onboard devices.

1.14 Maintenance Bus (I²C Bus)

There are two I²C buses (referred to as the "I squared C bus") in this system. The internal maintenance bus is used to monitor system conditions scanned by the power control logic on the server feature module, log error state and track system configuration information. There is a private I²C bus between memory and the C-chip used to provide memory configuration information to the consoles and operating systems.

Figure 1-19 I²C Bus Block Diagram



Monitor

The I^2C 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^2C bus when a CPU or system fan fails, an overtemperature condition exists, or power supplied to the system changes from N + 1 to N or from N to N +1.

The interrupt received by the I^2C bus controller and passed on to P-chip 0 alerts the system of a power system event that may or may not cause a power shutdown. In the event of imminent power loss the controller has 30 seconds to read the two registers and store the information in the NVRAM on the server feature module. The SRM console command **show power** reads these registers.

Fault Display

The OCP display is written through the I^2C bus.

Error State

Error state is stored for power, fan, and overtemperature conditions on the I^2C bus.

Configuration Tracking

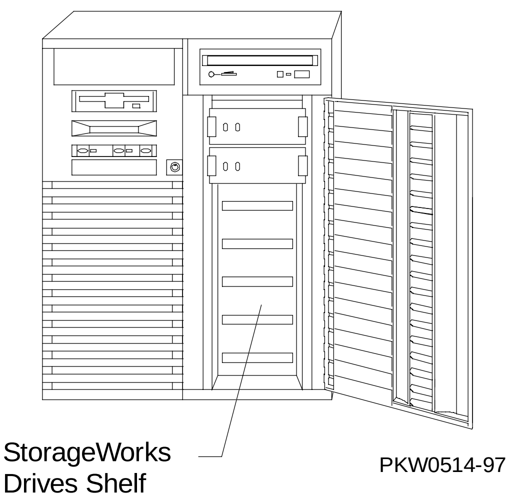
Each CPU and each logical section of the system board (the PCI bridge, the PCI backplane, the power control logic, the remote console manager), and the system board itself has an EEPROM that contains information about the module that can be written and read over the I^2C bus. All EEPROMs contain the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

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

1.15 StorageWorks Drives

The system supports up to seven StorageWorks drives.

Figure 1-20 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 UltraSCSI disk drives. The RAID controller is also supported. With an optional UltraSCSI Bus Splitter Kit, the StorageWorks shelf can be split into two buses.

Chapter 2

Troubleshooting

This chapter describes troubleshooting during power-up and booting. It also describes the console **test** command and other service related console commands. A Compaq Analyze example is also provided. The following topics are covered:

- Troubleshooting During Power-Up
- Control Panel Display and Troubleshooting
- Power-Up Display and Troubleshooting
- Running Diagnostics — Test Command
- Testing an Entire System
- Other Useful Console Commands
- Troubleshooting with LEDs
- Compaq Analyze
- Releasing Secure Mode

2.1 Troubleshooting During Power-Up

Power or other problems can occur before the system is up and running.

Power Problem List

The system will halt/power off for the following reasons:

1. A CPU fan failure
2. A system fan failure
3. An overtemperature condition
4. Power supply failure if the redundant power option is not present
5. Circuit beaker(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

- LEDs on the server feature module indicate fan, overtemperature, and power problem conditions.
- Circuit breaker(s) tripped at the AC service panel.
- There is no obvious indication for failures 7 – 9 from the power system.

Beep Codes

Number	Definition
1, 2, 3 beeps	The firmware in flash ROM is corrupt.
4 beeps	The header in the ROM is not valid.
6 beeps	A checksum error occurred after the ROM image was copied into memory.

If the system does not power up

- Are the power cords plugged in?
- Is the power supply functioning? (The power supply will shut down if it detects any faults. See Section 1.11.)
- Are the cover and side panels closed and the interlock engaged?

If the system comes up and approximately 30 seconds later goes down, possible failures are:

- CPU fan failure
- System fan failure
- Overtemperature condition

If you hear a series of beeps (1, followed by 2, followed by 3)

These beeps indicate that the firmware in flash ROM is corrupt. The machine hangs and the floppy light goes on.

Action:

1. On a working machine, insert the Alpha Systems Firmware Update Version V5.4 (minimum rev.) CD in the CD-ROM drive and copy the file PC264SRM.ROM found in the DS20 subdirectory onto a floppy renaming the file to DP264SRM.ROM.
2. Insert the floppy you just made into the floppy drive on the broken system.
3. Using the On/Off button, turn the machine off and then back on. The SRM console will load from the floppy.
4. Place the Alpha Systems Firmware Update CD in the CD-ROM drive.
5. Run LFU and update the firmware.

Refer to Appendix C for instructions on updating firmware.

If you hear four beeps

The header in the ROM is not valid, and the system will not boot. Replace the system board.

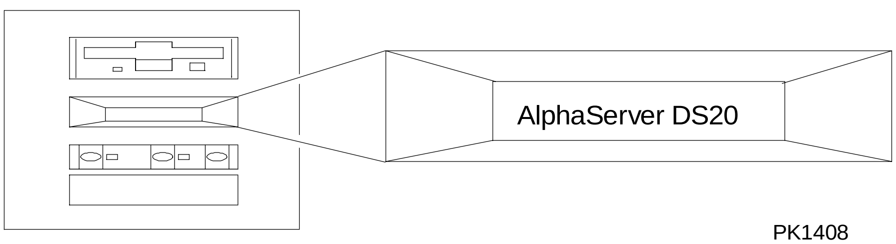
If you hear six beeps

Six beeps indicate a checksum error occurred after the ROM image was copied into memory. Either memory is misconfigured or a memory DIMM needs to be reseated.

2.2 Control Panel Display and Troubleshooting

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

Figure 2-1 Control Panel and LCD Display



- 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 server feature module 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.

Table 2-1 Control Panel Display

Content of Display	Progress Indicated in Power-Up Flow
Compaq	CPU functioning, path to the OCP operating. Hardware involved – CPU, C-chip, P-chip 0, PCI to ISA bridge, ISA to XBUS bridge, OCP controller.
Compaq *	B-cache initialized and both B-cache and memory is being tested. Additional hardware involved: Backup cache on the CPU module, D-chips, memory DIMMs.
Compaq Firmware	Firmware loading. Additional hardware involved – TIG bus.
Compaq Error 06	Memory error. No memory was found, or memory is bad, or misconfigured, or needs re-seating.
Probe I/O Subsystem	SRM console probing the system. Additional hardware involved – P-chip 1, all devices on both PCIs.
AlphaServer DS20	Either the SRM console or AlphaBIOS are up and running.

2.3 Power-Up Display and Troubleshooting

If the power-up display appears, the following hardware is at least partially functioning: at least one CPU, the C-chip, some D-chips, the P-chips, the TIG bus, the ISA bridge, and the I^2 C bus. The entire power-up display prints to a serial terminal (if the console environment variable is set to serial); the last several lines print to either a serial terminal or a graphics monitor. Power-up status also is seen on the control panel display.

Example 2–1 Power-Up Display

```
512 Meg of system memory                    ❶
probing hose 1, PCI                         ❷
bus 0, slot 7 -- pka -- QLogic ISP1040
bus 0, slot 8 -- ewa -- DECchip 21140-AA
probing hose 0, PCI
probing PCI-to-ISA bridge, bus 1
bus 0, slot 5, function 1 -- dqa -- Cypress 82C693 IDE
bus 0, slot 5, function 2 -- dqb -- Cypress 82C693 IDE
bus 0, slot 6, function 0 -- pkb -- Adaptec AIC-7895
bus 0, slot 6, function 1 -- pkc -- Adaptec AIC-7895
bus 0, slot 7 -- vga -- DEC PowerStorm
bus 0, slot 8 -- ewa -- DECchip 21040-AA
Testing the System                               ❸
Testing the Disks (read only)
Testing the Network
System Temperature is 22 degrees C

Compaq AlphaServer DS20 Console V5.4, Aug 26 1998 16:07:57 ❹

P00>>>
```

By the time the power-up display is completed,

1. the CPUs have run their self-tests,
2. the SROM has completed its preliminary tests and loaded the SRM console from flash ROM on the TIG bus into memory,
3. the SROM has passed control to the SRM console,
4. the SRM has polled the system, run its system diagnostics, and has sent the display characters.

If the system's operating system is NT, you will not see any of the power-up display before the line that says "Testing the System."

❶ Memory size is determined by the C-chip.

❷ The PCI bridges and attendant buses (indicated as IOD*n* by the console) are probed and the devices are reported. I/O adapters are configured. At a minimum, the devices are responding to probes by the console program.

❸ The system, disks, and network are tested by the console.

❹ The SRM console banner and prompt are printed. (The SRM prompt is shown in this manual as P00>>>. It can, however, be P01>>>. The number indicates the primary processor.) If the **auto_action** environment variable is set to **boot** or **restart** and the **os_type** environment variable is set to **unix** or **openvms**, the Compaq Tru64 UNIX or OpenVMS operating system boots.

If the system is running the Windows NT operating system (the **os_type** environment variable is set to **nt**), the SRM console loads and starts the AlphaBIOS console.

Refer to Chapters 4 and 5 of the *AlphaServer DS20 User's Guide* for information about the SRM console and AlphaBIOS.

2.4 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 2–2 Test Command Syntax

```
P00>>> help test
NAME
         test
FUNCTION
         Test the system.
SYNOPSIS
         test [-lb] [-t <time>]

                        COMMAND ARGUMENT(S):

P00>>>
P00>>>
P00>>>


SYNOPSIS
  test ([-lb] [-t <time>]
  The entire system is tested by default.
```

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, or select* ***Tru64 UNIX (SRM)*** *or* ***OpenVMS (SRM)*** *from the* ***Advanced CMOS Setup*** *screen and reset the system.*

test [**-lb**] [**-t** *time*]

-lb	Loop back test enable. Loop back connectors are needed on COM1, COM2, and the parallel port.
-t *time*	Specifies the run time in seconds. The default for system test is 600 seconds (10 minutes).

2.5 Testing an Entire System

A test command runs all exercisers for subsystems and devices on the system. I/O devices tested are supported boot devices. The test runs for 2 minutes.

Example 2–3 Sample Test Command

```
P00>>> test

System test, runtime 120 seconds

Type ^C if you wish to abort testing once it has started

Default zone extended at the expense of memzone.
Use INIT before booting

Testing Ethernet device(s)
Testing VGA
Testing Memory

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

Testing floppy drive (dva0, read-only)
No diskette present, skipping floppy test

 ID       Program      Device    Pass  Hard/Soft Bytes Wrtn   Bytes Rd
-------- ------------ ---------- ----- -------- ----------   ----------
00001c12   memtest  memory         1    0    0    352321536  352321536
00001c17   memtest  memory         1    0    0    352321536  352321536
00001c35   memtest  memory         1    0    0    352321536  352321536
00001c80   exer_kid dkb100.1.0.9   0    0    0            0    4915200
00001c83   exer_kid dkb200.2.0.9   0    0    0            0    4898816
00001c85   exer_kid dkb300.3.0.9   0    0    0            0    4898816
00001cc7   exer_kid dke0.0.0.200   0    0    0            0    6144000
00001cc8   exer_kid dke200.2.0.2   0    0    0            0    6144000
00001cc9   exer_kid dke400.4.0.2   0    0    0            0    6127616
00001cf7   exer_kid dkf100.1.0.2   0    0    0            0    8830976
00001cfa   exer_kid dkf300.3.0.2   0    0    0            0    8814592

 ID       Program      Device    Pass  Hard/Soft Bytes Wrtn   Bytes Rd
-------- ------------ ---------- ---- ---------- ----------   ---------
00001c12   memtest memory          1    0    0    713031680  713031680
00001c17   memtest memory          1    0    0    721420288  721420288
00001c35   memtest memory          1    0    0    713031680  713031680
00001c80   exer_kid dkb100.1.0.9   0    0    0            0   12730368
00001c83   exer_kid dkb200.2.0.9   0    0    0            0   12713984
00001c85   exer_kid dkb300.3.0.9   0    0    0            0   12713984
00001cc7   exer_kid dke0.0.0.200   0    0    0            0    8749056
00001cc8   exer_kid dke200.2.0.2   0    0    0            0    8749056
00001cc9   exer_kid dke400.4.0.2   0    0    0            0    8749056
00001cf7   exer_kid dkf100.1.0.2   0    0    0            0   13533184
00001cfa   exer_kid dkf300.3.0.2   0    0    0            0   13516800
```

Continued on next page

```
   ID       Program      Device     Pass  Hard/Soft Bytes Wrtn   Bytes Rd
-------- ------------ ---------- ----- -------- ----------   ----------
00001c12   memtest memory         2     0   0   1082130432    1082130432
00001c17   memtest memory         2     0   0   1082130432    1082130432
00001c35   memtest memory         2     0   0   1073741824    1073741824
00001c80   exer_kid dkb100.1.0.9  0     0   0            0      20086784
00001c83   exer_kid dkb200.2.0.9  0     0   0            0      20086784
00001c85   exer_kid dkb300.3.0.9  0     0   0            0      20086784
00001cc7   exer_kid dke0.0.0.200  0     0   0            0      16531456
00001cc8   exer_kid dke200.2.0.2  0     0   0            0      16515072
00001cc9   exer_kid dke400.4.0.2  0     0   0            0      16515072
00001cf7   exer_kid dkf100.1.0.2  0     0   0            0      23511040
00001cfa   exer_kid dkf300.3.0.2  0     0   0            0      23494656

ID       Program      Device     Pass  Hard/Soft Bytes Wrtn   Bytes Rd
-------- ------------ ---------- ----- -------- ----------   ----------
00001c12   memtest memory         2    0    0    1442840576   1442840576
00001c17   memtest memory         2    0    0    1442840576   1442840576
00001c35   memtest memory         2    0    0    1442840576   1442840576
00001c80   exer_kid dkb100.1.0.9  0    0    0             0     28852224
00001c83   exer_kid dkb200.2.0.9  0    0    0             0     28852224
00001c85   exer_kid dkb300.3.0.9  0    0    0             0     28852224
00001cc7   exer_kid dke0.0.0.200  0    0    0             0     19513344
00001cc8   exer_kid dke200.2.0.2  0    0    0             0     19513344
00001cc9   exer_kid dke400.4.0.2  0    0    0             0     19513344
00001cf7   exer_kid dkf100.1.0.2  0    0    0             0     29917184
00001cfa   exer_kid dkf300.3.0.2  0    0    0             0     29900800

ID       Program      Device     Pass  Hard/Soft Bytes Wrtn   Bytes Rd
-------- ------------ ---------- ----- -------- ----------   ----------
00001c12   memtest memory         2    0    0    1803550720   1803550720
00001c17   memtest memory         2    0    0    1811939328   1811939328
00001c35   memtest memory         2    0    0    1803550720   1803550720
00001c80   exer_kid dkb100.1.0.9  0    0    0             0     36241408
00001c83   exer_kid dkb200.2.0.9  0    0    0             0     36241408
00001c85   exer_kid dkb300.3.0.9  0    0    0             0     36241408
00001cc7   exer_kid dke0.0.0.200  0    0    0             0     26968064
00001cc8   exer_kid dke200.2.0.2  0    0    0             0     26968064
00001cc9   exer_kid dke400.4.0.2  0    0    0             0     26968064
00001cf7   exer_kid dkf100.1.0.2  0    0    0             0     38158336
00001cfa   exer_kid dkf300.3.0.2  0    0    0             0     38158336
^C
P00>>>
```

2.6 Other Useful Console Commands

Several console commands can be used to diagnose the system.

The **show power** command identifies power, temperature, and fan faults.

