AlphaServer 8200/8400 Service Manual

Order Number EK–T8030–SV. A01

This manual is intended for Digital service engineers. It includes troubleshooting information, configuration rules, and instructions for removal and replacement of field-replaceable units (FRUs) for AlphaServer 8200 and 8400 systems.

digital equipment corporation
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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. You can quickly gain a comprehensive overview by reading only the abstracts. Next is an illustration or example, which also provides quick reference. Last in the structure are descriptive text and syntax definitions.

This manual has 24 chapters and two appendixes, as follows:

- **Chapter 1, Overview of the Systems,** introduces the AlphaServer 8200 and 8400 systems and gives a brief overview of the system bus modules, and power subsystem.

Part 1: Troubleshooting

- **Chapter 2, Troubleshooting with LEDs**, tells how to use the LEDs and other indicators on the AlphaServer 8200 to find problem components in the system.
- **Chapter 3, Console Display and Diagnostics,** tells how to use these tools to find nonfunctioning components in the system.
- **Chapter 4, DECevent Error Log,** describes how to interpret the error log produced by this utility program.

Part 2: TLSB Modules

- **Chapter 5, TLSB Modules,** provides procedures for replacing I/O and memory modules and for replacing or adding processor modules.
- **Chapter 6, Updating Firmware,** describes how to use console commands and the Loadable Firmware Update (LFU) Utility to update system firmware.

Part 3: AlphaServer 8200 System

- **Chapter 7, Field-Replaceable Units,** describes the components of the AlphaServer 8200 system that are replaceable by field service personnel.

- **Chapter 8, Configuration Rules,** provides configuration information for the AlphaServer 8200 main and expander cabinet, power system, TLSB card cage and storage drawer, I/O interface, and PCI and StorageWorks shelves.
- **Chapter 9, Cabinet Control System,** describes how to remove and replace components of the AlphaServer 8200 cabinet control system.
- **Chapter 10, Power System,** tells how to remove and replace components of the AlphaServer 8200 power system.
- **Chapter 11, Processor System Unit,** tells how to remove and replace components of the AlphaServer 8200 processor system unit.
- **Chapter 12, PCI Shelves,** describes how to remove and replace PCI bus shelves.
- **Chapter 13, StorageWorks Shelves,** tells how to remove and replace StorageWorks shelves and components within StorageWorks shelves.

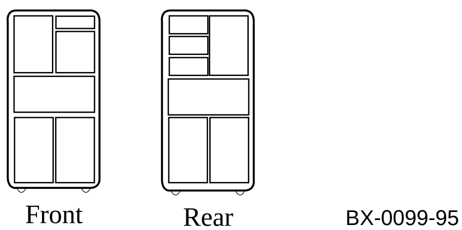
Part 4: AlphaServer 8400 System

- **Chapter 14, Field-Replaceable Units,** describes the components of the AlphaServer 8400 system that are replaceable by field service personnel.
- **Chapter 15, Configuration Rules,** provides configuration information for the AlphaServer 8400 main and expander cabinet, power system, TLSB card cage, I/O interface, and PCI plug-in unit.
- **Chapter 16, Cabinet Doors and Panels,** tells how to remove and replace the AlphaServer 8400 doors and top and side panels.
- **Chapter 17, Cabinet Control System,** describes how to remove and replace components of the AlphaServer 8400 cabinet control system.
- **Chapter 18, Power and Cooling Systems,** tells how to remove and replace components of the AlphaServer 8400 power and cooling subsystems.
- **Chapter 19, TLSB Card Cage,** describes how to remove and insert modules in the TLSB card cage, and how to remove and replace the card cage itself.
- **Chapter 20, PCI Plug-In Unit,** tells how to remove and replace a PCI plug-in unit in the AlphaServer 8400 system.
- **Chapter 21, XMI and Futurebus+ Plug-In Units,** tells how to remove and replace these field-replaceable units in the AlphaServer 8400 system.
- **Chapter 22, SCSI Storage Plug-In Unit,** tells how to remove and replace SCSI disks and tapes from a SCSI PIU.
- **Chapter 23, DSSI Disk Plug-In Unit,** tells how to remove and replace DSSI disks and tapes from a DSSI PIU.

- **Chapter 24, Battery Plug-In Unit,** tells how to remove and replace the BBU fuse, cable, and individual batteries in the battery plug-in-unit.
- **Appendix A, Console Commands and Environment Variables,** is a quick reference for commands.
- **Appendix B, How to Find Option Information,** explains the ways to find information about options.

Conventions Used in This Document

Icons. Icons similar to those shown below are used in illustrations for designating part placement in the system described. A shaded area in the icon shows the location of the component or part being discussed.



Documentation Titles

Table 1 lists the books in the AlphaServer 8200 and 8400 documentation set. Table 2 lists other documents that you may find useful.

Table 1 AlphaServer 8200 and 8400 Documentation

Title	Order Number
Hardware User Information and Installation	
Operations Manual	EK–T8030–OP
Site Preparation Guide	EK–T8030–SP
AlphaServer 8200 Installation Guide	EK–T8230–IN
AlphaServer 8400 Installation Guide	EK–T8430–IN
Service Information Kit	QZ–00RAC–GC
Service Manual (hard copy)	EK–T8030–SV
Service Manual (diskette)	AK–QKNFA–CA

Table 1 AlphaServer 8200 and 8400 Documentation (Continued)

Title	Order Number
Reference Manuals	
System Technical Manual	EK–T8030–TM
DWLPA PCI Adapter Technical Manual	EK–DWLPA–TM
Upgrade Manuals for Both Systems	
KN7CC CPU Module Installation Card	EK–KN7CC–IN
MS7CC Memory Installation Card	EK–MS7CC–IN
KFTHA System I/O Module Installation Guide	EK–KFTHA–IN
KFTIA Integrated I/O Module Installation Guide	EK–KFTIA–IN
Upgrade Manuals: 8400 System Only	
AlphaServer 8400 Upgrade Manual	EK–T8430–UI
BA654 DSSI Disk PIU Installation Guide	EK–BA654–IN
BA655 SCSI Disk and Tape PIU Installation Guide	EK–BA655–IN
DWLAA Futurebus+ PIU Installation Guide	EK–DWLAA–IN
DWLMA XMI PIU Installation Guide	EK–DWLMA–IN
DWLPA PCI PIU Installation Guide	EK–DWL84–IN
H7237 Battery PIU Installation Guide	EK–H7237–IN
H7263 Power Regulator Installation Card	EK–H7263–IN
H9F00 Power Upgrade Manual	EK–H8463–UI
KFMSB Adapter Installation Guide	EK–KFMSB–IN
KZMSA Adapter Installation Guide	EK–KXMSX–IN
RRDCD Installation Guide	EK–RRDRX–IN
Upgrade Manuals: 8200 System Only	
DWLPA PCI Shelf Installation Guide	EK–DWL82–IN
H7266 Power Regulator Installation Card	EK–H7266–IN
H7267 Battery Backup Installation Card	EK–H7267–IN

Table 2 Related Documents

Title	Order Number
General Site Preparation	
Site Environmental Preparation Guide	EK–CSEPG–MA
System I/O Options	
BA350 Modular Storage Shelf Subsystem Configuration Guide	EK–BA350–CG
BA350 Modular Storage Shelf Subsystem User's Guide	EK–BA350–UG
BA350-LA Modular Storage Shelf User's Guide	EK–350LA–UG
CIXCD Interface User Guide	EK–CIXCD–UG
DEC FDDIcontroller 400 Installation/Problem Solving	EK–DEMFA–IP
DEC FDDIcontrolle/Futurebus+ Installation Guide	EK–DEFAA–IN
DEC FDDIcontroller/PCI User Information	EK–DEFPA–IN
DEC LANcontroller 400 Installation Guide	EK–DEMNA–IN
DSSI VAXcluster Installation/Troubleshooting Manual	EK–410AA–MG
EtherWORKS Turbo PCI User Information	EK–DE435–OM
KZPSA PCI to SCSI User's Guide	EK–KZPSA–UG
RF Series Integrated Storage Element User Guide	EK–RF72D–UG
StorageWorks RAID Array 200 Subsystem Family Installation and Configuration Guide	EK–SWRA2–IG
StorageWorks RAID Array 200 Subsystem Family Software User's Guide for OpenVMS AXP	AA–Q6WVA–TE
StorageWorks RAID Array 200 Subsystem Family Software User's Guide for DEC OSF/1	AA–Q6TGA–TE
Operating System Manuals	
Alpha Architecture Reference Manual	EY–L520E–DP
DEC OSF/1 Guide to System Administration	AA–PJU7A–TE
Guide to Installing DEC OSF/1	AA–PS2DE–TE
OpenVMS Alpha Version 6.2 Upgrade and Installation Manual	AA–PV6XC–TE

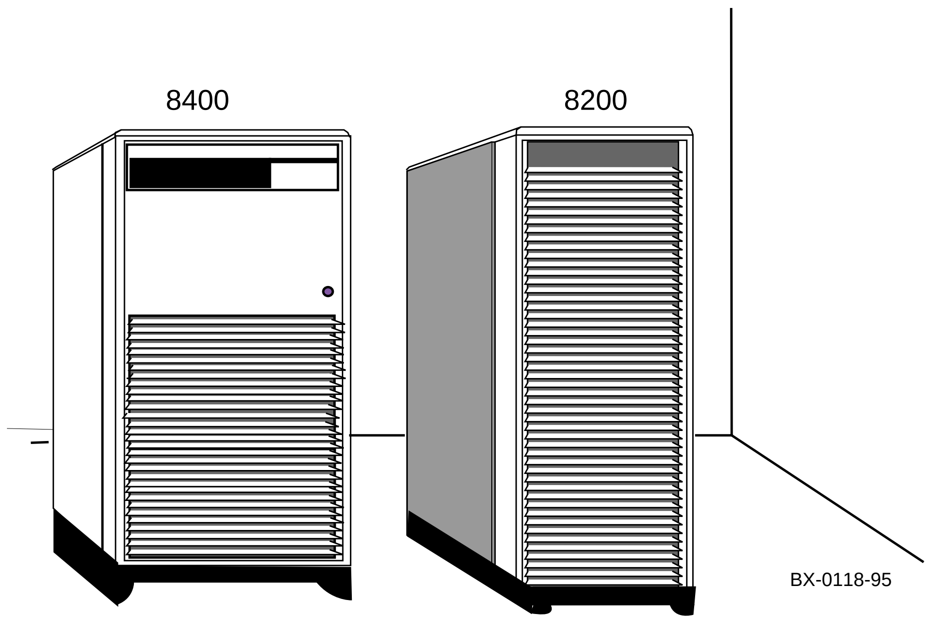
Chapter 1

Overview of the Systems

This manual tells how to service two separate, but related, systems. The AlphaServer 8400 and 8200 systems both use the same system bus (called the TLSB).

The processor, memory, and I/O adapter units that can be configured on this bus are also the same. The cabinets, and the components they are designed to carry, vary.

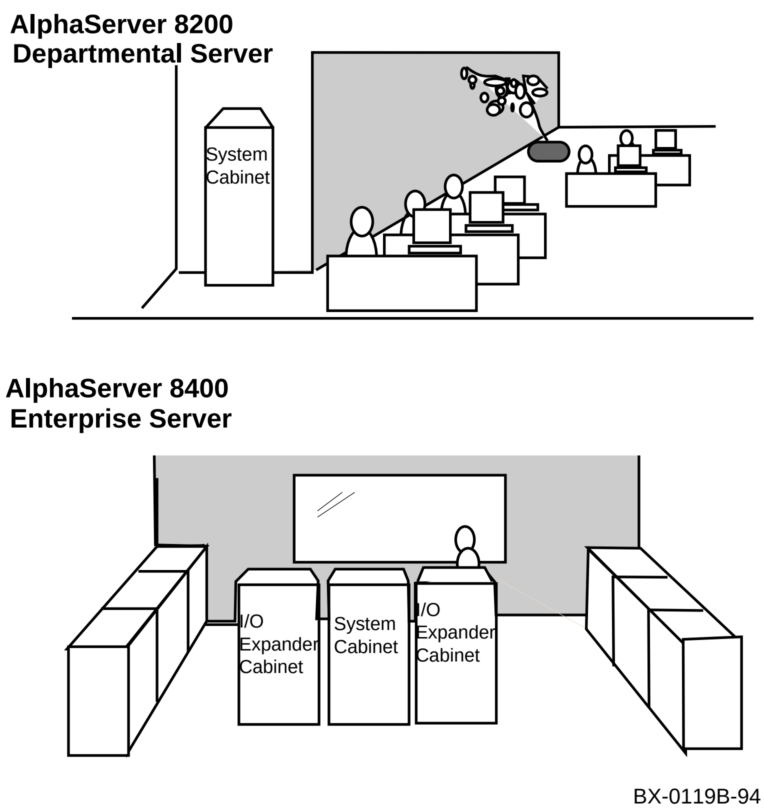
Figure 1–1 AlphaServer 8400 and 8200 System Cabinets



1.1 AlphaServer 8400/8200 Overview

The AlphaServer 8400 has a 9-slot system bus, and the cabinet is designed to house "plug-in units” that contain XMI, Futurebus+, and PCI/EISA buses, as well as SCSI and DSSI I/O devices. The AlphaServer 8200 system has a 5-slot system bus and is designed to house PCI/EISA buses and SCSI devices.

Figure 1–2 AlphaServer 8400 and 8200 Systems



The AlphaServer 8400 and 8200 systems are described in detail in the *Technical Summary* for these systems. Here are some highlights, concentrating on serviceability.

You will probably find the AlphaServer 8200 system in an office environment. The AlphaServer 8400 systems are generally found in temperature and humidity controlled (data center or laboratory) environments.

Troubleshooting aids for both systems include:

- Easily seen and labeled LEDs and indicators.
- A system self-test display that appears on the system console terminal at power-up. The console software also includes a **test** command for running various diagnostics. If the power system includes H7263 regulators, detailed information on the power system can be requested.
- An error log produced by both the OpenVMS Alpha and Digital UNIX operating systems for analyzing transient errors.

Removal and replacement procedures for field-replaceable units (FRUs) in the AlphaServer 8200 system are for elements in the system unit (the top part of the cabinet. Other elements that can be included in the cabinet are one or two AC/DC power regulators, PCI bus shelves, and SCSI BA350–JB shelves. These are mounted with brackets and screws attached to the cabinet.

AlphaServer 8400 systems can contain a wider variety of I/O buses and hence the system self-test includes information on these buses and the I/O adapters in them.

In both systems, the components are accessible from the front and rear doors. Side panels can be removed, if necessary, to check or fix cabling. Some components are heavy and require two people for removal and replacement.

1.2 TLSB System Bus

Both the AlphaServer 8400 and 8200 systems use the TLSB system bus. The TLSB is a centerplane in the 8400 system; it offers 9 slots for modules. For an 8200 system, only the "back half" of the bus is used, to offer 5 slots for modules.