Example 2–4 Show Power

```
P00>>> show power

                        Status
Power Supply 0           good
Power Supply 1/Fan Tray  good
System Fans              good
CPU Fans                 good
Temperature              good

Current ambient temperature is 27 degrees C
System shutdown temperature is set to 55 degrees C

1 Environmental events are logged in nvram
Do you want to view the events? (Y/<N>) y

Total Environmental Events: 1 (1 logged)

1  NOV 11 18:00  System Fan 0 Failure, Power Supply 0,1 Failure

Do you want to clear all events from nvram? (Y/<N>) n
P00>>>
```

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

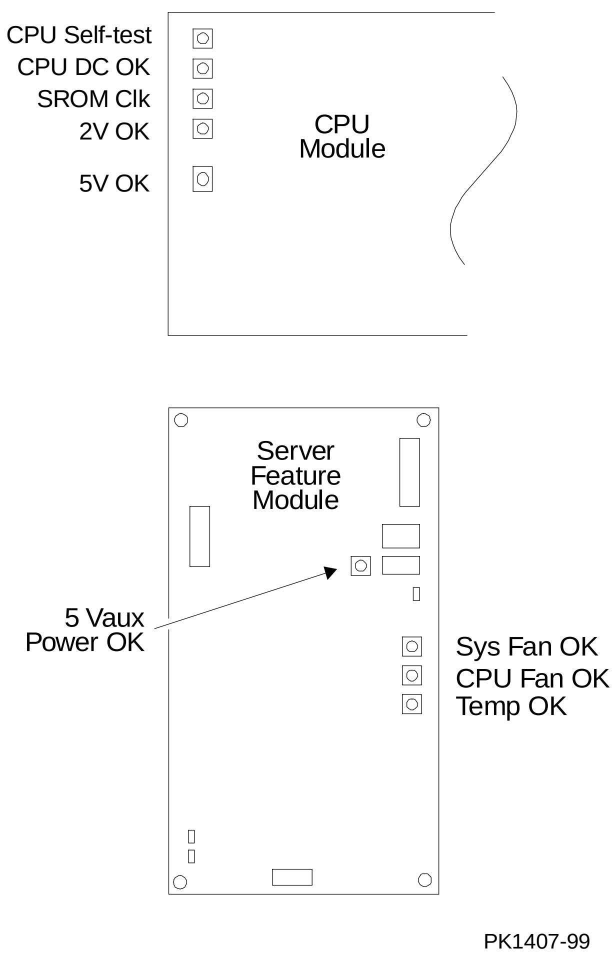
Example 2–5 Show Memory

```
P00>>> show memory

Array #       Size     Base Addr
-------    ----------  ---------
   0         512 MB    000000000
   1         512 MB    020000000
   2         256 MB    040000000
   3         128 MB    050000000

Total Bad Pages = 0

Total Good Memory = 1408 MBytes

P00>>>
```

2.7 Troubleshooting with LEDs

During power-up, reset, initialization, or testing, diagnostics are run on CPUs, memories, P-chips, and the PCI backplane and its embedded options. Although system LEDs are not visible when the side panels are on, they can be viewed when the card cage side of the system is exposed and the top cover is on. There are LEDs on the CPU and server feature modules.

Figure 2-2 CPU and Server Feature Module LEDs



To see LEDs, the card cage side of the system must be exposed; the system top should be on, and the system must be on.

CPU LEDs

The CPU LEDs are on the under side of the module. Figure 2-2 shows the location of the LEDs when looking up at the module. Normally all CPU LEDs are on except the SROM Clock LED.

Replace the CPU if the 5V OK LED is on and any of the following LEDs are off: CPU DC OK, or 2V OK.

If the 5V OK LED is off, power is not getting to the CPU. The problem could be the power harness, the power translation board, the power supply, or the CPU.

If the CPU self-test LED is off, the built-in self-test on the CPU chip did not complete for some reason.

Server Feature Module LEDs

All the LEDs on this module are normally on.

If the 5 Vaux Power OK LED is off, power is not getting to the module and the problem could be the power harness, the power translation board, the power supply, or the server feature module.

If the Sys Fan OK LED is off, a system fan is broken. Use the **show power** command to determine which.

If the CPU Fan OK LED is off, a CPU fan is broken. Use the **show power** command to determine which.

If the Temp OK LED is off, the temperature in the cabinet is above the temperature threshold. 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. If the system gets too hot, hardware can be damaged.

2.8 Compaq Analyze

Compaq Analyze is the error analysis tool used to analyze errors. An example of its output is shown here. For information on installing, running, and learning about Compaq Analyze, go to http://www.evnrud.cxo.dec.com/desta/kits.htm.

2.8.1 Compaq Analyze Graphics Interface (GUI)

Compaq Analyze automatically runs on each of the supported operating systems on the DS20 system.

Figure 2-3 Compaq Analyze Graphics Interface

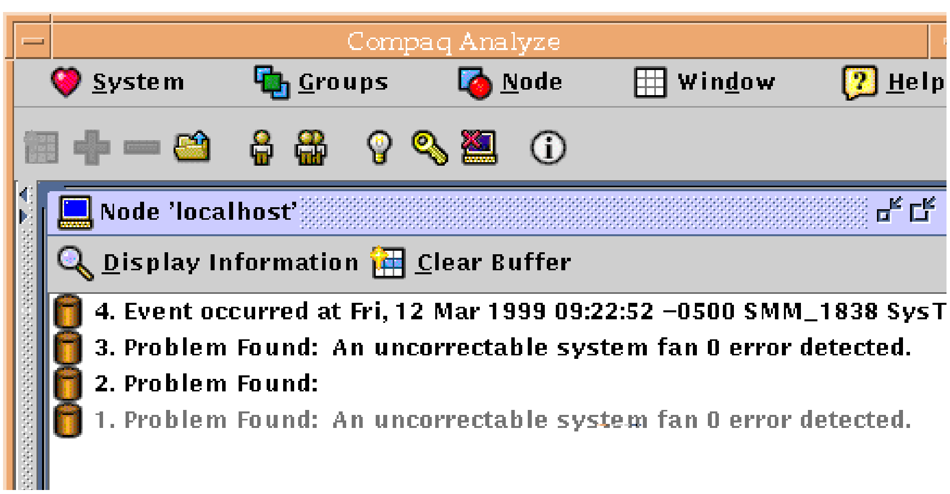


Figure 2-3 shows an example of what you can expect to see on a system's console, assuming it is a graphics terminal and Compaq Analyze is installed and running in the backround. When an error is detected, it is reported to the console with a series of problem found statements. In this case, "an uncorrectable system fan 0 error detected," was logged a couple of times in the event log with a time stamp of Friday March 12, 1999.

To get a full analysis of the error, double click on the Problem Found: hot spot on the active screen and a full report of the error is displayed.

2.8.2 Description of the Error

After "double clicking" the Problem Found: hot spot on the Compaq Analyze screen a full description of the error is displayed and a FRU and its location is called out. Example 2–6 shows a Compaq Analyze error report.

Example 2–6 Compaq Analyze Error Report

Problem Found: An uncorrectable system fan 0 error detected.

Managed Entity:

```
System Entity: enugu Error Environment:
Record Number :
Event ID_Count:2Event ID_Prefix:15008
Event Time:
Time of Error : Thu, 11 Mar 1999 12:43:58 –0500
```

Brief Description:

```
An uncorrectable system fan 0 error detected.
```

Callout ID:

```
0020050000072E05
```

Severity:

```
2
```

Reporting Node:

```
enugu
```

Full Description:

```
An uncorrectable system fan 0 error has been diagnosed. This System
error requires replacement service to be administered to Fan 0 Field
Replaceable Unit (FRU). This FRU is physically located in the
compartment to the right of the system card cage and is System Fan 0
– Upper Fan.
```

FRU List:

```
Probability: High
Manufacturer: Compaq
Device Type: Power, Cooling, and Temperature
Physical Location: Slot System Fan 0 --
FRU Part Number: System fan 0 pn from config tree
FRU Serial Number: Fru SN from config tree
FRU Firmware Rev: NA
```

Evidence:

```
Entry Errlog: SMM_1838 SysType_34 OS_Type_1 Entry_Type_682
Entry_Type_Ana Mchk_Error_Cod
Event_Header_Common_Fields_V2_0
Event_Leader: xFFFFFFFE
Header_Length: 176
Event_Length: 312
Header_Rev_Major: 2
Header_Rev_Minor: 0
OS_Type: 1                          ! 1 = UNIX, 2 = OVMS, 3 = NT
Hardware_Arch: 4
CEH_Vendor_ID: 3564
Hdwr_Sys_Type: 34
Logging_CPU: 0
CPUs_In_Active_Set: 2
Major_Class: 115
Minor_Class: 2
DSR_Msg_Num: 1838                   ! Compaq AlphaServer DS20
CEH_Device: 35
Chip_Type: 8                        ! 8 = EV6
CEH_Device_ID_0: x0000FFFF
CEH_Device_ID_1: x00000000
CEH_Device_ID_2: x00000000
Unique_ID_Count: 2
Unique_ID_Prefix: 15008
Num_Strings: 2
Event_Header_UNIX_WNT_Specific_Fields_V2_0
Priority: 3
DID_Fmt: x00
Subid_Errcode: xFFFFFFFF
Subid_Num: 0
TLV_Processing_Support
TLV_Time_as_Local: Thu, 11 Mar 1999 12:43:58 -0500
TLV_Computer_Name: enugu
SMM_Decode_Support
System_Marketing_Model: 1838       ! Compaq AlphaServer DS20
System_Type: 34
Chip_Type: 8
Member_ID: 6
Chip_Speed: 500
Number_of_CPUs: 1
Entry_Type_Support
Entry_Type: 682      ! Machine Check type 682 (environment error)
```

Continued on next page

```
Systype34_Env_Regs_V1
Frame_Flags: x00000000
Mchk_Error_Code: x00000206
Frame_Rev: 1
SW_Sum_Flags: x0000000000000000
Cchip_DIR: x0001000000000000
Environ_QW_1: x0000000000000009
Environ_QW_2: x000000000000004F
Environ_QW_3: x0000000000000000
Environ_QW_4: x0000000000000000
Environ_QW_5: x0000000000000000
Environ_QW_6: x0000000000000000
Environ_QW_7: x0000000000000000
Environ_QW_8: x0000000000000000
Environ_QW_9: x0000000000000000
Subpacket_Support
Subpacket_Header_Support
Trailer_Frame_Support
Compaq Analyze Problem Report
```

Of particular interest in the error report is the **Full Description** of the error. If Compaq Analyze is able to determine what failed on the machine, it gives a full description of the failing FRU and its location. In this case the upper system fan is identified as the failing part and its location is given.

Evidence provided depends upon the type of error detected. The types of errors detected are given in Table 2-2. The evidence section of the Compaq Analyze report provides information that lead the tool to identify the failing FRU and its location. For more information, see the Regatta Platform Fault Management Specification.

Table 2-2 Types of Errors

Error Event	Description
MCHK 670	Processor Machine checks. These are synchronous errors that inform precisely what happened at the time the error occurred. They are detected inside the CPU chip and are fatal errors.
MCHK 660	System machine checks. These are asynchronous errors that are recorded after the error has occurred. Data on exactly what was going on in the machine at the time of the error may not be known. They are fatal errors.
MCHK 630	Processor correctable errors.
MCHK 620	System correctable errors.
MCHK 682 - 685	System environment failures that require repair (power supply failure, system fan failure, overtemperature condition).
MCHK 687	Redundant power supply failure.

2.9 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 2–7 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, enter the **login** command:

```
P00>>> login
please enter password:
```

At this 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*.

Chapter 3

Error Registers

This chapter describes the following registers used to hold error information:

- Ibox Status Register - I_STAT
- Memory Management Status Register – MM_STAT
- Dcache Status Register – DC_STAT
- Cbox Read Register
- Miscellaneous Register (MISC)
- Device Interrupt Request Register (DIRn, n=0,1)
- Pchip Error Register (PERROR)
- Failure Register
- Function Register

3.1 Ibox Status Register - I_STAT

The Ibox Status Register (I_STAT) is a read/write-1-to-clear register that contains Ibox status information. The register is read only by PAL code and is an element in the CPU or System Uncorrectable Machine Check Error Logout frame.

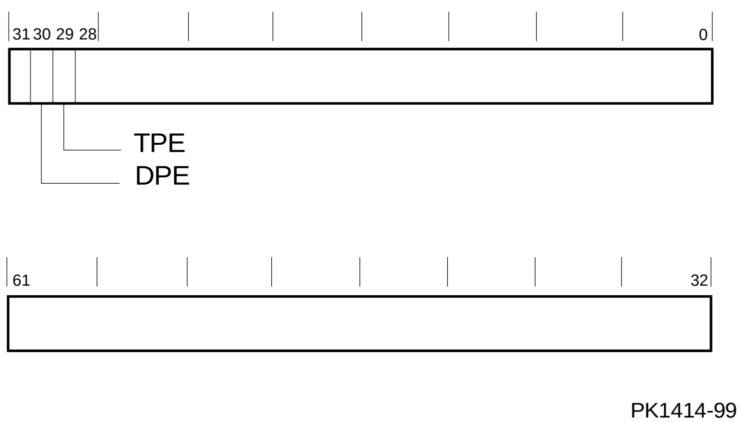


Table 3-1 Ibox Status Register

Name	Bits	Type	Description
Reserved	<63:31>	RO	Reserved for Compaq.
DPE	<30>	W1C	Icache data parity error When set, indicates that the Icache encountered a data parity error on instruction fetch.
TPE	<29>	W1C	Icache tag parity error When set, indicates that the Icache encountered a tag parity error on instruction fetch.
Reserved	<28:0>	RO	Reserved for Compaq.

3.2 Memory Management Status Register – MM_STAT

The Memory Management Status Register (MM_STAT) is a read-only register. When a Dstream TB miss or fault occurs, information about the error is latched in MM_STAT. This register is not updated when a LD_VPTE gets a DTB miss instruction. The register is read only by PALcode and is an element in the CPU or System Uncorrectable Machine Check Error Logout frame.

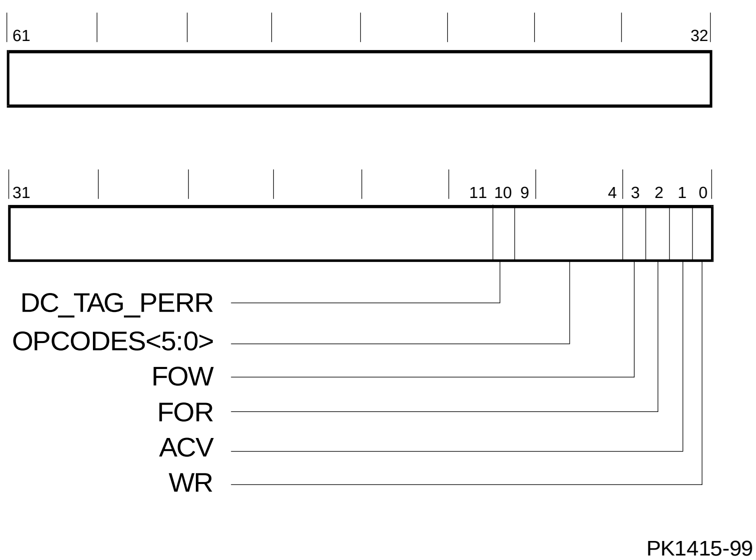


Table 3-2 Memory Management Status Register

Name	Bits	Type	Description
Reserved	<63:11>		Reserved for Compaq.
DC_TAG _PERR	<10>	RO	This bit is set when a Dcache tag parity error occurs during the initial tag probe of a load or store instruction. The error created a synchronous fault to the D_FAULT PALcode entry point and is correctable. The virtual address associated with the error is available in the VA register.
OPCODE	<9:4>	RO	Opcode of the instruction that caused the error. HW_LD is displayed as 3 and HW_ST is displayed as 7.
FOW	<3>	RO	Set when a fault-on-write error occurs during a write transaction and PTE[FOW] was set.
FOR	<2>	RO	Set when a fault-on-read error occurs during a read transaction and PTE[FOR] was set.
ACV	<1>	RO	Set when an access violation occurs during a transaction. Access violations include a bad virtual address.
WR	<0>	RO	Set when an error occurs during a write transaction.