Figure 1–3 TLSB System Bus

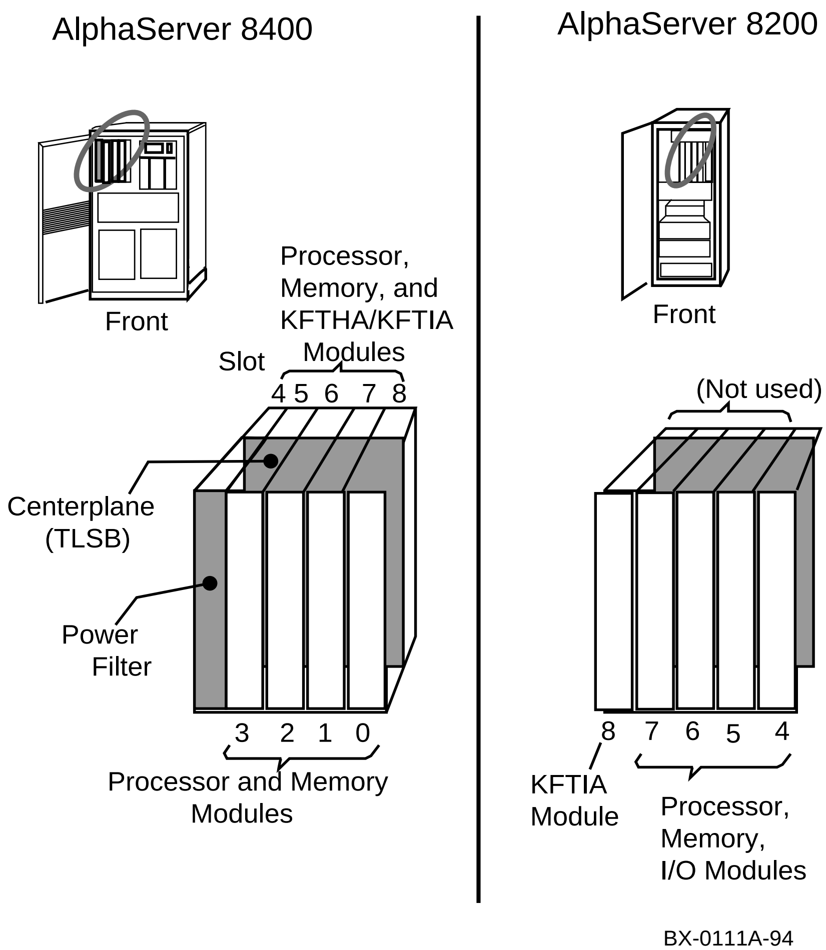
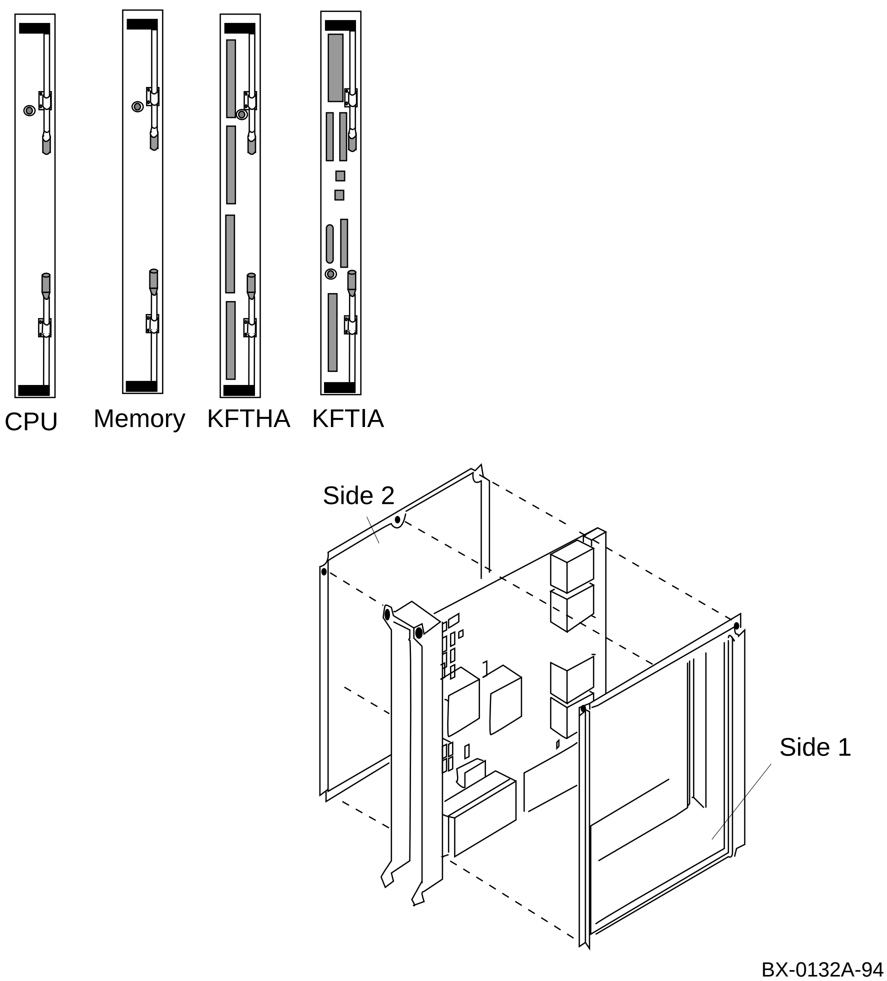


Figure 1–3 shows the location of the TLSB card cage in each system, and the node numbers for the slots that contain either CPU, memory, or I/O modules, or fillers which provide EMI protection, direct airflow, and terminate the TLSB system bus.

Figure 1–4 shows the front of the four types of modules. Also shown is a generic "module." Notice the molded cover on the right side of the module; each type of module has a different cover, specially molded to follow the shape of the components on the module. These covers ensure swift, even airflow around the components for proper cooling. Thus, if you have occasion to remove the covers from a module, be sure that you put them back correctly.

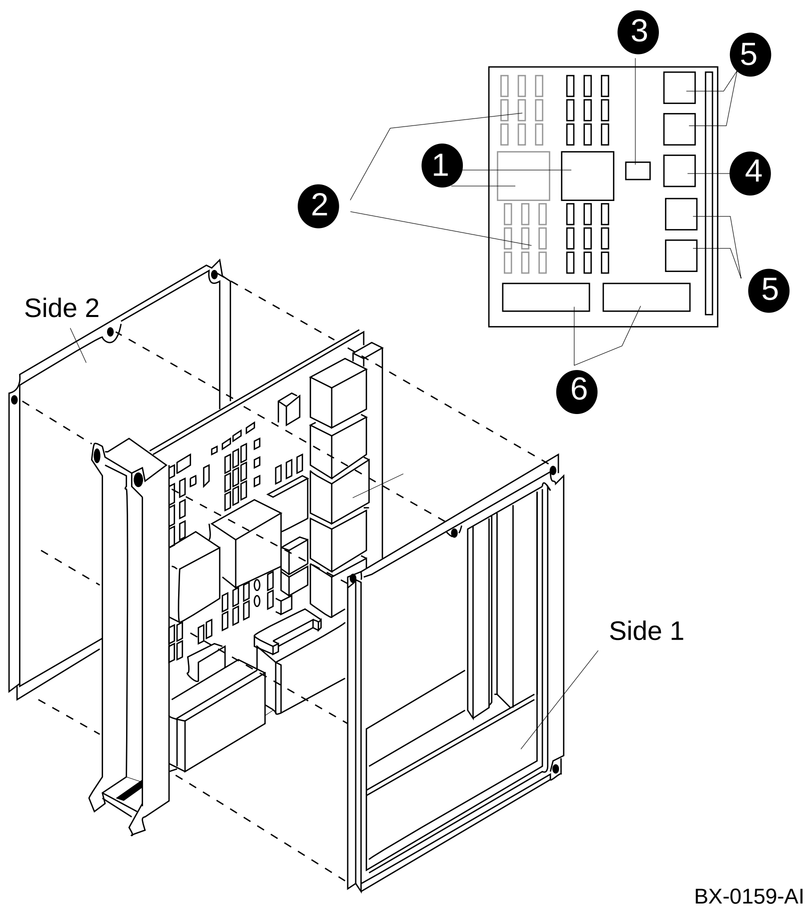
Figure 1–4 General Appearance of TLSB Modules



1.3 KN7CC Processor Module

Up to six KN7CC modules can be used in an AlphaServer 8400 system, and up to three in an AlphaServer 8200 system. A processor module contains either one or two CPU chips.

Figure 1–5 KN7CC Processor Module



The KN7CC processor module can have either one (KN7CC–AA) or two (KN7CC–AB) CPU chips. At the time of this printing, the chips are the DECchip 21164 chips, with a cycle time of 300 MHz.

NOTE: Since the bus cycle time is an integer multiple of the chip cycle time, it is ***crucial*** *that the system clock card (see Sections 1.7 and 1.8) and the processor modules are properly matched. If a bus clock card and processor module(s) cannot be synchronized, the system will start power-up, but will probably not complete, halting in the middle of the power-up console display in a way that is hard to diagnose. The part number for the clock card synchronized to 300 MHz CPUs is 54–21728–05.*

If one of the CPUs in a dual-CPU processor module is malfunctioning, you replace the entire module. The chip is not a field-replaceable unit (FRU); the module is. You will see indications of dual processors on the console display, as shown in Section 3.1.

Figure 1–5 shows a two-CPU processor module. The raised blocks in the figure represent heat sinks that cover the CPU chips. Note that the lightly shaded CPU and B-cache areas are not populated if this is a single-CPU module.

❶ **CPU chip(s).** The DECchip 21164 operates at supercomputer speeds. It is an Alpha architecture chip with super-pipelined micro-architecture. The CPU controls two levels of on-chip caching and one level of off-chip caching. The 8-Kbyte instruction cache and 2x8-Kbyte data cache are fed from the on-chip 96-Kbyte secondary cache.

❷ **B-cache**. The backup cache on the module is a 4-Mbyte nonpipelined cache using 256Kx4 SRAMs.

❸ **MMG.** The MMG gate array multiplexes the addresses to and from the two CPU chips to the interface control chip (ADG). In addition, the MMG supplies write data and is used to perform some Gbus addressing and sequencing functions.

❹ **ADG.** The address gate array contains the interface control logic for the CPU chips, the memory multiplexing gate array (MMG), the TLSB bus, and the data interface gate arrays (DIGAs).

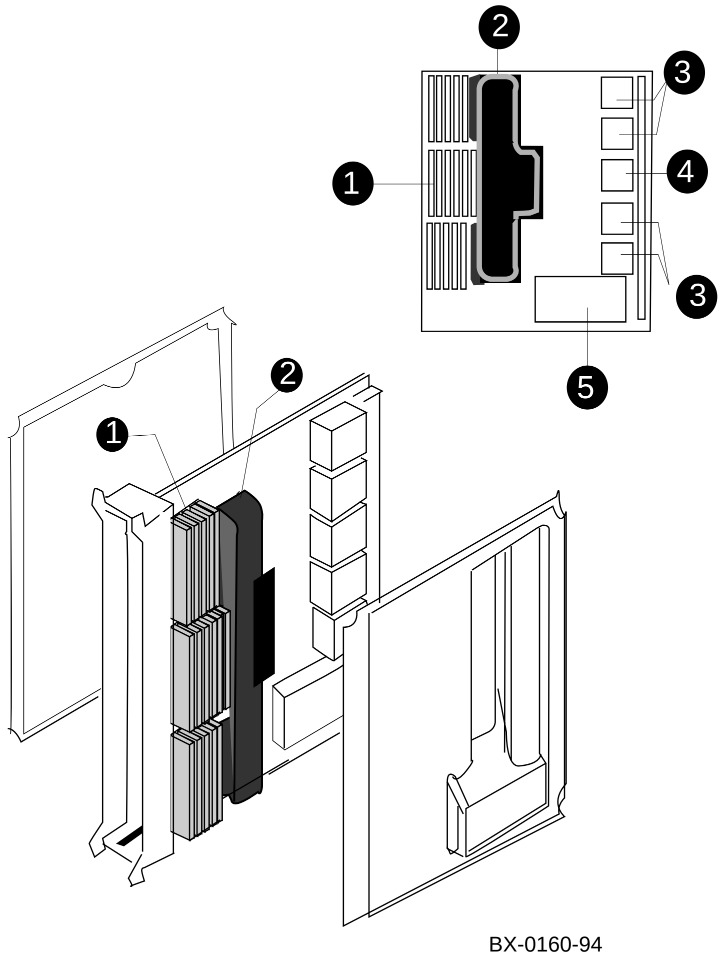
❺ **DIGAs.** The four data interface gate arrays together assemble the 128-bit incoming and 256-bit outgoing data from and to the TLSB.

❻ **DC-to-DC Converters.** These converters step the 48 VDC power supplied by the power subsystem to the voltages required by the components on the processor board.

1.4 MS7CC Memory Module

The MS7CC memory module comes in five variants offering 128 Mbytes, 256 Mbytes, 512 Mbytes, 1 Gbyte, and 2 Gbytes. Up to seven memory modules can be installed in an 8400 system; three in an 8200.

Figure 1–6 MS7CC–BA (128-Mbyte) Memory Module



All memory modules for the AlphaServer 8400 and 8200 systems have SIMMs (single inline memory modules). DRAMs are mounted on small cards that are fixed to the larger memory module by spring-held mounting clips that grip both sides of the SIMM. Figure 1–6 shows:

❶ The array of SIMMs in an MS7CCA–BA (128-Mbyte) memory module.

❷ The dust cover that protects the connectors into which SIMMs can be plugged to upgrade the 128-Mbyte module to a 256-Mbyte module.

❸ Memory data interface (MDI) gate arrays that provide the data interface between the TLSB bus and the DRAM arrays. The MDIs contain data buffers, ECC checking logic, self-test data generation and checking logic, and control and status registers (CSRs).

❹ The control address interface (CTL) gate array that provides the interface to the TLSB, controls DRAM timing and refresh, runs memory self-test, and contains TLSB and memory-specific registers.

❺ The DC-to-DC converter.

All types of SIMMs for all the memory modules available for AlphaServer 8400 and 8200 systems are field-replaceable. Section 3.3 describes how to isolate a problem SIMM. When you replace a SIMM, you must be sure that the type of SIMM matches the module it is designed for, as detailed in Table 1–1.

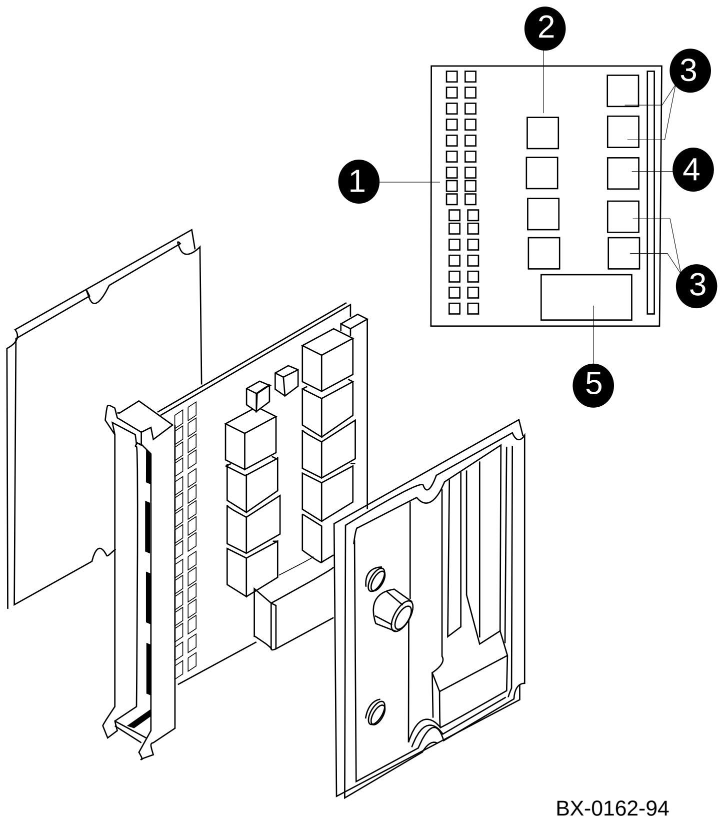
Table 1–1 Memory Modules and Related SIMMs

Memory (Size)	Motherboard Part Number	SIMM Part Number	Number of SIMMs
MS7CC–BA (128 MB)	E2035–AA	54–21724–01 (8 MB)	16
MS7CC–CA (256 MB)	E2035–AA	54–21724–01 (8 MB)	32
MS7CC–DA (512 MB)	E2035–AA	54–21726–01 (32 MB)	16
MS7CC–EA (1 GB)	E2035–AA	54–21726–01 (32 MB)	32
MS7CC–FA (2 GB)	E2036–AA	54–21718–01 (64 MB)	36

1.5 KFTHA Module

The KFTHA module offers four "hose" connectors that interface between the TLSB bus and external buses: XMI, Futurebus+, and PCI/EISA.

Figure 1–7 KFTHA Module



The KFTHA module is designed for high-speed, high-volume data transfers. Direct memory access (DMA) transfers are pipelined to allow for up to 500 Mbytes/second throughput. The major elements of the KFTHA module are:

❶ RAM to buffer data for the DMA transfers.

❷ Four hose-to-data-path (HDP) chips, each handling 32 bits from two “hoses” (I/O cables connecting to an adapter in an associated I/O bus). Data on the HDPs flow in one direction; either “up” (to the KFTHA) or “down” (to the I/O adapter).

❸ Four I/O data path (IDP) chips, which together handle a 256-bit data transfer to or from the TLSB system bus.

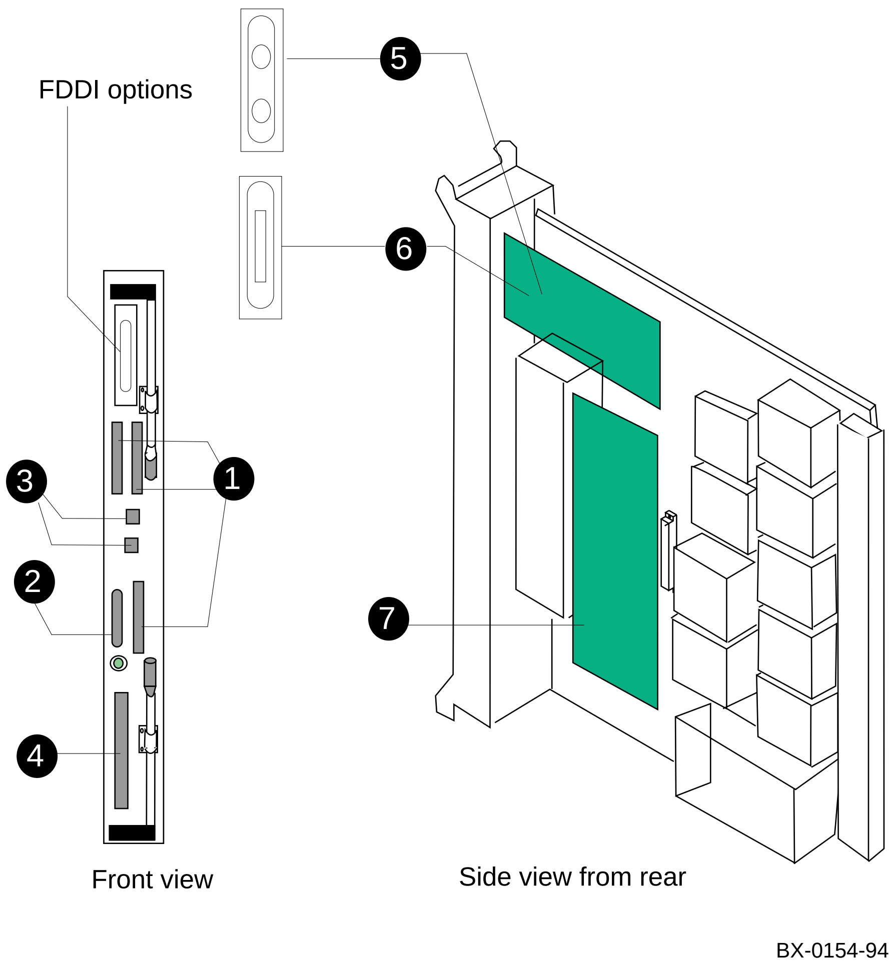
❹ An I/O control chip (ICC) houses the primary control logic for the TLSB interface.