3.3 Dcache Status Register – DC_STAT

The Dcache Status Register (DC_STAT) is a read-write register. If a Dcache tag parity error or data ECC error occurs, information about the error is latched in this register. The register is read only by PALcode and is an element in the CPU or System Uncorrectable Machine Check Error Logout frame.

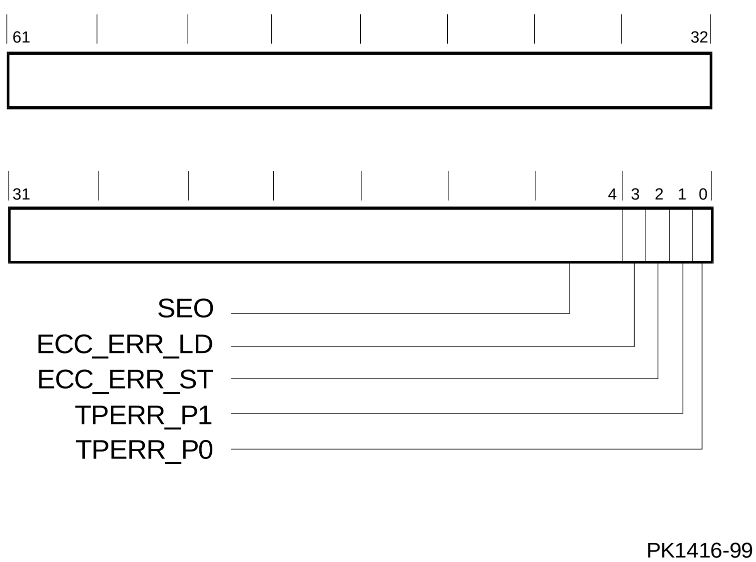


Table 3-3 Dcache Status Register

Name	Bits	Type	Description
Reserved	<63:5>		Reserved for Compaq.
SEO	<4>	W1C	Second error occured. When set, indicates that a second Dcache store ECC error occurred within 6 cycles of the previous Dcache store ECC error.
ECC_ERR _LD	<3>	W1C	ECC error on load. When set, indicates that a single-bit ECC error occurred while processing a load from the Dcache or any fill.
ECC_ERR _ST	<2>	W1C	ECC error on store. When set, indicates that an ECC error occurred while processing a store.
TPERR_P1	<1>	W1C	Tag parity error — pipe 1. When set, indicates that a Dcache tag probe from pipe 1 resulted in a tag parity error. The error is uncorrectable and results in a machine check.
TPERR_P0	<0>	W1C	Tag parity error — pipe 0. When set, this bit indicates that a Dcache tag probe from pipe 1 resulted in a tag parity error. The error is uncorrectable and results in a machine check.

3.4 Cbox Read Register

The Cbox Read Register is read 6 bits at a time. Table 3-4 shows the ordering from LSB to MSB. The register is read only by PALcode and is an element in the CPU or System Uncorrectable Machine Check Error Logout frame.

Table 3-4 Cbox Read Register

Name	Description	
C_SYNDROME_1 <7:0>	Syndrome for the upper QW in the OW of victim that was scrubbed.	
C_SYNDROME_0 <7:0>	Syndrome for the lower QW in the OW of victim that was scrubbed.	
C_STAT<4:0>	**Bits**	**Error status**
	00000	Either no error, or error on a speculative load, of a Bcache victim read due to a Dcache/Bcache miss.
	00001	BC_PERR (Bcache tag parity error)
	00010	DC_PERR (duplicate tag parity error
	00011	DSTREAM_MEM_ERR
	00100	DSTREAM_BC_ERR
	00101	DSTREAM_DC_ERR
	0011X	PROBE_BC_ERR
	01000	Reserved
	01001	Reserved
	01010	Reserved
	01011	ISTREAM_MEM_ERR
	01100	ISTREAM_BC_ERR
	01101	Reserved
	1XXXX	DOUBLE_BIT_ERROR

Table 3-4 Cbox Read Register (Continued)

Name	Description
C_STAT<3:0>	If C_STAT equals xxx_MEM_ERR or xxx_BC_ERR, then C_STAT contains the status of the block as follows; otherwise, the value of C_STAT is X. **Bit valus** — **Status of block** 7 - 4 — Reserved 3 — Parity 2 — Valid 1 — Dirty 0 — Shared
C_ADDR <6:42>	Address of the last reported ECC or parity error. If C_STAT value is DSTREAM_DC_ERR, only bits <6:19> are valid.

3.5 Miscellaneous Register (MISC)

This register is designed so that only writes of 1 affect it. When a 1 is written to any bit in the register, the programmer does not need to be concerned with read-modify-write or the status of any other bits in the register. Once NXM is set, the NXS field is locked. It is unlocked when software clears the NXM field. The ABW (arbitration won) field is locked if either ABW bit is set, so the first CPU to write it locks out the other CPU. Writing a 1 to ACL (arbitration clear) clears both ABW bits and both ABT (arbitration try) bits and unlocks the ABW field.

Address 801 A000 0040

Access RW

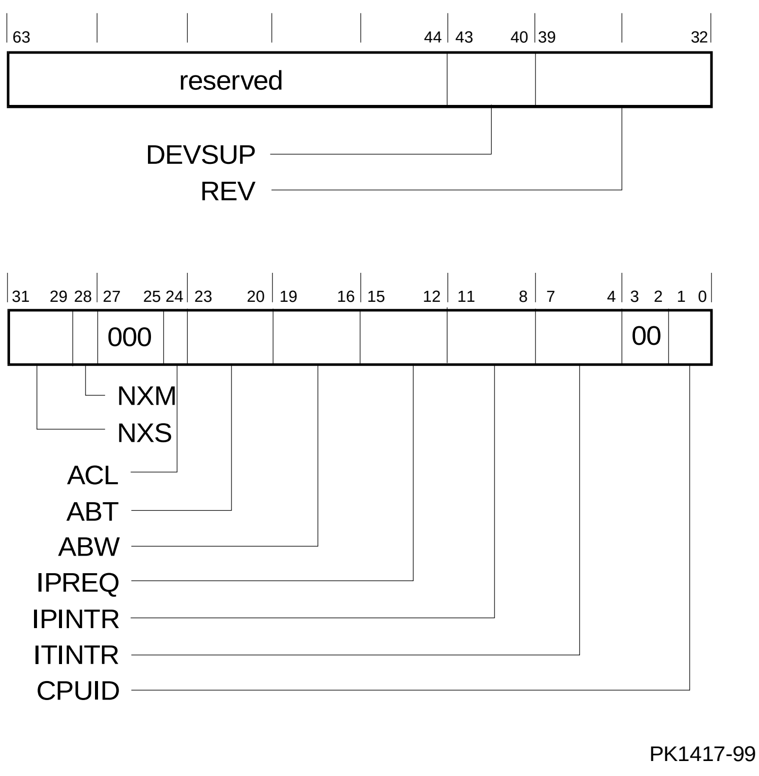


Table 3-5 Miscellaneous Register

Name	Bits	Type	Initial State	Description
RES	<63:44>	MBZ, RAZ	0	Reserved.
DEVSUP	<43:40>	WO	0	
REV	<39:32>	RO	1	Latest revision of the Cchip: 1 = Tsunami
NXS	<31:29>	RO	0	NXM source – Device that caused the NXM. Unpredictable if NXM not set. 0 = CPU0, 1 = CPU1.
NXM	<28>	R, W1C	0	Nonexistent memory address detected. Sets DRIR<63> and locks the NXS field until it is cleared.
RES	<27:25>	MBZ, RAZ	0	Reserved.
ACL	<24>	WO	0	Arbitration clear – writing a 1 to this bit clears the ABT and ABW fields.
ABT	<23:20>	R, W1S	0	Arbitration try – writing a 1 to these bits sets them.
ABW	<19:16>	R, W1S	0	Arbitration won – writing a 1 to these bits sets them unless one is already set, in which case the write is ignored.
IPREQ	<15:12>	WO	0	Interprocessor interrupt request – write a 1 to the bit corresponding to the CPU you want to interrupt. Writing a 1 here sets the corresponding bit in the IPINTR.
IPINTR	<11:8>	R, W1C	0	Interprocessor interrupt pending – one bit per CPU. Pin **irq<3>** is asserted to the CPU corresponding to a 1 in this field.

Table 3-5 Miscellaneous Register (Continued)

Name	Bits	Type	Initial State	Description
ITINTR	<7:4>	R, W1C	0	Interval timer interrupt pending – one bit per CPU. Pin **irq<2>** is asserted to the CPU corresponding to a 1 in this field.
RES	<3:2>	MBZ, RAZ	0	Reserved.
CPUID	<1:0>	RO	-	ID of the CPU performing the read.

3.6 Device Interrupt Request Register (DIRn, n=0,1)

These registers indicate which interrupts are pending to the CPUs and indicate the presence of an I/O error condition.

Address 801 A000 0280 CPU0
801 A000 02C0 CPU1

Access RO

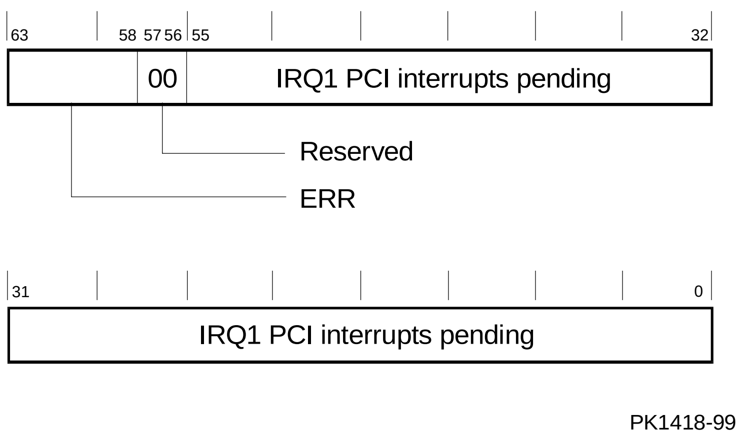


Table 3-6 Device Interrupt Request Register

Name	Bits	Type	Initial State	Description
ERR	<63:62>	RO	0	IRQ0 error interrupts <63> Cchip detected MISC <NXM> <62> Pchip0 error <62> Pchip1 error
RES	<61:56>	RO	0	Reserved
NXS	<55:0>	RO	0	IRQ1 PCI interrupts pending to the CPU

3.7 Pchip Error Register (PERROR)

If any bits <11:0> are set, this register is frozen. Only bit <0> can be set after that. All other values are held until all bits <11:0> are clear. When an error occurs and one of the <11:0> bits set, the associated information is captured in bit <63:16>. After the information is captured, the INV bit is cleared, but the information is not valid and should not be used if INV is set.

Address 801 8000 03C0 P0 ERROR
803 8000 03C0 P1 ERROR

Access RW

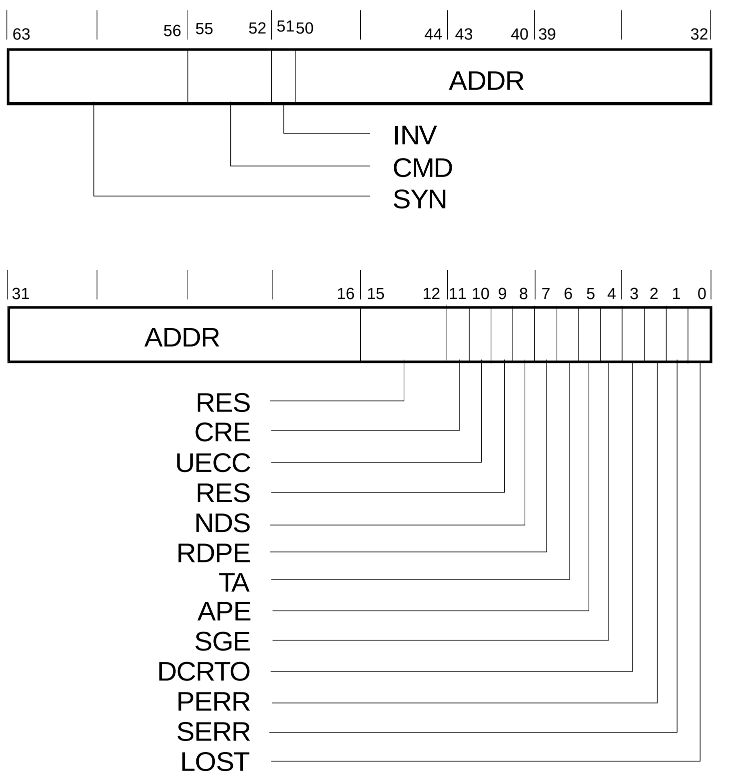


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Table 3-7 Pchip Error Register

Name	Bits	Type	Initial State	Description
SYN	<63:56>	RO	0	ECC syndrome of error if CRE or UECC.
CMD	<55:52>	RO	0	PCI command when error occurred if *not* CRE or UECC. If CRE or UECC, then: **Value** — **Command** 0000 — DMA read 0001 — DMA read-modify-write 0011 — SGTE read Others — Reserved
INV	<51>	RO Rev1 RAZ Rv0	0	Info Not Valid – meaningful when one of bits <11:0> is set. Indicates the validity of SYN, CMD, and ADDR bits. Valid = 0, Invalid = 1.
ADDR	<50:16>	RO	0	If CRE or UECC, then ADDR<50:19> = system address <34:3> of erroneous quadword and ADDR<18:16> = 0. If not CRE and not UECC, then ADDR<50:48> = 0; ADDR<47:18> = starting PCI address <31:2> of transaction when error was detected; ADDR<17:16> = 00 → not a DAC operation; ADDR<17:16> = 01 → via DAC SG Window 3; ADDR<17> = 1 → via Monster Window
RES	<15:12>	MBZ, RAZ	0	Reserved
CRE	<11>	R, W1C	0	Correctable ECC error.
UECC	<10>	R, W1C	0	Uncorrectable ECC error.
RES	<9>	MBZ, RAZ	0	Reserved.
NDS	<8>	R, W1C	0	No **b_devsel_l** as PCI master.

Table 3-7 Pchip Error Register (Continued)

Name	Bits	Type	Initial State	Description
RDPE	<7>	R,W1C	0	PCI read data parity error as PCI master.
TA	<6>	R, W1C	0	Target abort as PCI master.
APE	<5>	R, W1C	0	Address parity error detected as potential PCI target.
SGE	<4>	R, W1C	0	Scatter-gather had invalid page table entry.
DCRTO	<3>	R, W1C	0	Delayed completion retry timeout as PCI target.
PERR	<2>	R, W1C	0	**b_perr_l** sampled asserted.
SERR	<1>	R, W1C	0	**b_serr_l** sampled asserted.
LOST	<0>	R, W1C	0	Lost an error because it was detected after this register was frozen, or while in the process of clearing this register.

3.8 Failure Register

This register, on the I²C bus, is locked when there is a power supply or fan failure. Together with the Function Register, fan and power supply failures are identified and reported to the operating system thus notifying it that the system will shut down in 30 seconds. The results of reading this register are displayed by the SRM show power console command.

I²C Bus Address 0111000

Access Read Only

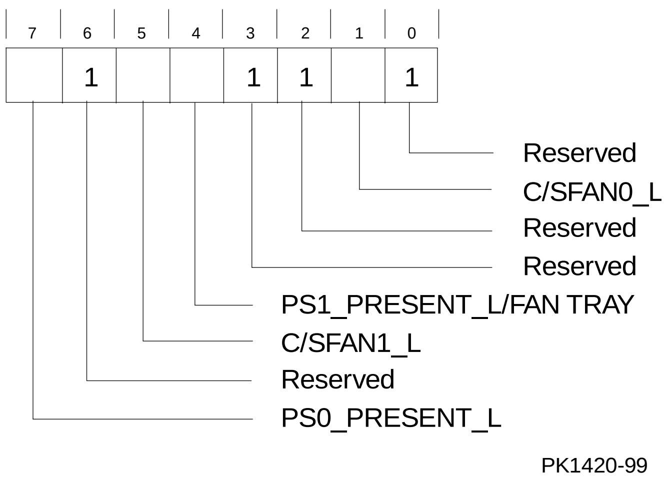


Table 3-8 Failure Register

Name	Bits	Type	Initial State	Description
PS0_PRESENT_L	<7>	RO	X	If the bit is clear, power supply 0 is present.
Reserved	<6>	RO	1	Reserved
C/SFAN1_L	<5>	RO	X	When set, indicates that either the system fan 1 or the fan on the heatsink on CPU1 failed. Which failed is determined by the state of SYSFAN_OK and CPUFANS_OK in the Function Register.
PS1_PRESENT_L /FAN TRAY	<4>	RO	X	If the bit is clear, either power supply 1 or the system fan tray is present.
Reserved	<3>	RO	1	Reserved
Reserved	<2>	RO	1	Reserved
C/SFAN0_L	<1>	RO	X	When set, indicates that either the system fan 0 or the fan on the heatsink on CPU0 failed. Which failed is determined by the state of SYSFAN_OK and CPUFANS_OK in the Function Register.
Reserved	<0>	RO	1	Reserved

3.9 Function Register

The Function Register generates an interrupt on the I^2C bus if one of the critical functions monitored (power, temperature, fan operation) goes beyond predetermined limits. When such an interrupt is generated, the contents of bits <0, 1, 2, and 5> in the Failure Register are frozen. The system will shut down 30 seconds after the interrupt is posted. The results of reading this register are displayed by the SRM show power console command.

I2C Bus Address 0111001

Access RO

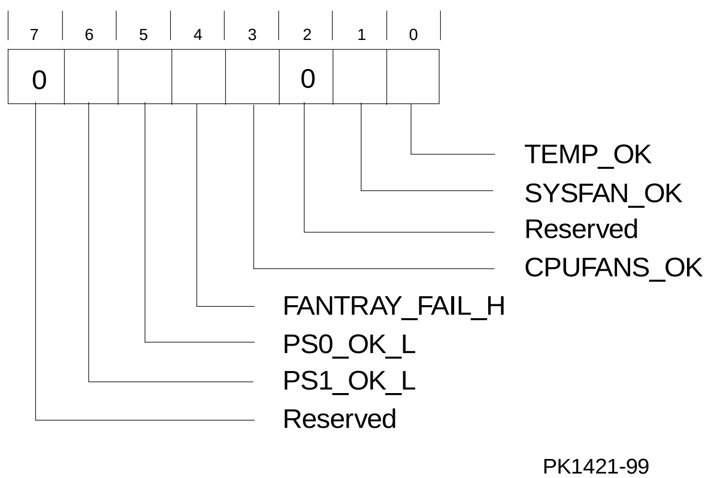


Table 3-9 Function Register

Name	Bits	Type	Initial State	Description
Reserved	<7>	RO	0	Reserved
PS1_OK_L	<6>	RO	X	When set, indicates that power supply 1 is functioning properly.
PS0_OK_L	<5>	RO	X	When set, indicates that power supply 0 is functioning properly.
FANTRAY_FAIL_H	<4>	RO	X	When clear, indicates that the fantray, if present is functioning properly.
CPUFANS_OK	<3>	RO	X	When set, indicates that the fans on CPU heatsinks are functioning properly.
Reserved	<2>	RO	0	Reserved
SYSFAN_OK	<1>	RO	X	When set, indicates that the system fans are functioning properly.
TEMP_OK	<0>	RO	X	When set, indicates that the temperature inside the system enclosure is below the temperature limit.

Chapter 4

Removal and Replacement

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

4.1 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 is off and plugged into an AC outlet, auxiliary power is still supplied to the system. To remove all power, unplug the power supply. Note though that unplugging the system will turn off LEDs that could identify the problem.

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.*

4.2 FRU List

Figure 4-1 shows of the FRU locations and Table 4-1 lists the part numbers of the field-replaceable units.

Figure 4-1 Some of the FRU Locations

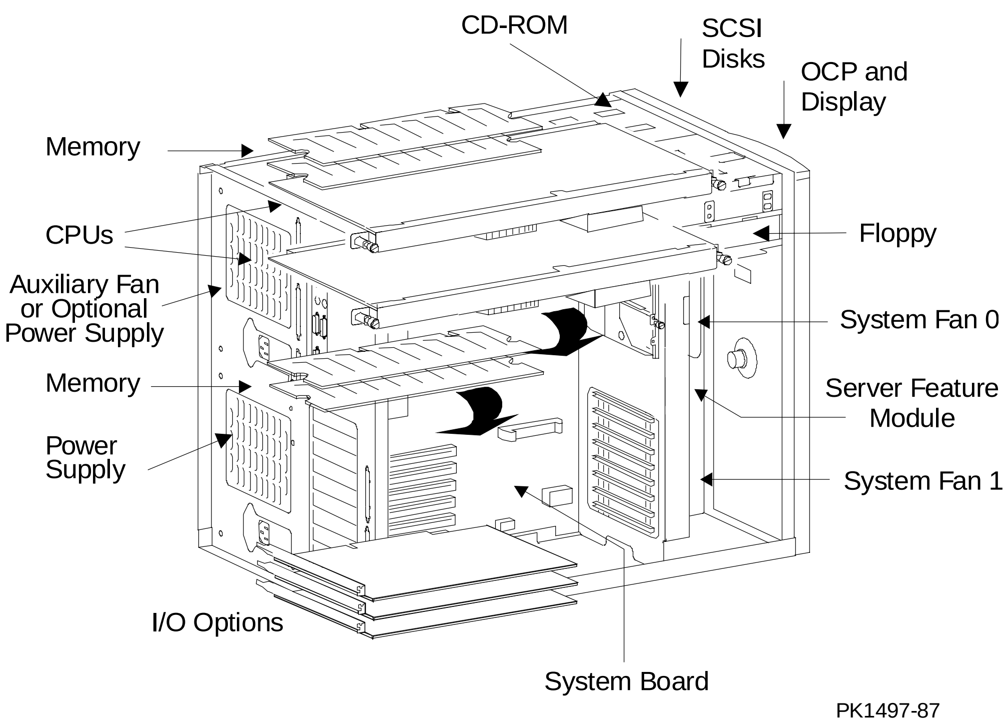


Table 4-1 Field-Replaceable Unit Part Numbers

CPU Modules	
54-24758-01 C01	500 MHz CPU, 4 Mbyte cache
Memory Modules	
54-25066-BA	32 Mbyte DIMM
54-25053-BA	64 Mbyte DIMM
54-25941-KA	128 Mbyte DIMM
54-25941-BA	256 Mbyte DIMM
System Backplane, Display, and Support Hardware	
54-25756-01 D02	System board
54-25580-01	Server feature module
RX23L-AC	Floppy
RRD47-AC	CD-ROM
54-23302-02	OCP assembly
70-31349-01	Speaker assembly
Fans	
70-31351-01 & -02	Cooling fan 120x120
70-33195-02	Auxiliary cooling fan assembly
Power System Components	
30-48043-01	Power supply (cables connect to the power transition module)
54-25588-01	Power transition module
SCSI Hardware	
54-23365-01 & -02	SCSI backplane
30-48985-01	UltraSCSI bus extender

Table 4-1 Field-Replaceable Unit Part Numbers (Continued)

Power Cords			
BN26J-1K	North America, Japan 12V, 75-inches long		
BN19H-2E	Australia, New Zealand, 2.5m long		
BN19C-2E	Central Europe, 2.5m long		
BN19A-2E	UK, Ireland, 2.5m long		
BN19E-2E	Switzerland 2.5m long		
BN19K-2E	Denmark, 2.5m long		
BN19Z-2E	Italy, 2.5m long		
BN19S-2E	Egypt, India, South Africa, 2.5m long		
BN18L-2E	Israel, 2.5m long		
Ultra SCSI Signal Cables		**From**	**To**
17-04890-01	68 pin connector cable	SCSI controller	UltraSCSI bus extender
17-04022-03	68 pin connector cable	UltraSCSI bus extender	SCSI backplane signal connector
17-04021-01	68 pin conn jumper	SCSI backplane	SCSI backplane
17-04795-01	68 pin connector cable	External port, SCSI backplane	Terminator
12-41768-03	68 pin terminator		End or 17-04795-01
System Cables and Jumpers		**From**	**To**
17-04532-01	Current share cable	Crrnt shr conn, PS0	Crrnt shr conn, PS1
17-03970-01	34 pin Floppy signal cable	Flop connector on system board	Floppy
17-03971-06	OCP signal	OCP connector on server feature module	OCP signal
	Twisted pair (y & g)	RCM connector on server feature module	Power connector on OCP
	Twisted pair (red and black)	OCP	Interlock switch pigtail

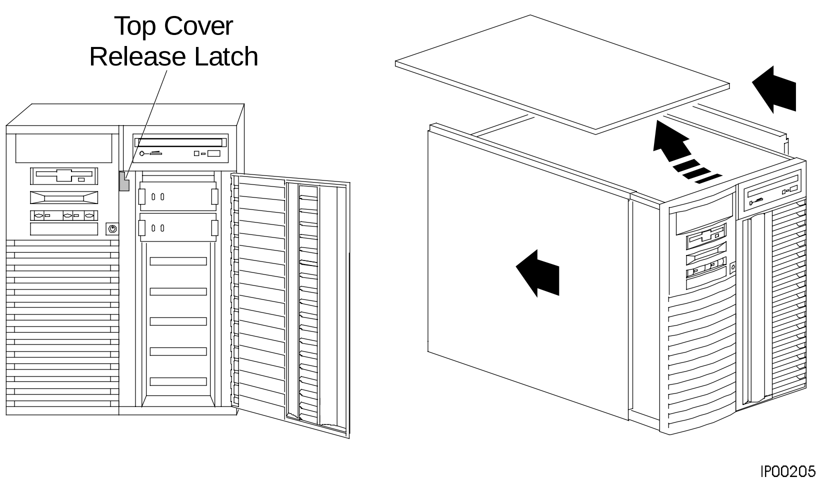
Table 4-1 Field-Replaceable Unit Part Numbers (Continued)

System Cables and Jumpers		From	To
70-31348-01	Interlock switch and pigtail cable	Interlock switch assembly	Twisted pair (red and black) OCP DC enable power cable from OCP connector
17-04796-01	20 pin signal cable	RCM con on system board	RCM connector on server feature module
17-04886-01	SCSI CD-ROM signal cable	SCSI backplane	CD-ROM signal connector
17-04735-01	24 pin power harness	Power supply	Power transition module
70-33578-01	Power harness	Power transition	3 connectors on sys board, connector on CPU(s)
		Power supply	server feature module CD-ROM drive power Floppy power Optional drive above flop Single UltraSCSI config StorageWorks backplane and power cable to Ultra-SCSI bus extender Dual UltraSCSI config two power cables to two SCSI bus extenders
17-04700-01	Power cable to UltraSCSI bus extender(s) Y cable(s)	Power harness	UltraSCSI bus extender(s) power and StorageWorks backplane

4.3 System Access

Three sheet metal covers, one on top and one on each side, when removed provide access to the system card cage and the power/SCSI sections of the system.

Figure 4-2 Accessing the System



Exposing the System

CAUTION: Be sure the system On/Off button is in the "off" position before removing system covers.

1. Shut down 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 4-2 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.)
7. From the back, removing the right side cover exposes the system card cage; removing the left side cover exposes the power supply and SCSI backplane.

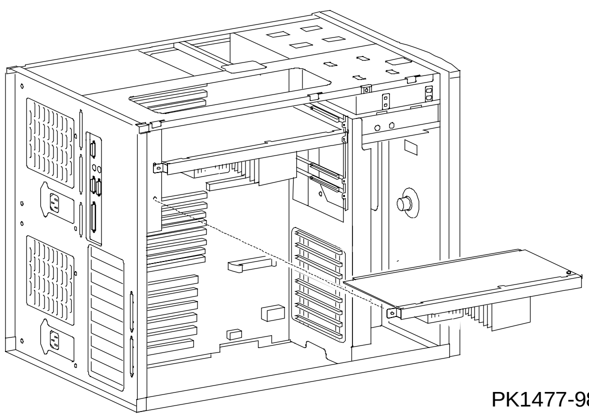
Dressing the System

Reverse the steps in the exposure process.

4.4 CPU Removal and Replacement

CAUTION: Make sure all CPU modules are the same variant.

Figure 4-3 Removing CPU Module



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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 turn the system off.
2. Expose the card cage side of the system (see Section 4.3).
3. Detatch the power cable from the CPU.
4. Loosen the two captive screws holding the module to the card cage.
5. Pull the CPU module from the system.

Replacement

Reverse the steps in the Removal procedure.

Verification — DIGITAL UNIX and OpenVMS Systems

1. Bring the system up to the SRM console by pressing the Halt button, if necessary.
2. Issue the **show cpu** command to display the status of the new module.

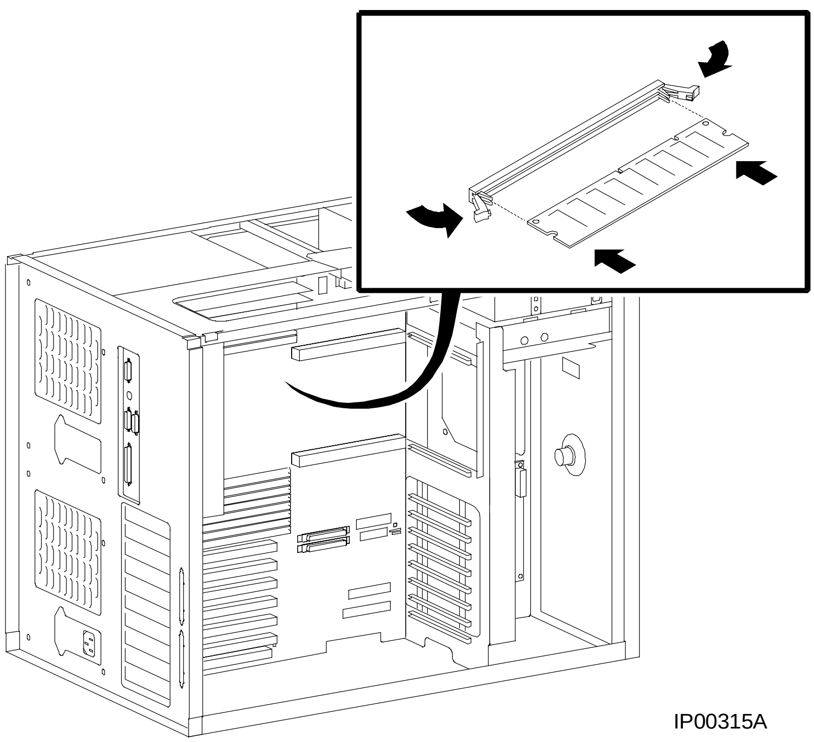
Verification — Windows NT Systems

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

4.5 Memory Module 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 4-4 Removing Memory



WARNING: CPU modules and memory DIMMs 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 turn the system off.
2. Expose the card cage side of the system (see Section 4.3).
3. There are levers on the connectors in each memory slot on the system board. 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.