❺ A DC-to-DC converter that converts the 48 VDC system power to the DC voltage required by the KFTHA module.

1.6 KFTIA Module

The KFTIA module offers an internal peripheral component interconnect (PCI) bus that connects to various kinds of I/O devices through connectors at the front of the module. The module also has one “hose” connector that can interface to a PCI/EISA, XMI, or Futurebus+ bus.

Figure 1–8 KFTIA Module



The KFTIA I/O module offers an internal PCI bus that is *integrated* into the module itself, as well as a direct “hose” connector from the KFTIA to separate buses. As Figure 1–8 shows, several types of connectors reveal the I/O options accessible directly from the module.

The basic module offers:

❶ Three FWD (fast wide differential) SCSI connectors, that, combined with Digital StorageWorks RAID controllers, storage cabinets, and devices, offer access to large amounts of SCSI disk storage.

❷ One single-ended SCSI connector, reserved for the system load device.

❸ Two Ethernet connectors.

❹ One “hose” connector that can interface to an XMI, Futurebus+, or PCI/EISA bus.

Three other options are available, which can be ordered and are field-installable:

❺ DEFPZ–AA daughter card. A multimode fiber FDDI (fiber-distributed data interface) on-board logic card and its associated connector. (Allows up to 2 km local area network (LAN).

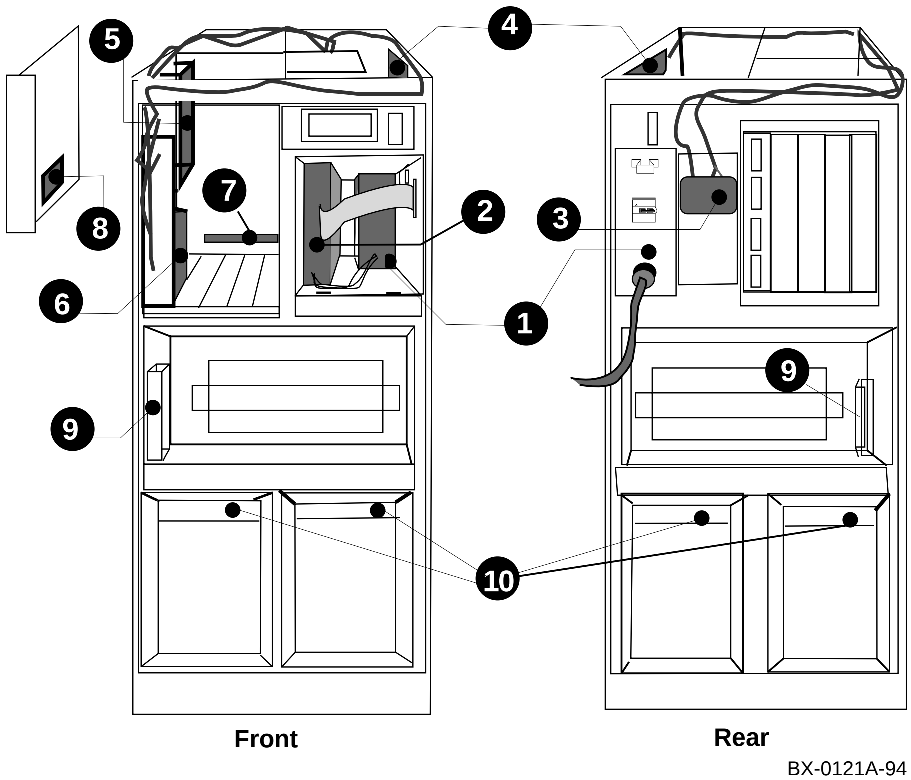
❻ DEFPZ–UA daughter card. A copper wire FDDI (fiber-distributed data interface) on-board logic card and its associated connector. (Allows up to 100-m cabling in office-type LAN).

❼ NVRAM daughter card (part number DJ–ML300–BA). A 4-Mbyte memory card that can enhance performance, increasing the memory available as buffer space for DMA (direct memory access) transmissions.

1.7 AlphaServer 8400 Power Subsystem Overview

An AlphaServer 8400 power subsystem has either single-phase or three-phase AC power input.

Figure 1–9 AlphaServer 8400 Power System Overview



❶ Either single-phase or three-phase AC power enters the system by cable through the AC input box. Figure 1–9 shows a system with single-phase power. Each has a cabinet circuit breaker and fuses for protection from power surges. The three-phase system offers a port for monitoring voltage and the choice of battery backup.

❷ Two kinds of power regulators are available. An H7264 regulator (shown in Figure 1–9 with the cover plate removed) converts single-phase AC power to 48 VDC. A system may use one or two H7264 power regulators, as needed for power demands (see the *Systems and Options Catalog* for power requirements).

The H7263 regulators convert three-phase AC power to 48 VDC and also supply information for console display. Two or three regulators offer n+1 redundancy; that is, if one regulator fails, the second or third supplies the needed power.

❸ The DC distribution box in back of the H7264 power regulator provides 48VDC to the system, holding connector points for power distribution (under the gray cover) and provides a signal interface between the CCL and the power regulators. With three-phase power input and H7263 regulator(s), connector points are also available for input from battery-backup units (BBUs) located in either a BBU plug-in unit (PIU) or from battery expander cabinets.

❹ The cabinet control logic (CCL) module contains logic that monitors signals from parts of the power system.

❺ The clock module provides the oscillator and logic that governs the frequency with which signals can be transmitted on the TLSB (bus cycle time). The clocking scheme supports a bus cycle time of 10 ns, which translates to a system clock frequency of 100 MHz.

❻ The power filter removes any noise disturbance on the 48V line to supply consistent power to the delicate system modules and other components.

❼ The power bus bar delivers 48 VDC power to modules on the system bus. All slots in the system bus must be filled for proper termination of the bus (filler modules are supplied as part of the base system).

❽ Modules on the system bus contain DC-to-DC converters that step the power down to the voltages required by the particular component.

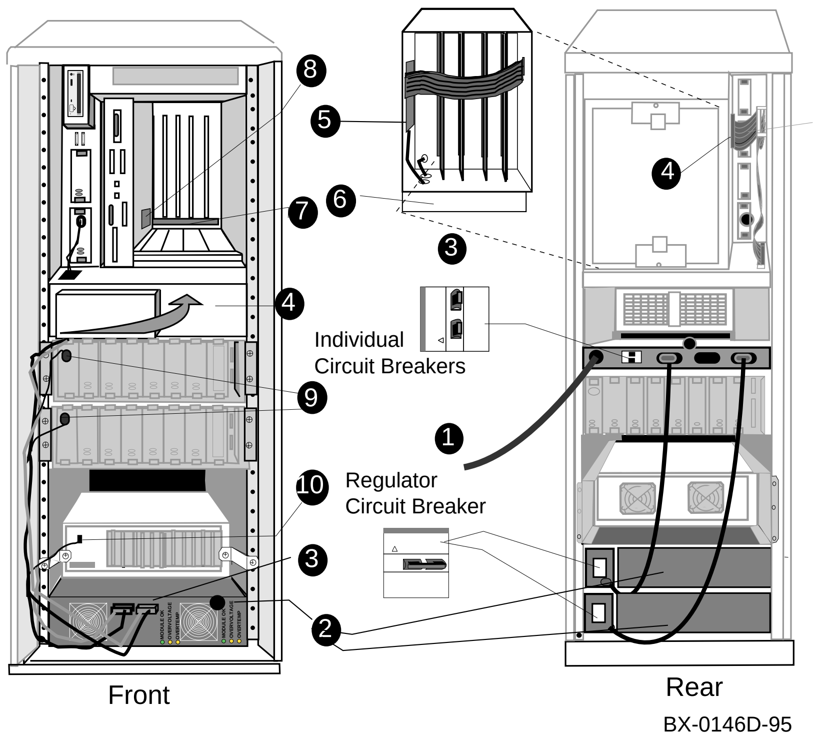
❾ This connection provides power to the system blower that cools the entire system.

❿ 48 VDC power is supplied to system plug-in unit housing through receptacles located on a crossbar of the PIU housing. (This receptacle is covered by a plate that is removed when a PIU is installed.)

1.8 AlphaServer 8200 Power Subsystem Overview

The power subsystem consists of those system components that deliver electrical current to the rest of the system.

Figure 1–10 AlphaServer 8200 Power Subsystem Overview



❶ Single-phase AC power enters the system through the AC input box. The front view in Figure 1–10 shows one power regulator. The rear view shows two, to illustrate how the AC power enters the power strip, and then is routed down to the two regulators. Two regulators provide n+1 redundancy (that is, if one fails, the other will supply power).

❷ Each power regulator contains an AC input, two 48 VDC outputs, and (optional) battery backup.

❸ The two DC distribution connectors in the front of the power regulator provide 48 VDC to the system. LEDs signal the status of the regulator feeding these connectors.

❹ The cabinet control logic (CCL) module monitors signals from parts of the power system and provides error information to the console software. It is located behind the CCL panel.

❺ The clock module provides the oscillator and logic that governs the frequency with which signals can be transmitted on the TLSB (bus cycle time). The clocking scheme supports a bus cycle time of 10 ns; system clock frequencies may vary. The clock card must support the timing of the processors in the TLSB bus; otherwise, the system will not power up properly.

❻ The power filter removes any noise disturbance on the 48V line, supplying consistent power to system modules and other components.

❼ The power bus bar delivers 48 VDC power to modules on the system bus. All slots must be filled for proper termination of the bus; terminator modules are supplied as part of the base system.

❽ Modules on the system bus contain DC-to-DC converters that step the power down to the voltages required by the particular component.

❾ As shown, 48 VDC power is supplied to the StorageWorks shelves mounted in the cabinet. The power regulators convert the 48 VDC to the 12, 3, and 5 VDC power used by the StorageWorks I/O devices.

❿ The same type of clips and receptacles used for the StorageWorks shelves supply 48 VDC power to the PCI card cage. A regulator inside the card cage converts the 48 VDC to the power used internally.

1.9 I/O Buses and In-Cab Storage Devices

Both the AlphaServer 8200 and 8400 system and expander cabinets are designed to hold PCI/EISA bus shelves and StorageWorks I/O device shelves. In addition, the AlphaServer 8400 cabinets can hold XMI and Futurebus+ buses.

Figure 1–11 AlphaServer 82/8400 I/O Buses and In-Cab Storage

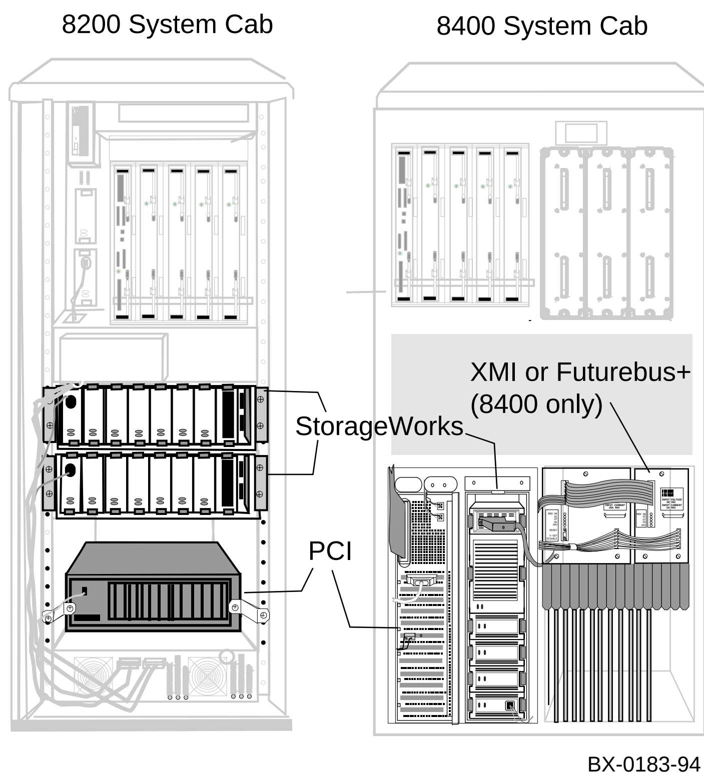


Figure 1–11 shows an AlphaServer 8200 system cabinet and an AlphaServer 8400 system cabinet.

As shown, the PCI/EISA bus and StorageWorks shelves are mounted horizontally in the 8200 and vertically – within enclosures called “plug-in units” (PIUs) – in the 8400. Each StorageWorks shelf has room for up to seven devices, including a signal converter and 3.25-inch disks or tapes. A power unit (DC-to-DC converter) is in the bottom (leftmost) slot of the shelf.

The AlphaServer 8200 cabinets are structured to hold horizontal shelves of roughly the same height. The system cabinet has five shelf slots; the bottom two can be power regulators, and the top three can be any combination of PCI/EISA shelves (starting from the bottom up) or StorageWorks shelves (starting from the top down). Two StorageWorks shelves can be mounted, back to back, in the same shelf slot.

The 8200 expander cabinet is also structured to hold horizontal shelves of about the same height. The configuration rules for the AlphaServer 8200 are described in Chapter 8.

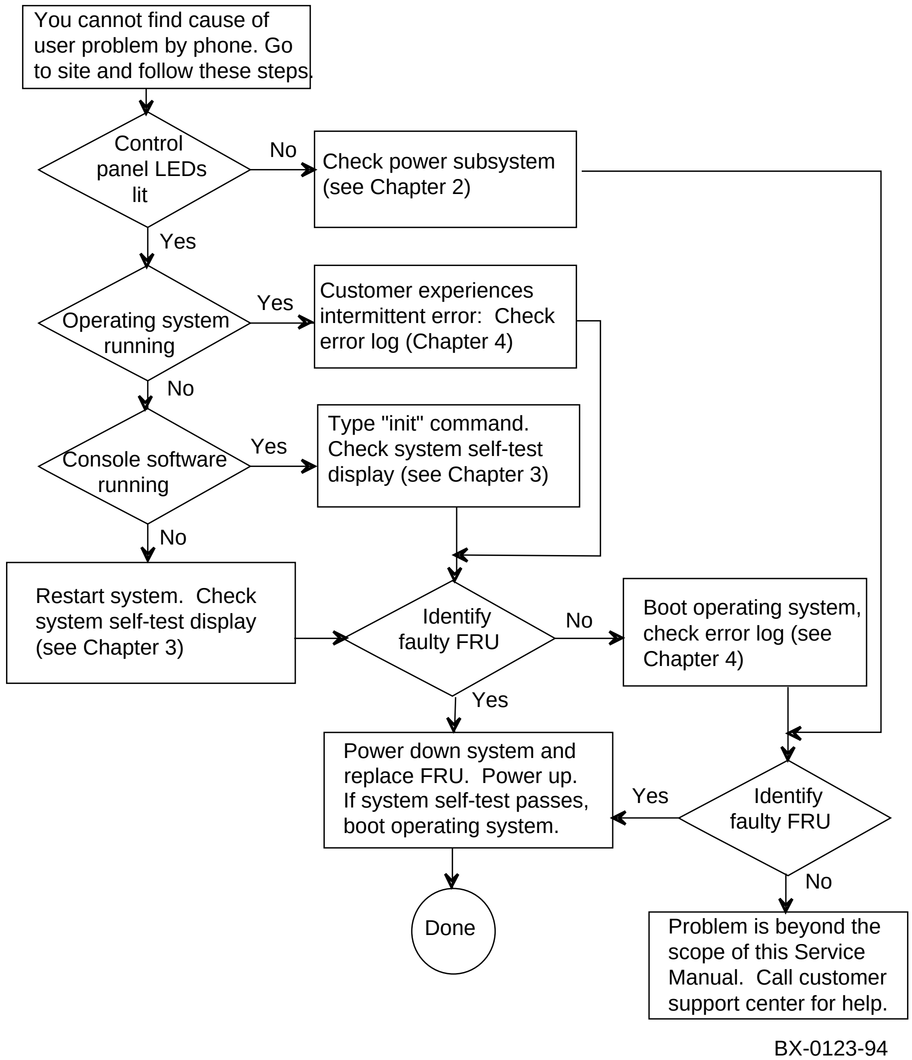
The AlphaServer 8400 cabinets can also contain XMI and Futurebus+ buses in PIUs. The system cabinet has four *quadrants* in the lower part of the cabinet (the XMI PIU takes two quadrants). Expander cabinets have six quadrants.

Both systems can be connected to the I/O devices of their resident buses and adapters, but these are not housed within the cabinets themselves. StorageWorks cabinets are also available that can hold RAID controllers and other options not available within the system cabinets.

1.10 Troubleshooting Steps and Tools

Follow steps to isolate system problems. A possible routine is shown below.