NOTE: Memory DIMMs are installed in banks of four modules of the same size. When you replace a DIMM, be sure its size is the same as the one you removed.

Verification — DIGITAL UNIX and OpenVMS Systems

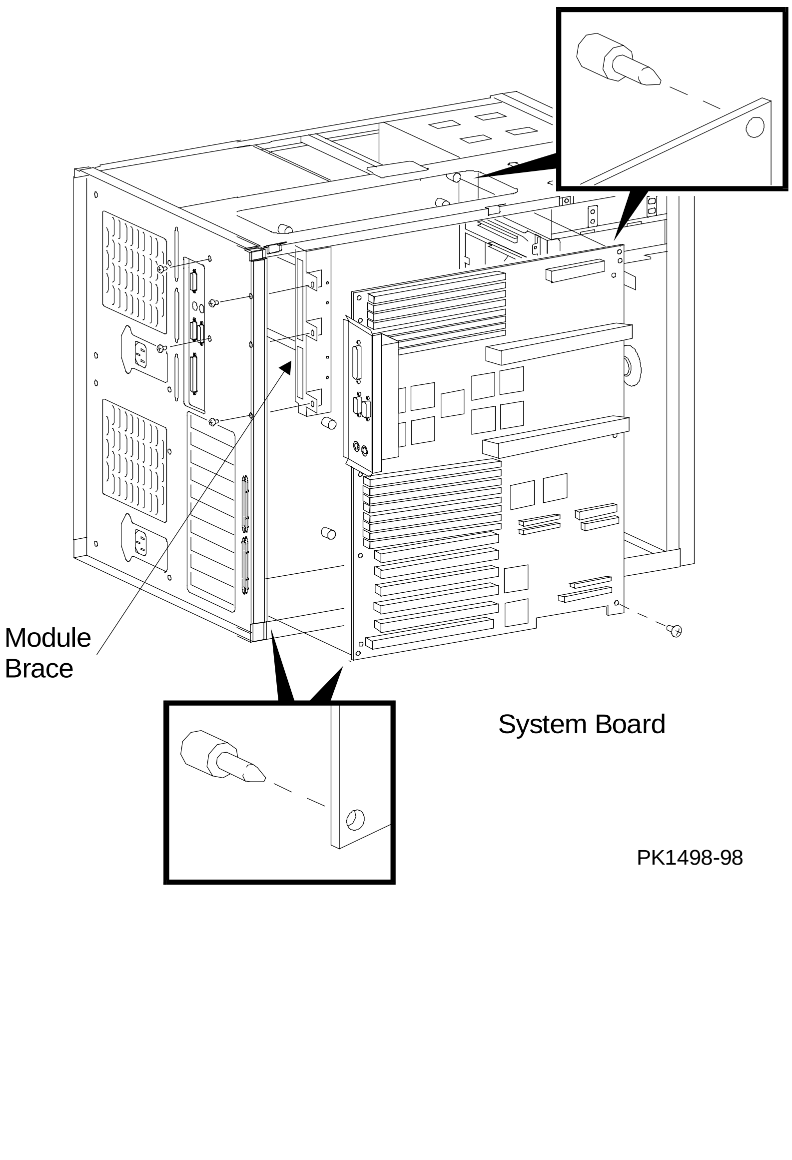
1. Bring the system up to the SRM console by pressing the Halt button, if necessary.
2. Issue the **show memory** command to display the status of the new memory.
3. Verify the functioning of the new memory by issuing the **test** command.

Verification — Windows NT Systems

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 the Halt button in so that the LED on the button lights and reset the system). Verify the functioning of the new memory by issuing the **test** command.

4.6 System Board Removal and Replacement

Figure 4-5 Removing System Board



Removal

1. Shut down the operating system and turn the system off.
2. Unplug the AC power cord. (Auxiliary power is applied to the server feature module and parts of the system board even when the system is turned off.)
3. Expose the card cage side of the system (see Section 4.3).
4. Remove memory.
5. Remove all CPUs.
6. Remove all PCI and ISA options.
7. From the back of the cabinet, using a Phillips head screwdriver, unscrew the four screws holding the CPU module brace from the system frame. Remove the brace.
8. Unplug all cables connected to the system board and clear access to all screws holding the system board in place.
9. Using a Phillips head screwdriver, unscrew the fifteen screws holding the system board 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 system board.

Replacement

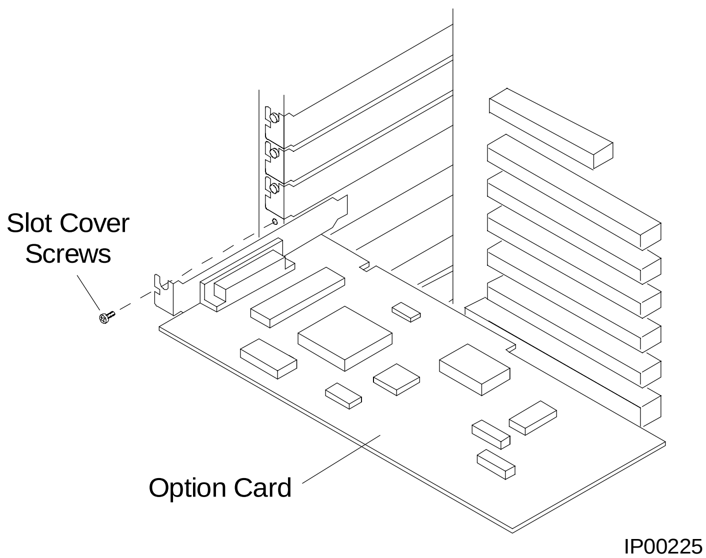
Reverse the steps in the Removal procedure.

Verification

Power up the system (press the Halt button if necessary to bring up the SRM console) and issue the **show device** command at the console prompt to verify that the system sees all system options and peripherals.

4.7 PCI/ISA Option Removal and Replacement

Figure 4-6 Removing PCI/ISA 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 turn the system off.
2. Expose the card cage side of the system (see Section 4.3).
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 — DIGITAL UNIX and OpenVMS Systems

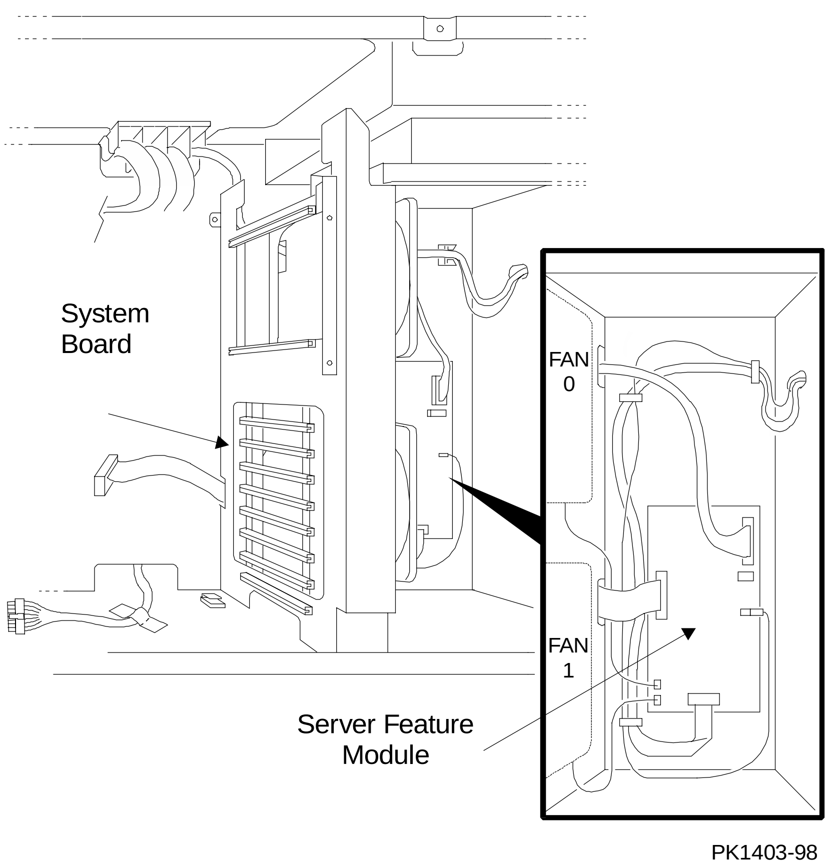
1. Power up the system (press the Halt button if necessary to bring up the SRM console) and run the ECU to restore ISA configuration data.
2. Issue the **show config** command or **show device** command at the console prompt to verify that the system sees the option you replaced.
3. Run any diagnostic appropriate for the option you replaced.

Verification — Windows NT Systems

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

4.8 Server Feature Module Removal and Replacement

Figure 4-7 Removing Server Feature Module



Removal

1. Shut down the operating system and turn the system off.
2. Unplug the AC power cords. (Auxiliary power is applied to the server feature module and parts of the system board even when the system is turned off.)
3. Expose the card cage section of the system (see Section 4.3).
4. Unplug all cables connected to the server feature module.
5. Pinch each plastic snap holding the transition module in place with a pair of needle-nose pliers and pull the module away from the frame so each snap is closed and no longer grips the module.
6. Once all the snaps are released, gently pull the module off the snaps and remove the module.

Replacement

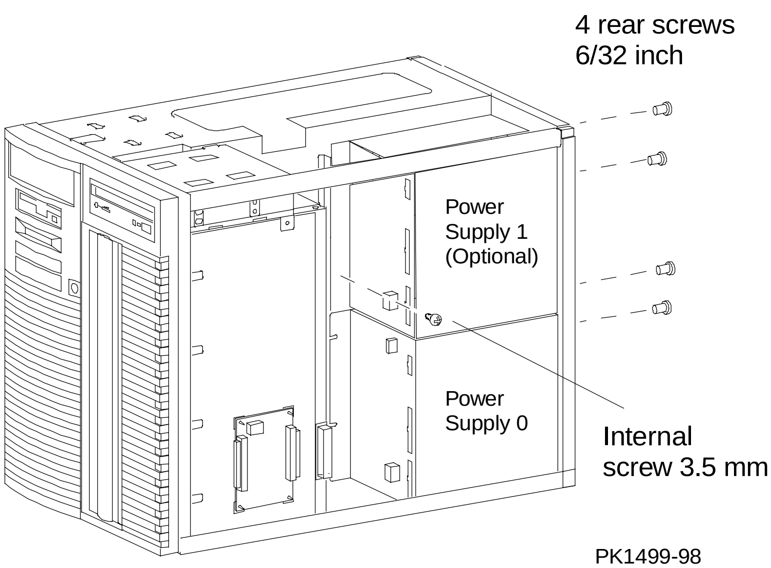
Reverse the steps in the Removal procedure.

Verification

Power up the system.

4.9 Power Supply Removal and Replacement

Figure 4-8 Removing Power Supply



Removal

1. Shut down the operating system and turn the system off.
2. Expose the power section of the system (see Section 4.3).
3. Unplug the AC power cord. (Auxiliary power is applied to the server feature module and parts of the system board even when the system is turned off.)
4. Unplug all the cables to the power supply and unplug the power cables to the transition module.
5. Remove the four screws at the back of the system cabinet and the single screw at the back of the power supply that hold the power supply in place.
6. 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

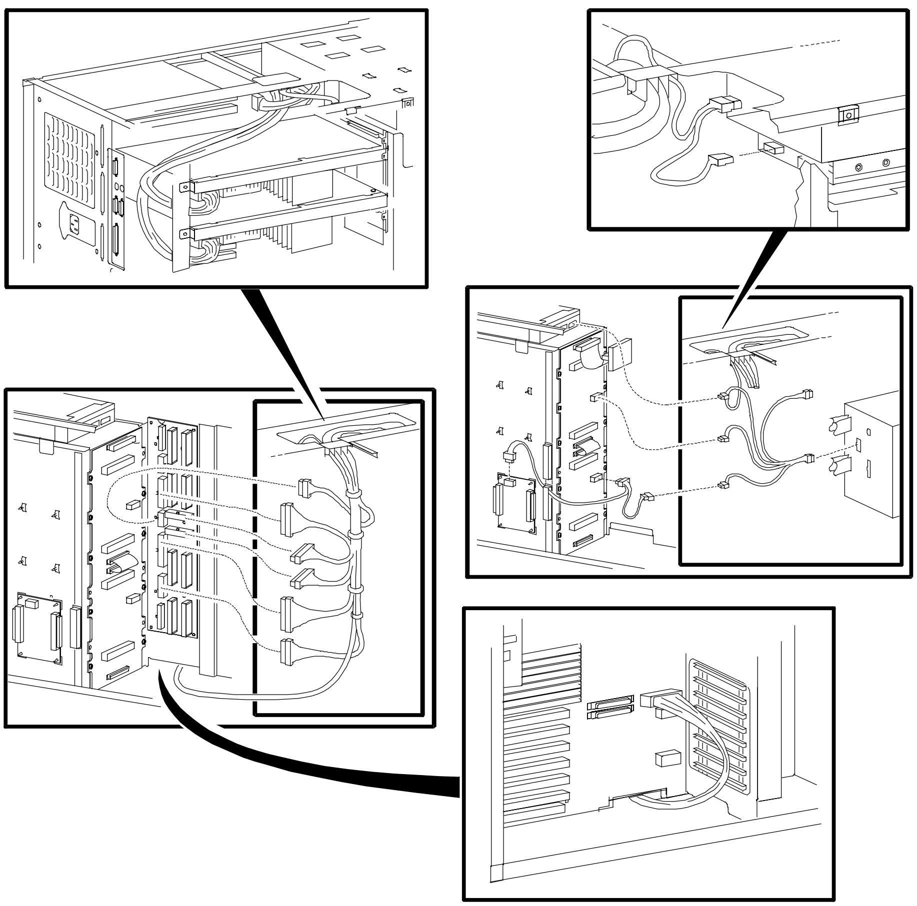
Reverse the steps in the Removal procedure.

Verification

Power up the system.

4.10 Power Harness Removal and Replacement

Figure 4-9 Removing Power Harness



Removal

1. Shut down the operating system and power down the system.
2. Remove the AC power cords. (Auxiliary power is applied to the server feature module and parts of the system board even when the system is turned off.)
3. Expose both the card cage section and the power section of the system (see Section 4.3).
4. Remove the cable clip between the power section and the card cage section of the system.
5. Unplug the cable connection to the server feature module and thread the cable through from the fan section into the card cage section. Leave the cable loose and out of the way.
6. Unplug the cable connections to the CPU(s) and thread them up to the top of the card cage section above CPU0. Leave the cable loose and out of the way.
7. Unplug the three cable connections to the system board; two connections on top right corner of the board and one about 2 inches below the CPU1 slot on the right of the board. Leave the cable loose and out of the way.
8. Unplug the cable connection to the floppy and, if applicable, to the optional device above the floppy. Again leave the cable loose and out of the way.
9. Remove the power supply (see Section 4.9).
10. Unplug the cable connection to the CD-ROM.
11. Unplug the cable connections to the repeater card(s) and/or the StorageWorks backplane.
12. Unplug all the connections to the power transition module.
13. As you remove the power harness from the system, be careful as you thread that piece of the cable that passes from the power section into the card cage section below the system board.

Replacement

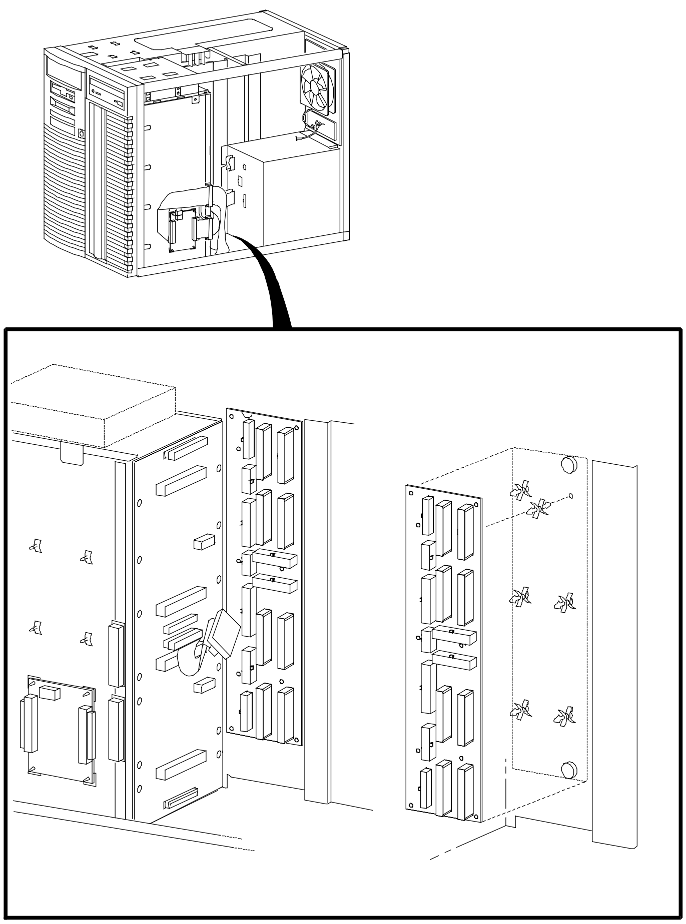
Reverse the steps in the Removal procedure.

Verification

Power up the system.

4.11 Power Transition Module Removal and Replacement

Figure 4-10 Removing Power Transition Module



Removal

1. Shut down the operating system and turn the system off.
2. Remove the AC power cords.
3. Expose both the card cage section and the power section of the system (see Section 4.3).
4. Remove the power supply(s) (see Section 4.9).
5. Unplug the fan cable connected to the power transition module.
6. Fold the power harness up over the top of the system so that it does not interfere with access to the module.
7. Pinch each plastic snap holding the transition module in place with a pair of needle-nose pliers and pull the module away from the frame so each snap is closed and no longer grips the module.
8. Once all the snaps are released, gently pull the module off the snaps.

Replacement

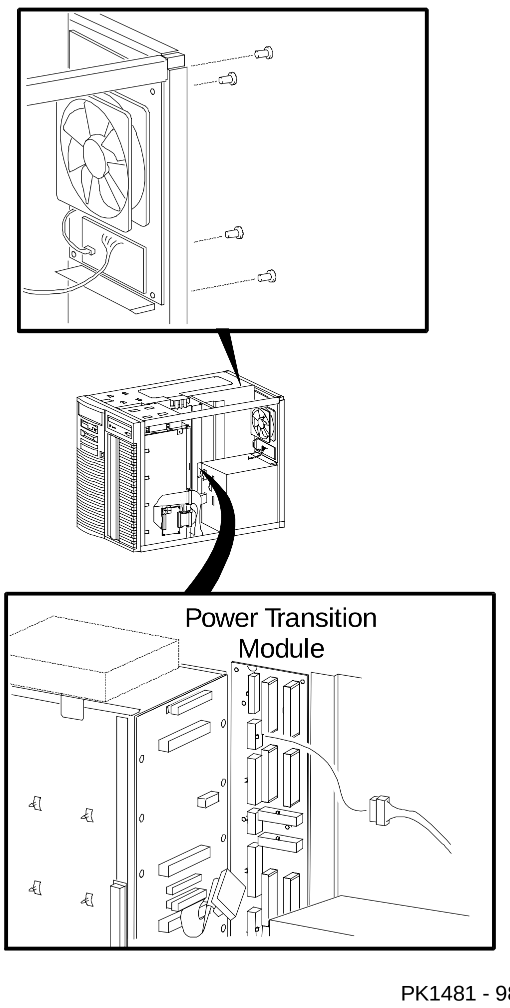
Reverse the steps in the Removal procedure.

Verification

Power up the system. If the fan is faulty, the system will run for approximately 30 seconds and then power off.

4.12 Auxiliary Fan Removal and Replacement

Figure 4-11 Removing Auxiliary Fan



Removal

1. Shut down the operating system and power down the system.
2. Unplug the AC power cord.
3. Expose the power section of the system (see Section 4.3).
4. Unplug all cables connected to the power transition module.
5. From the rear, remove the four screws holding the auxiliary fan in place.
6. Remove the fan.

Replacement

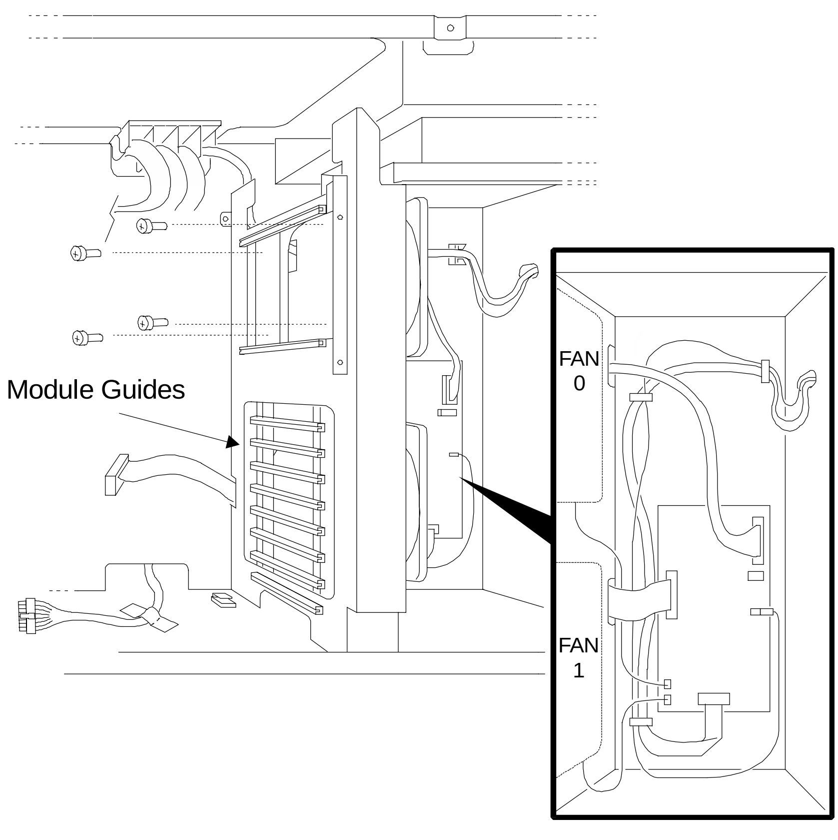
Reverse the steps in the Removal procedure.

Verification

Power up the system.

4.13 System Fan Removal and Replacement

Figure 4-12 Removing System Fan



Removal

1. Shut down the operating system and turn the system off.
2. Unplug the AC power cord. (Auxiliary power is applied to the server feature module and parts of the system board even when the system is turned off.)
3. Expose the card cage side of the system (see Section 4.3).

Removing Fan 0

4. Remove the CPU module(s).
5. Unplug the power cord to fan 0 from the server feature module.
6. Unscrew the fan from the frame and remove it from the system.

Removing Fan 1

4. Remove any PCI modules that prevent access to the four Phillips head screws that hold fan 1 in place.
5. Remove any plastic module guides that prevent access to the Phillips head screws.
6. Unplug the power cord to fan 1 from the server feature module.
7. Unscrew the fan from the frame and remove it from the system.

Replacement

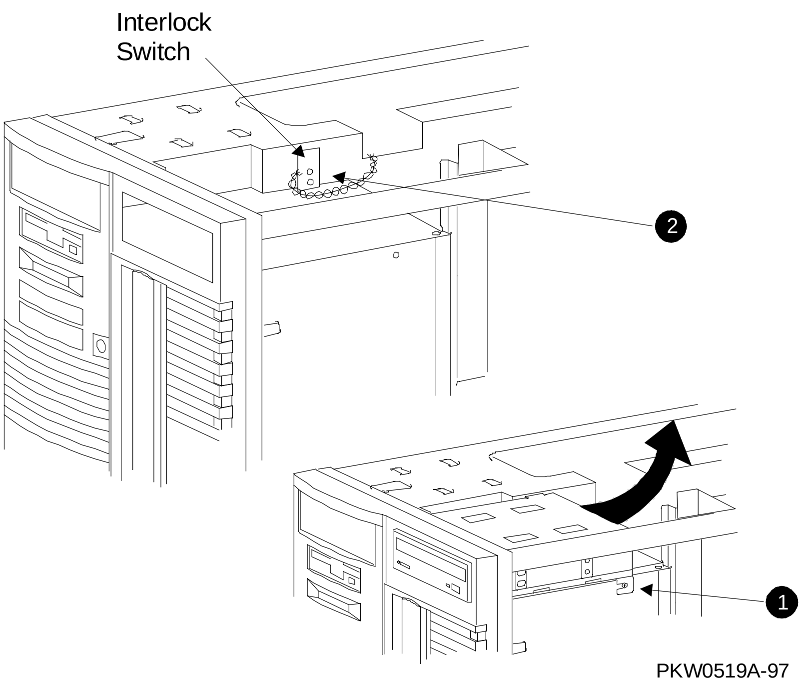
Reverse the steps in the Removal procedure.

Verification

Power up the system. If the fan is faulty, the system will run for approximately 30 seconds and then power down.

4.14 Cover Interlock Removal and Replacement

Figure 4-13 Removing Cover Interlock



Removal

1. Shut down the operating system and turn the system off.
2. Expose the card cage side of the system (see Section 4.3).
3. Unplug the AC power cord.
4. Loosen the screw that holds the CD-ROM bracket to the system (➊ in Figure 4-13).
5. Detach both the power and the signal connectors at the rear of the CD-ROM.
6. Pull the CD-ROM and the bracket a short distance toward the rear of the system and lift them out of the cabinet.
7. Unplug the interlock switch's pigtail cable from the cable it is connected to.
8. Remove the two screws holding the interlock in place and remove the interlock (➋).

Replacement

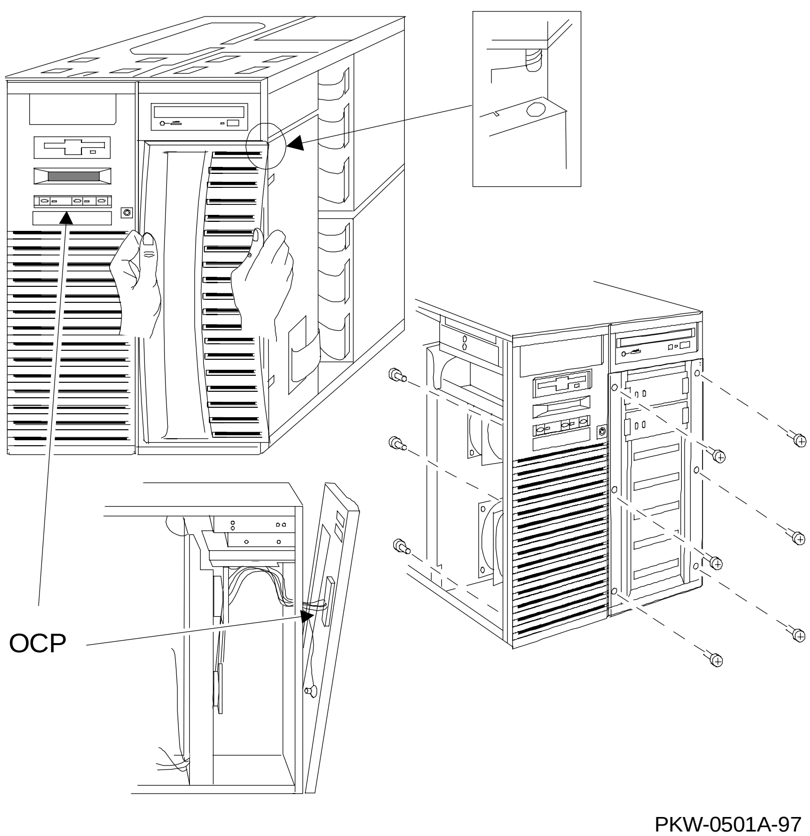
Reverse the steps in the Removal procedure.

Verification

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

4.15 Operator Control Panel Removal and Replacement

Figure 4-14 Removing OCP



Removal

1. Shut down the operating system and turn the system off.
2. Expose the card cage side of the system (see Section 4.3).
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.)
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

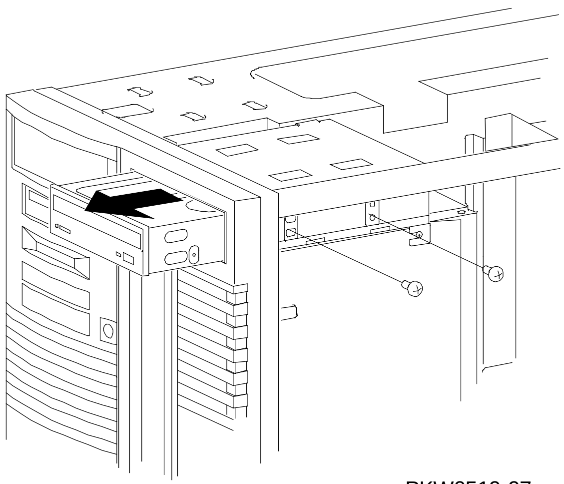
Reverse the steps in the Removal procedure.

Verification

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

4.16 CD-ROM Removal and Replacement

Figure 4-15 Removing CD-ROM



Removal

1. Shut down the operating system and turn the system off.
2. Expose the card cage side of the system (see Section 4.3).
3. Loosen the two screws holding the CD-ROM to its bracket (see Figure 4-15).
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. You can use the SRM **test** command to test the CD-ROM or, to save time, use the following SRM console commands:

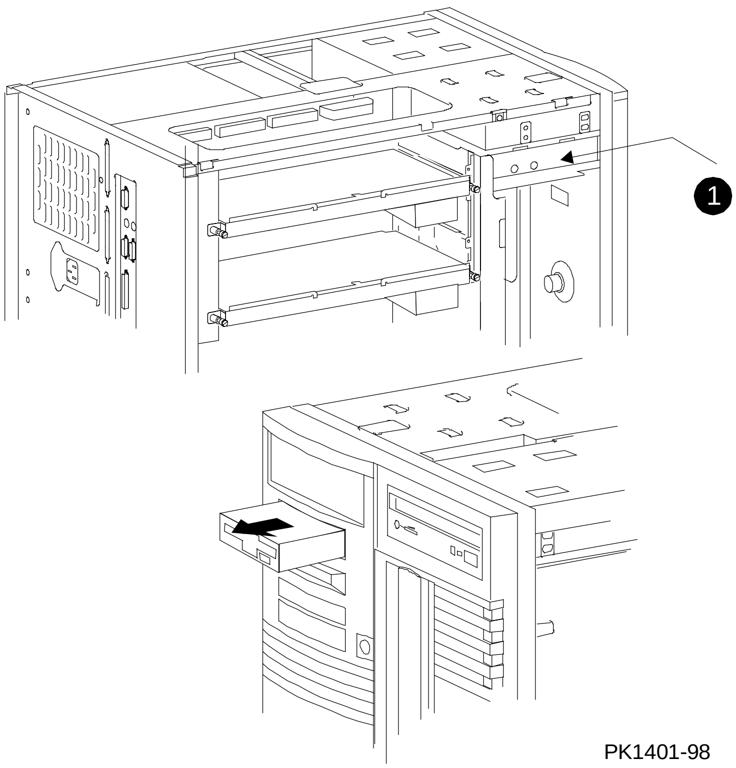
(Place a CD in the CD-ROM drive.)