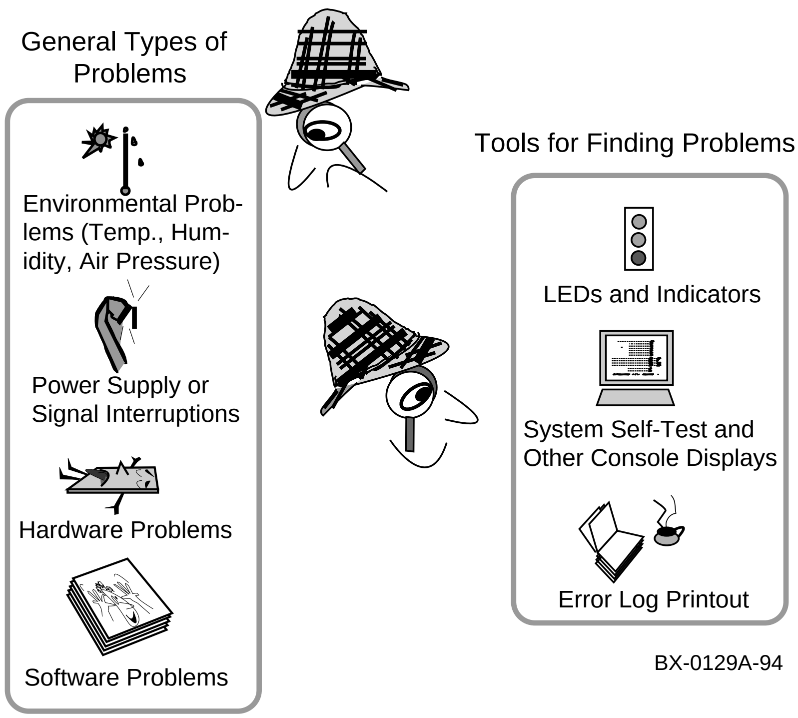
Figure 1–12 Troubleshooting Steps



The system hardware, console software, and operating system software provide three types of troubleshooting tools, as shown in Figure 1–13.

Chapters 2, 3, and 4 tell how to use these tools to isolate faulty components or report software problems for AlphaServer 8200 and 8400 systems.

Figure 1–13 Troubleshooting Tools



Part 1

Troubleshooting

Chapter 2

Troubleshooting with LEDs

This chapter tells how to use LED displays and other indicators to track down faulty components that you can replace in the AlphaServer 8200 and 8400 systems.

LEDs give status on the power subsystem, system bus (TLSB) modules (processor, memory, and I/O), and I/O buses and devices in shelves. The cooling subsystem consists of fans in various locations and can be checked by looking and listening for the fans.

Where the systems are similar (TLSB bus and modules), the troubleshooting procedures described here apply to both. Where they are different (power subsystem), details of troubleshooting vary.

The sections in this chapter are as follows:

- Troubleshooting Common to Both Systems
  - Start with the Control Panel
  - Troubleshooting TLSB Modules
  - Troubleshooting a PCI Shelf
  - Troubleshooting StorageWorks Shelves
- Troubleshooting the 8200 Power Subsystem
  - 8200 Power Regulators
  - 8200 Cabling
- Troubleshooting the 8200 Cooling Subsystem
- Troubleshooting the 8400 Power Subsystem
  - 8400 AC Input Box
  - H7264 Power Regulators
  - H7263 Power Regulators
  - Cabinet Control Logic (CCL) Module
- Troubleshooting the 8400 Blower
- Troubleshooting 8400 XMI and Futurebus+
- Troubleshooting with 8400 XMI and Futurebus+ I/O Module LEDs
- Troubleshooting an 8400 DSSI PIU

2.1 Troubleshooting Common to Both Systems

2.1.1 Start with the Control Panel

Check the control panel lights. The 8200 has three pushbuttons and three LEDs. The 8400 has a keyswitch and three LEDs.

Figure 2–1 Control Panel

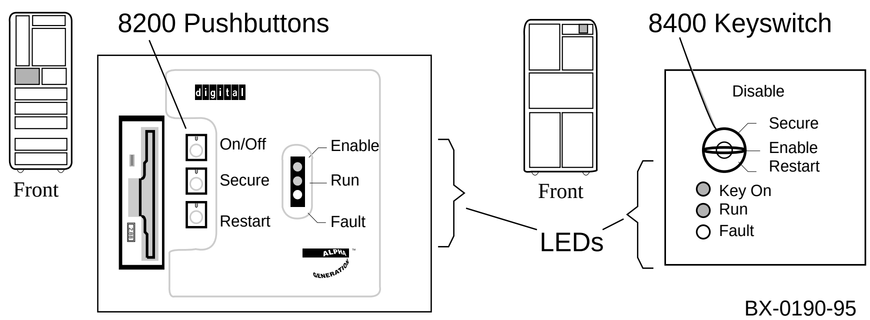


Figure 2–2 Troubleshooting: Start with the Control Panel

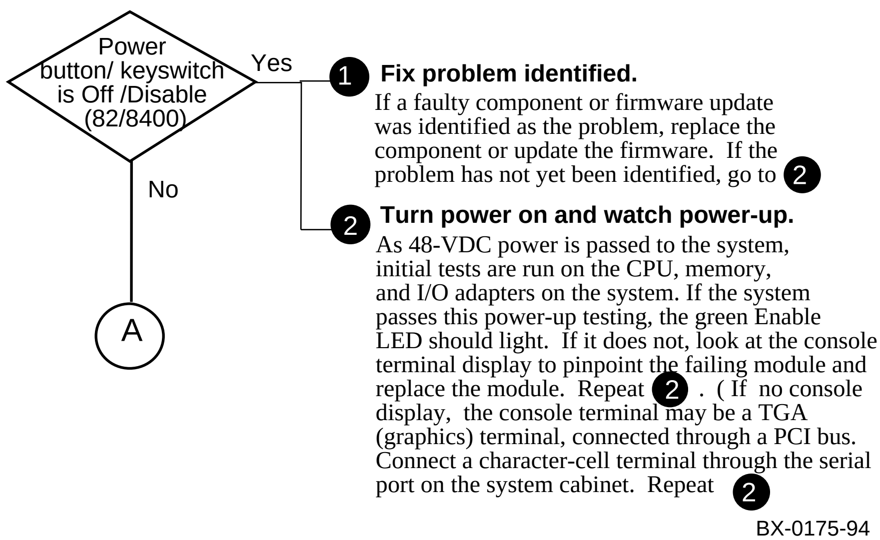
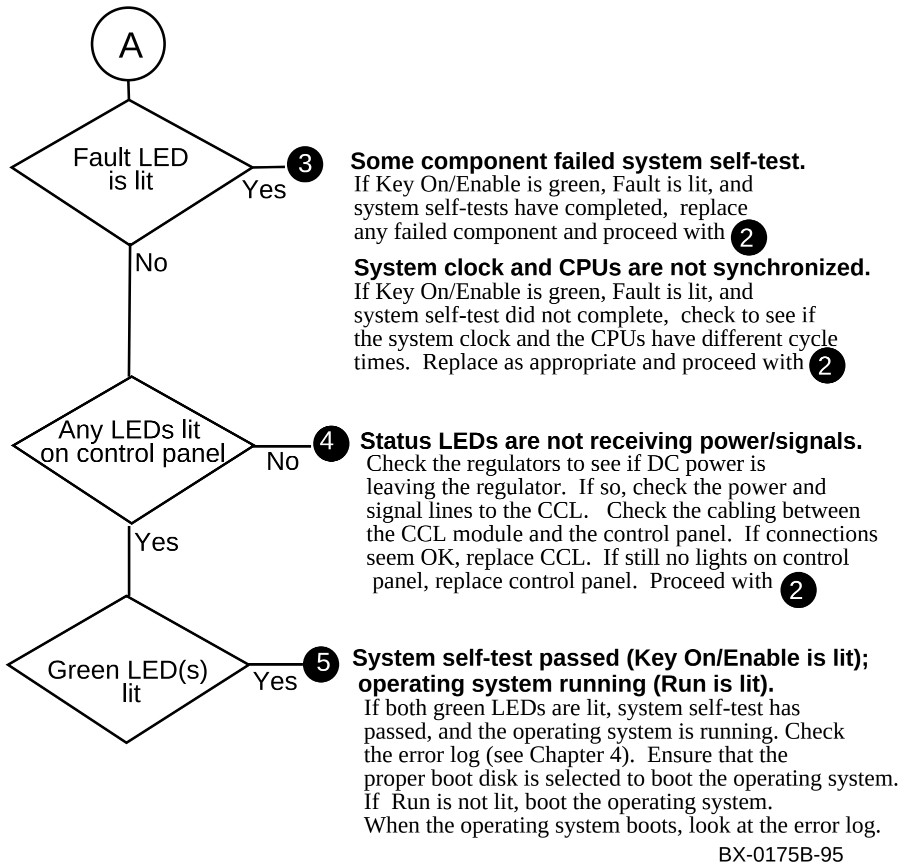