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

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

4.17 Floppy Removal and Replacement

Figure 4-16 Removing Floppy



Removal

1. Shut down the operating system and turn the system off.
2. Unplug the AC power cords.
3. Expose the card cage side of the system (see Section 4.3).
4. Detatch the power and signal cables from the back of the floppy.
5. Remove the two Phillips head screws holding the floppy in the system (❶ in Figure 4-16).
6. Slide the floppy out the front of the system.

Replacement

Reverse the steps in the Removal procedure.

Verification

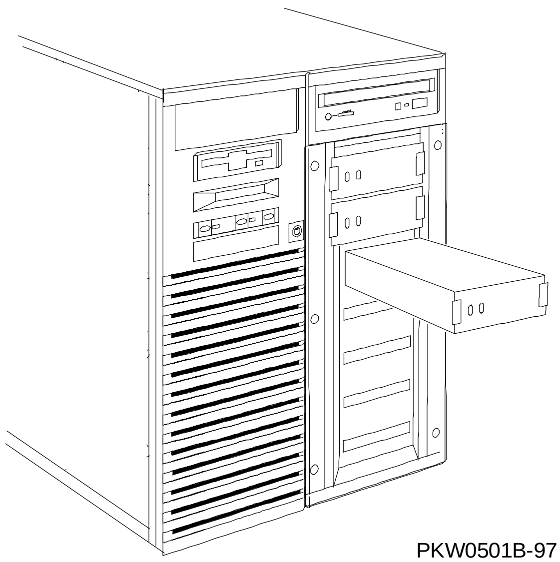
Power up the system (press the Halt button if necessary to bring up the SRM console). You can use the SRM **test** command to test the floppy or, to save time, use the following SRM console commands:

(Place a floppy in the drive.)

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

4.18 SCSI Disk Removal and Replacement

Figure 4-17 Removing StorageWorks Disk



Removal

1. Shut down the operating system and turn the system off.
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

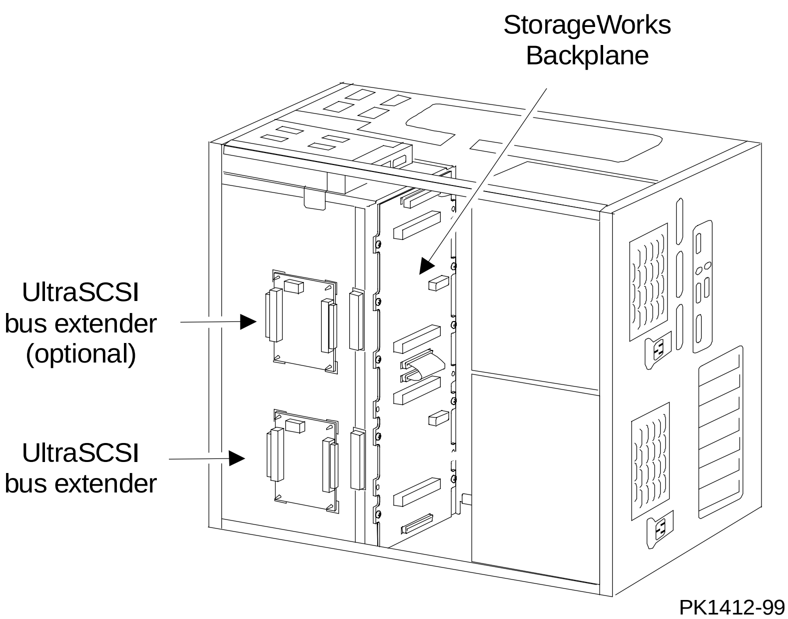
Reverse the steps in the Removal procedure.

Verification

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

4.19 StorageWorks Backplane Removal and Replacement

Figure 4-18 Removing StorageWorks Backplane



Removal

1. Shut down the operating system and turn the system off.
2. Unplug the AC power cords.
3. Expose the power section of the system (see Section 4.3).
4. Remove the power and signal cables from the UltraSCSI bus extender on the side of the StorageWorks shelf.
5. Remove the power harness and all signal cables from the StorageWorks backplane and the power transition module and lift it out of the way.
6. Using a short Phillips head screwdriver, remove the screws holding the backplane to the back of the shelf and remove from the system.

Replacement

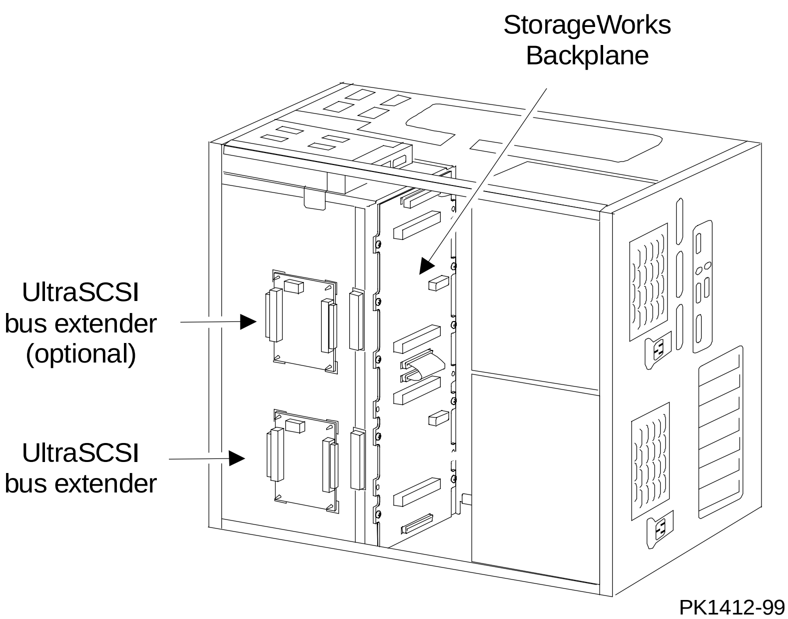
Reverse the steps in the Removal procedure.

Verification

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

4.20 StorageWorks UltraSCSI Bus Extender Removal and Replacement

Figure 4-19 Removing StorageWorks UltraSCSI Bus Extender



Removal

1. Shut down the operating system and turn the system off.
2. Unplug the AC power cords.
3. Expose the power section of the system. See Section 4.3.
4. Remove the power and signal cables from the UltraSCSI bus extender on the side of the StorageWorks shelf.
5. The UltraSCSI bus extender is mounted on plastic standoffs to which it snaps. Pinch each snap with a pair of needle nose pliers, free the corners, and pull the bus extender off.

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.

Appendix A

Halts, Console Commands, and Environment Variables

This appendix discusses halting the system and provides a summary of the SRM console commands and environment variables. The **test** command is described in Chapter 2 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 A-4 for a convenient worksheet.

A.1 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 A-1 describes the full function of the Halt button.

Table A-1 Results of Pressing the Halt Button

Machine State	Result
OpenVMS running/hung	SRM console runs
Compaq Tru64 UNIX running/hung	SRM console runs
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 or running Compaq Tru64 UNIX or OpenVMS 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. When the SRM console finds the halt assertion flag set, the conditions of the environment variables **auto_action = boot/restart** and **os_type = NT** are ignored; the SRM console runs and prints the following message:

```
Halt assertion detected
NVRAM power-up script not executed
AUTO_ACTION=BOOT/RESTART and OS_TYPE=NT ignored, if applicable
P00>>>
```

A.2 Using the Halt Button

Use the Halt button to halt the Compaq Tru64 UNIX or OpenVMS operating system when it hangs or you want to use the SRM console. Use the Halt button to force Windows NT systems to bring up the SRM console rather than booting or halting in AlphaBIOS.

Using Halt to Shut Down the Operating System

You can use the Halt button if the Compaq Tru64 UNIX or OpenVMS operating system hangs. Pressing the Halt button halts the operating system back to the SRM console firmware. From the console, you can use the **crash** command to force a crash dump at the operating system level.

The Windows NT operating system does not support halts on this system. Pressing the Halt button during a Windows NT session has no effect.

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 Section 4.8 of your system *User's Guide*.

A.3 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 during a Compaq TRU64 UNIX or OpenVMS session, the system halts back to the SRM console, and the halt status is saved. The next time the system powers up, the saved halt status is checked.

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.

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 selected operating system at power-up or reset if the following environment variables are set:

- For Compaq Tru64 UNIX and OpenVMS, the SRM environment variables **os_type**, **auto_action**, **bootdef_dev**, **boot_file**, and **boot_osflags**
- For Windows NT, the SRM **os_type** environment variable and the **Auto Start** selection in the AlphaBIOS **Standard CMOS Setup** screen

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 Section 4.4 of your system *User's Guide* for more information on editing the nvram script.

A.4 Summary of SRM Console Commands

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

Table A-2 Summary of SRM Console Commands

Command	Function
alphabios	Loads and starts the AlphaBIOS console.
boot	Loads and starts the operating system.
clear *envar*	Resets an environment variable to its default value.
clear password	Sets the password to 0.
continue	Resumes program execution.
crash	Forces a crash dump at the operating system level.
deposit	Writes data to the specified address.
edit	Invokes the console line editor on a RAM file or on the nvram file (power-up script).
examine	Displays the contents of a memory location, register, or device.
halt	Halts the specified processor. (Same as **stop**.)
help	Displays information about the specified console command.
info *num*	Displays various types of information about the system:
	Info shows a list describing the **num** qualifier.
	Info 3 reads the impure area that contains the state of the CPU before it entered PAL mode.
	Info 5 reads the PAL built logout area that contains the data used by the operating system to create the error entry
	Info 8 reads the IOD and IOD1 registers.
initialize	Resets the system.
lfu	Runs the Loadable Firmware Update Utility.

Continued on next page

Table A-2 Summary of SRM Console Commands (Continued)

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

A.5 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, boots the operating system, and operates. Environment variables are set or changed with the set *envar* command and returned to their default values with the clear *envar* command. Their values are viewed with the show *envar* command. The SRM environment variables are specific to the SRM console.

Table A-3 Environment Variable Summary

Environment Variable	Function
auto_action	Specifies the console's action at power-up, a failure, or a reset.
bootdef_dev	Specifies the default boot device string.
boot_osflags	Specifies the default operating system boot flags.
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.
ew*0_mode	Specifies the connection type of the default Ethernet controller.
ew*0_protocols	Specifies network protocols for booting over the Ethernet controller.
kbd_hardware_ type	Specifies the default console keyboard type.
kzpsa*_host_id	Specifies the default value for the KZPSA host SCSI bus node ID.
language	Specifies the console keyboard layout.

Continued on next page

Table A-3 Environment Variable Summary (Continued)

Environment Variable	Function
memory_test	Specifies the extent to which memory will be tested. For Compaq Tru64 UNIX systems only.
ocp_text	Overrides the default OCP display text with specified text.
os_type	Specifies the operating system and sets the appropriate console interface.
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 the system board is replaced.
sys_serial_num	Restores the system serial number. Must be set if the system board is replaced.
sys_type	Displays the system type and computes certain information passed to the operating system. Must be restored after the system board 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.

A.6 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 A-4 Environment Variables Worksheet

Environment Variable	System Name	System Name	System Name
auto_action			
bootdef_dev			
boot_osflags			
com1_baud			
com2_baud			
console			
cpu_enabled			
ew*0_mode			
ew*0_protocols			
kbd_hardware_ type			
kzpsa*_host_id			
language			
memory_test			
ocp_text			
os_type			
pci_parity			
pk*0_fast			
pk*0_host_id			

Table A-4 Environment Variables Worksheet (Continued)

Environment Variable	System Name	System Name	System Name
pk*0_soft_term			
sys_model_num			
sys_serial_num			
sys_type			
tga_sync_green			
tt_allow_login			

Appendix B

Managing the System Remotely

This appendix 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 or from a local console terminal connected to the COM1 port.

Sections in this appendix are:

- RCM Overview
- First-Time Setup
- RCM Commands
- Using the RCM Switchpack
- Troubleshooting Guide

B.1 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 SRM and AlphaBIOS firmware reside on the system board. The RCM firmware resides on the server feature module and can only be accessed through COM1. 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.

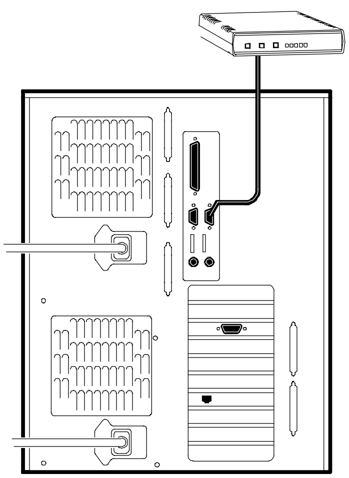
- To connect to the RCM remotely, you dial in through a modem and then type an escape sequence that invokes RCM command mode. You must set up the modem before you can dial in remotely.
- To connect to the RCM locally, the console terminal has to be connected to COM 1 and then you type the escape sequence at the SRM console prompt on the local serial console terminal to enter RCM mode.

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. See Section A.3 for information on halt assertion.*

B.2 First-Time Setup

To set up the RCM to monitor a system remotely, connect the modem to the COM1 port at the back of the system, configure the modem for autoanswer and 9600 baud, and dial in.

Figure B-1 RCM Connections



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B.2.1 Using RCM Locally or with a Modem on COM1

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 B–1 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 B–1 Invoking and Leaving RCM Locally

```
P00>>> ^]^]rcm    ❶
RCM>

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

B.3 RCM Commands

The RCM commands given in Table B-1 are used to control and monitor a system remotely.

Table B-1 RCM Command Summary

Command	Function
halt	Halts the server. Emulates pressing the Halt button and immediately releasing it.
haltin	Causes a halt assertion. Emulates pressing the Halt button and holding it in.
haltout	Terminates a halt assertion created with **haltin**. Emulates releasing the Halt button after holding it in.
help or **?**	Displays the list of commands.
poweroff	Turns off power. Emulates pressing the On/Off button to the off position.
poweron	Turns on power. Emulates pressing the On/Off button to the on position.
quit	Exits console mode and returns to system console port.
reset	Resets the server. Emulates pressing the Reset button.
setesc	Changes the escape sequence for invoking command mode.
status	Displays system status and sensors.

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 ***
```

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 Section A.3 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.

*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.

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:

1. Press the On/Off button to the off position and disconnect the power cord.
2. Reconnect the power cord and press the On/Off button to the on position.

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
```

Upon entering a carriage return, the system returns to either the console or the operating system depending upon which was running when the RCM was invoked.

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 or console monitor to the system COM1 serial port.
- The system executes its normal power-up sequence.

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.

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

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

If the 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.

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
Temp (C): 26.0
RCM Power Control: ON
RCM Halt: Deasserted
External Power: ON
Server Power: ON

RCM>
```

The status fields are explained in Table B-2.

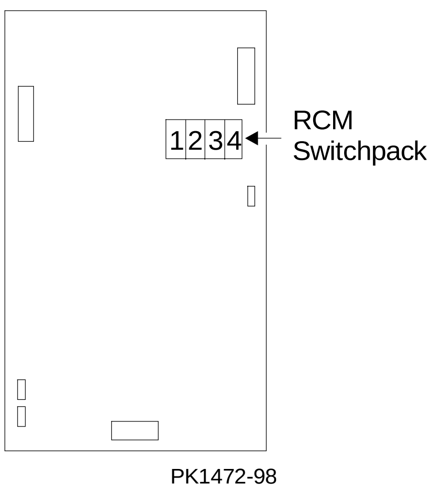
Table B-2 RCM Status Command Fields

Item	Description
Firmware Rev:	Revision of RCM firmware.
Escape Sequence:	Current escape sequence to invoke RCM.
Remote Access:	Modem remote access state. (ENABLE/DISABLE)
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.

B.4 Using the RCM Switchpack

The RCM operating mode is controlled by a switchpack on the server feature module located in the fan area between the system card cage and the front of the system. Use the switches to enable or disable certain RCM functions, if desired.

Figure B-2 Location of RCM Switchpack on Server Feature Module



Switch	Name	Description
1	EN RCM	Enables or disables the RCM. The default is ON (RCM enabled). The OFF setting disables RCM.
2	Reserved	Reserved
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 (Reserved)—Reserved.
- 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 server feature module. The default positions are shown in Figure B-2. 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 Section 4.3.
4. Locate the RCM switchpack on the server feature module 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 Section 3.2.
4. Locate the RCM switchpack on the server feature module 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
    ```

B.5 Troubleshooting Guide

Table B-3 is a list of possible causes and suggested solutions for symptoms you might see.

Table B-3 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.
The console terminal is displaying garbage.	System and terminal baud rate set incorrectly.	Disable RCM and set the system and terminal baud rates to 9600 baud.
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.
RCM installation is complete, but system does not power up.	RCM Power Control: is set to DISABLE.	Invoke RCM and issue **poweron** command.
	Cables not correctly installed.	Reseat the cables.
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 Section B.4.
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.

Appendix C

Firmware Update

This appendix provides instructions on updating firmware.

Sections in this chapter are:

- Updating Firmware and Consoles
- Updating Firmware from the CD-ROM
- Updating Firmware from Floppy Disk – Creating the Diskettes
- Updating Firmware from Floppy Disk – Performing the Update
- Updating Firmware from a Network Device
- LFU Commands

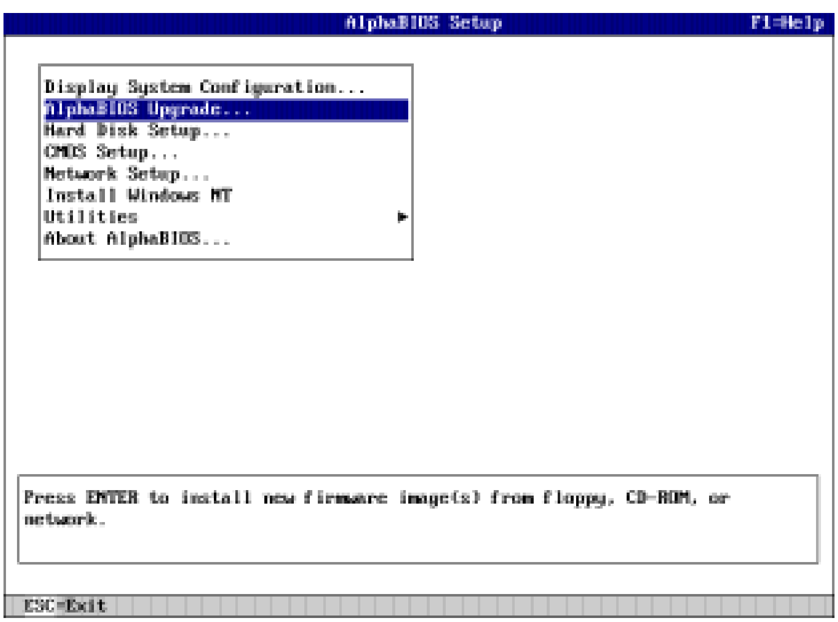
C.1 Updating Firmware and Consoles

Start the Loadable Firmware Update (LFU) utility by issuing the lfu command at the SRM console prompt, booting it from the CD-ROM while in the SRM console, or selecting Update AlphaBIOS in the AlphaBIOS Setup screen.

Example C–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 C–1 Starting LFU from the AlphaBIOS Console



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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 (see Example C–1). Also from the SRM console, LFU can be booted from the Alpha CD-ROM (V5.4 or later), as shown in Example C–2.
- From the AlphaBIOS console, select **Update AlphaBIOS** from the **AlphaBIOS Setup** screen (see Figure C–1).

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 go back to the console.

Examples of updating firmware from CD-ROM, floppy, and the network follow.

Example C–2 Booting LFU from the CD-ROM

```
P00>>> show device                                                      ➊
dka0.0.0.7.1        DKA0             RZ1DB-BA  LYG0
dka100.1.0.7.1      DKA100           RZ1CB-CA  LYJ0
dka500.5.0.7.1      DKA500           RRD47  1645
dva0.0.0.0.0        DVA0
ewa0.0.0.8.1        EWA0     00-00-F8-00-0E-3B
pka0.7.0.7.1        PKA0             SCSI Bus ID 7  5.54
P00>>> boot dka500
(boot dka500.5.0.7.1 -flags 0,0)
block 0 of dka500.5.0.7.1 is a valid boot block
.
.
jumping to bootstrap code
The default bootfile for this platform is
        [AS1400]AS1400_LFU.EXE
Hit <RETURN> at the prompt to use the default bootfile.
Bootfile: <CR>
Starting Firmware Update Utility

          ***** Loadable Firmware Update Utility *****
UPD>
```

C.1.1 Updating Firmware from the CD-ROM

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

Example C–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 <return> to use the default filename [AS1400FW]: AS1400CP ❷

Copying AS1400CP from DKA500.5.0.1.1 .
Copying [AS1400]TCREADME from DKA500.5.0.1.1 .
Copying [AS1400]TCSRMROM from DKA500.5.0.1.1 ...................
Copying [AS1400]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
Fsb               3.1-x            fsb_fw                3.x
Nt                5.68             nt_fw                 5.xx
Pkx0              A11              kzpsa_fw              A11
Srm               5.4-x            srm_fw                5.4-xx
Pua               A214             cipca_fw              A2xx
```

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, 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:

AS1400FW (default)	SRM console, AlphaBIOS console, and I/O adapter firmware.
AS1400CP	SRM console and AlphaBIOS console firmware only.
AS1400IO	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 **list** 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) is at an earlier revision than the firmware in the update file.

Continued on next page

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

```
UPD> update *                                                ➎
WARNING: updates may take several minutes to complete for each
device.

Confirm update on: AlphaBIOS       [Y/(N)] y               ➏

                          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                                                   ➐
```

❺ 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.

❻ 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.

❼ The **exit** command returns you to the console from which you entered LFU (either SRM or AlphaBIOS).

C.1.2 Updating Firmware from Floppy Disk — Creating the Diskettes

---

Create the update diskettes before starting LFU. See Section C.1.3 for an example of the update procedure.

Table C–1 File Locations for Creating Update Diskettes on a PC

Console Update Diskette	I/O Update Diskette
AS1400FW.TXT	AS1400IO.TXT
AS1400CP.TXT	TCREADME.SYS
TCREADME.SYS	CIPCA315.SYS
TCSRMROM.SYS	DFPAA310.SYS
TCARCROM.SYS	KZPAAA11.SYS

To update system firmware from floppy disk, you first must create the firmware update diskettes. You will need to create two diskettes: one for console updates, and one for I/O.

1. Download the update files from the Internet.
2. On a PC, copy files onto two FAT-formatted diskettes as shown in Table C–1.
3. From an OpenVMS system, copy files onto two ODS2-formatted diskettes as shown in Example C–4.

Example C–4 Creating Update Diskettes on an OpenVMS System

Console update diskette

```
$ inquire ignore "Insert blank HD floppy in DVA0, then continue"
$ set verify
$ set proc/priv=all
$ init /density=hd/index=begin dva0: tcods2cp
$ mount dva0: tcods2cp
$ create /directory dva0:[as1400]
$ copy tcreadme.sys dva0:[as1400]tcreadme.sys
$ copy AS1400fw.txt dva0:[as1400]as1400fw.txt
$ copy AS1400cp.txt dva0:[as1400]as1400cp.txt
$ copy tcsrmrom.sys dva0:[as1400]tcsrmrom.sys
$ copy tcarcrom.sys dva0:[as1400]tcarcrom.sys
$ dismount dva0:
$ set noverify
$ exit
```

I/O update diskette

```
$ inquire ignore "Insert blank HD floppy in DVA0, then continue"
$ set verify
$ set proc/priv=all
$ init /density=hd/index=begin dva0: tcods2io
$ mount dva0: tcods2io
$ create /directory dva0:[as1400]
$ create /directory dva0:[options]
$ copy tcreadme.sys dva0:[as1400]tcreadme.sys
$ copy AS1400fw.txt dva0:[as1400]as1400fw.txt
$ copy AS1400io.txt dva0:[as1400]as1400io.txt
$ copy cipca214.sys dva0:[options]cipca214.sys
$ copy dfpaa246.sys dva0:[options]dfpaa246.sys
$ copy kzpsaA10.sys dva0:[options]kzpsaa10.sys
$ dismount dva0:
$ set noverify
$ exit
```

C.1.3 Updating Firmware from Floppy Disk — Performing the Update

Insert an update diskette (see Section C.1.2) into the floppy drive. Start LFU and select dva0 as the load device.

Example C–5 Updating Firmware from the Floppy Disk

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

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

Please enter the name of the options firmware files list, or
Press <return> to use the default filename [AS1400IO,(AS1400CP)]: AS1400IO
❷

Copying AS1400IO from DVA0 .
Copying TCREADME from DVA0 .
Copying CIPCA214 from DVA0 .
Copying DFPAA252 from DVA0 ...
Copying KZPSAA11 from DVA0 ...
.
.  [The function table displays, followed by the UPD> prompt, as
.  shown in Example C–3.]

UPD> list                                                        ❸

Device         Current Revision    Filename       Update Revision
Fsb                3.1-x             fsb_fw                3.x
Nt                 5.68              nt_fw                 5.xx
Pkx0               A11               kzpsa_fw              A11
Srm                5.4-x             srm_fw                5.4-xx
Pua                A214              cipca_fw              A2xx
```

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, the internal floppy disk is selected.

❷ Select the file that has the firmware update, or press Enter to select the default file. When the internal floppy disk is the load device, the file options are:

AS1400CP (default)	SRM console and AlphaBIOS console firmware only.
AS1400IO	I/O adapter firmware only.

The default option in Example C–3 (AS1400FW) is not available, since the file is too large to fit on a 1.44 MB diskette. This means that when a floppy disk is the load device, you can update either console firmware or I/O adapter firmware, but not both in the same LFU session. If you need to update both, after finishing the first update, restart LFU with the **lfu** command and insert the diskette with the other file.

In this example the file for I/O adapter firmware is selected.

❸ Use the LFU **list** 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 update revision for console firmware displays as “Missing file” because only the I/O firmware files are available on the floppy disk.

Continued on next page

Example C–5 Updating Firmware from the Floppy Disk (Continued)

```
UPD> update pfi0                                                  ❹
WARNING: updates may take several minutes to complete for each device.

Confirm update on: pfi0            [Y/(N)] y                      ❺

                          DO NOT ABORT!
pfi0            Updating to 3.10... Verifying to 3.10... PASSED.

UPD> lfu                                                          ❻

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

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

Please enter the name of the options firmware files list, or
Press <return> to use the default filename [AS1400IO,(AS1400CP)]:❼

.
. (The function table displays, followed by the UPD> prompt.
.  Console firmware can now be updated.)

UPD> exit                                                         ❽
```

❹ The **update** command updates the device specified or all devices.

❺ 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.

❻ The **lfu** command restarts the utility so that console firmware can be updated. (Another method is shown in Example C–6, where the user specifies the file AS1400FW and is prompted to insert the second diskette.)

❼ The default update file, AS1400CP, is selected. The console firmware can now be updated, using the same procedure as for the I/O firmware.

❽ The **exit** command returns you to the console from which you entered LFU (either SRM or AlphaBIOS).

Example C–6 Selecting AS1400FW to Update Firmware from the Internal Floppy Disk

```
P00>>> lfu

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

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

Please enter the name of the firmware files list, or
Press <return> to use the default filename [AS1400IO,(AS1400CP)]: AS1400fw

Copying AS1400FW from DVA0 .
Copying TCREADME from DVA0 .
Copying TCSRMROM from DVA0 .........................
Copying TCARCROM from DVA0 ..............
Copying CIPCA214 from DVA0
Please insert next floppy containing the firmware,
Press <return> when ready. Or type DONE to abort.
Copying CIPCA214 from DVA0 .
Copying DFPAA246 from DVA0 ...
Copying KZPSAA10 from DVA0 ...
.
.
.
```

C.1.4 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 C–7 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 [AS1400FW]:             ❷

Copying AS1400FW from EWA0 .
Copying TCREADME from EWA0 .
Copying TCSRMROM from EWA0 ..........................
Copying TCARCROM from EWA0 ...........
Copying CIPCA214 from EWA0 .
Copying DFPAA246 from EWA0 ...
Copying KZPSAA11 from EWA0 ...

.
.  [The function table displays, followed by the UPD> prompt, as
.  shown in Example C–3.]

UPD> list                                                          ❸

Device         Current Revision    Filename       Update Revision
Fsb                3.1-x             fsb_fw               3.x
Nt                 5.68              nt_fw                5.xx
Pkx0               A11               kzpsa_fw             A11
Srm                5.4-x             srm_fw               5.4-xx
Pua                A214              cipca_fw             A2xx
```

Continued on next page

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

➊ Select the device from which firmware will be loaded. The choices are the CD-ROM, the internal floppy disk, or a network device. In this example, a network device is selected.

➋ Select the file that has the firmware update, or press Enter to select the default file. The file options are:

AS1400FW (default)	SRM console, AlphaBIOS console, and I/O adapter firmware.
AS1400CP	SRM console and AlphaBIOS console firmware only.
AS1400IO	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.

➌ Use the LFU **list** 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

Example C–7 Updating Firmware from a Network Device (Continued)

```
UPD> update * -all                                              ❹
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  A11    ...  Verifying A11...  PASSED.

                          DO NOT ABORT!
kzpsa1        Updating to  A11    ...  Verifying A11...  PASSED.

                          DO NOT ABORT!
srmflash      Updating to V6.0-3...  Verifying V6.0-3...  PASSED.

UPD> exit                                                       ❺
```

❹ 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. Typically LFU requests confirmation before updating each console’s or device’s firmware. The **-all** option eliminates the update confirmation requests.

❺ The **exit** command returns you to the console from which you entered LFU (either SRM or AlphaBIOS).

C.1.5 LFU Commands

The commands summarized in Table C–2 are used to update system firmware.

Table C–2 LFU Command Summary

Command	Function
display	Shows the physical configuration of the system.
exit	Terminates the LFU program.
help	Displays the LFU command list.
lfu	Restarts the LFU program.
list	Displays the inventory of update firmware on the selected device.
readme	Lists release notes for the LFU program.
update	Writes new firmware to the module.
verify	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 physical configuration of the system. **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.

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 eliminates 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.

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