Table 2–1 Control Panel LEDs at Power-Up

Action	Key On (8400) /Enable (8200)	Run	Fault
Set circuit breaker to On	Off	Off	Off
Press On button (8200) /Turn keyswitch to Enable (8400)	On	Off	Slow Blink
System self-test starts	On	Off	On
Modules pass self-test	On	Off	Off
Module fails self-test	On	Off	On
Three-phase power problem	On	Off	Blink
Operating system boots	On	On	Off

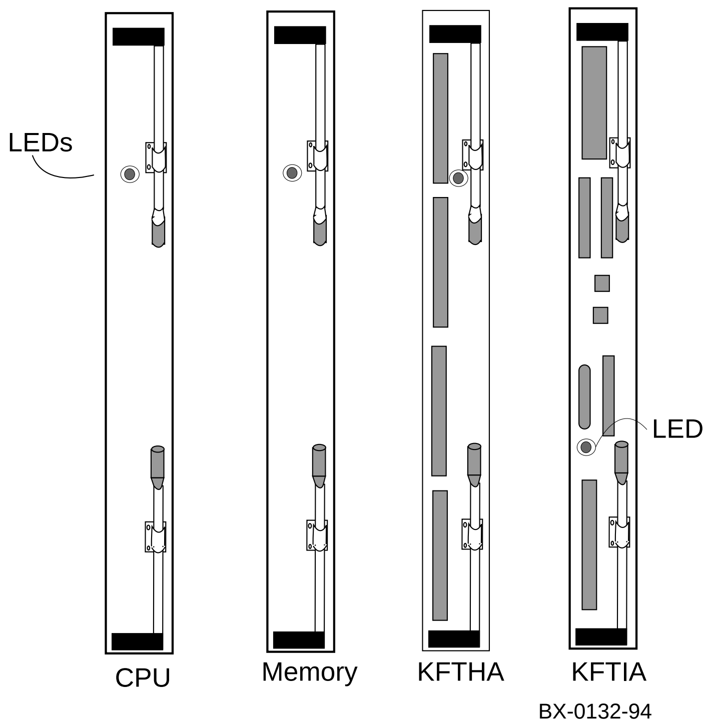
Figure 2–2 Troubleshooting: Start with the Control Panel (Cont.)



2.1.2 Troubleshooting TLSB Modules

You can check individual module self-test results by looking at the status LEDs on the modules.

Figure 2–3 TLSB Module Status



In general, if a module on the TLSB does not pass self-test (green led is not lit) it should be replaced.

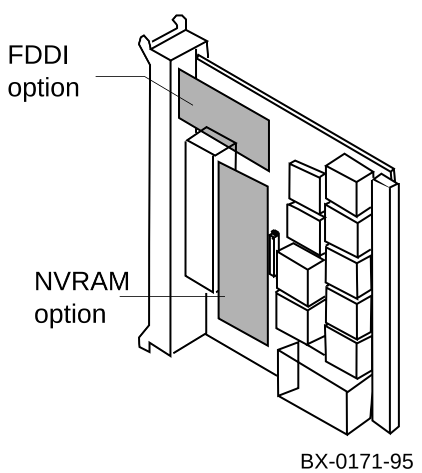
There are two cases where some removal and replacement action may be needed even though the module passes self-test.

Failure of the built-in-self-test for the MS7CC modules indicates that testing has shown that there is no single 64-Kbyte segment of memory that is usable. Each 64-Kbyte segment must show at least 256 bad pages before it is noted as unusable. However, it is possible for a SIMM to warrant replacement, even though the module as a whole passes its self-test.

Also, a KFTIA may contain field-replaceable options that are faulty, even when the module has passed its self-test. The PCI FDDI option and the PCI NVRAM cards can be replaced (see below), and, for other options, you may simply disconnect the I/O option that failed its own self-test, rather than bringing down the whole I/O operation handled by the KFTIA, until a replacement module can be found.

You can determine faulty SIMMs and KFTIA options with the **show config** console command, as described in Chapter 3.

Figure 2–4 PCI FDDI and NVRAM Options on KFTIA



2.1.3 Troubleshooting a PCI Shelf

LEDs show the status of the power supplies, as well as the adapter self-test results in the PCI shelf, mounted vertically in the AlphaServer 8400, horizontally in the AlphaServer 8200.

Figure 2–5 PCI PIU in an 8400

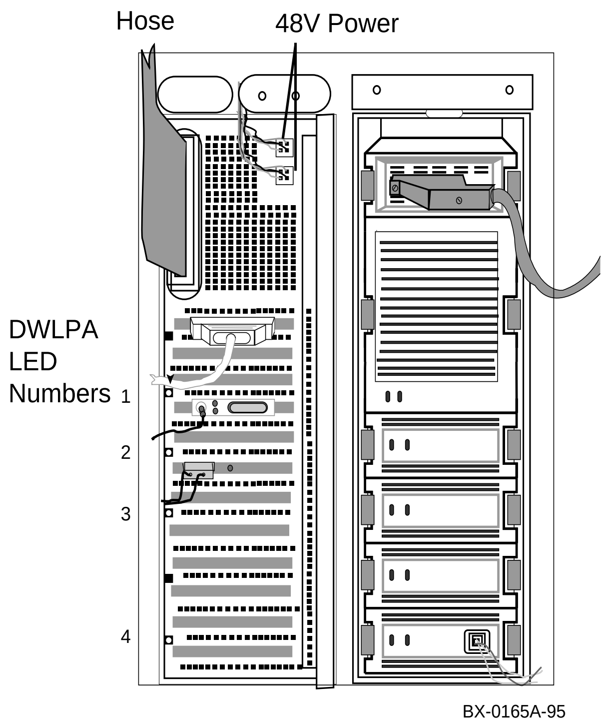


Table 2–2 LEDs in a PCI Shelf

LED No.	Meaning When Lit
1	On-board power system OK
2	Motherboard self-test passed
3	48 VDC power supply OK
4	Hose error

Figure 2–6 PCI Shelf in an 8200

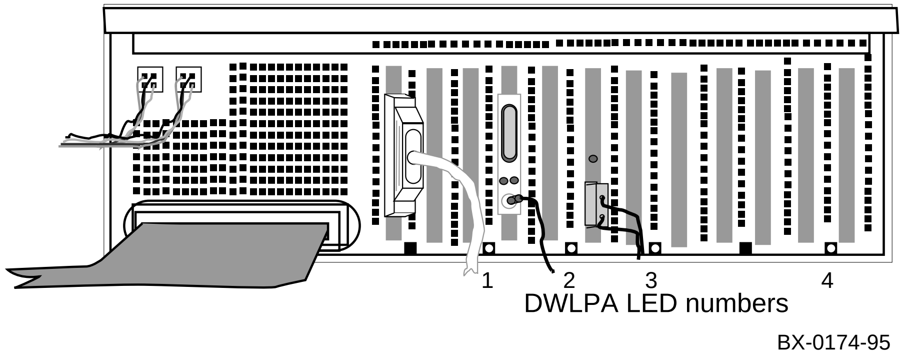
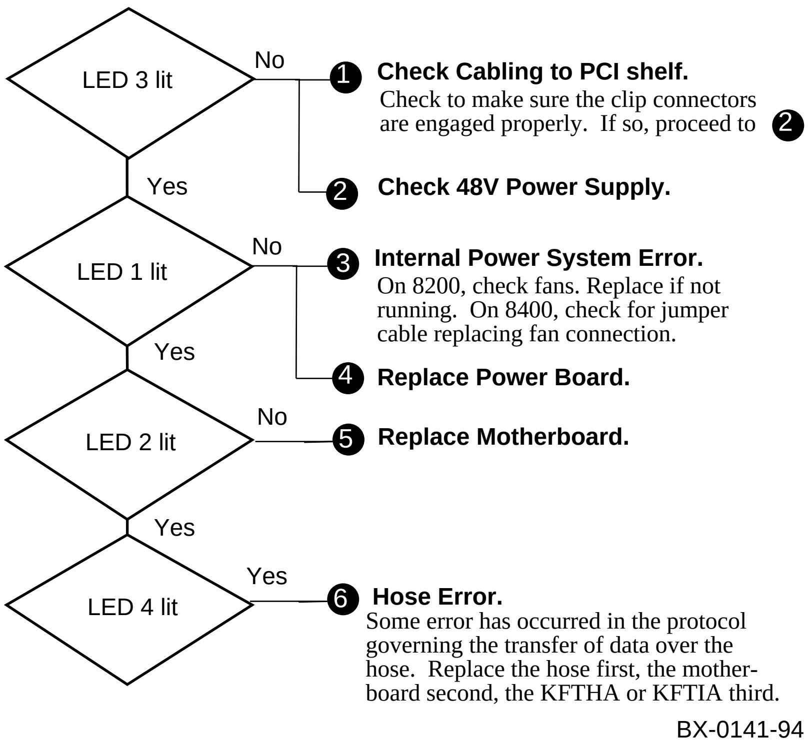


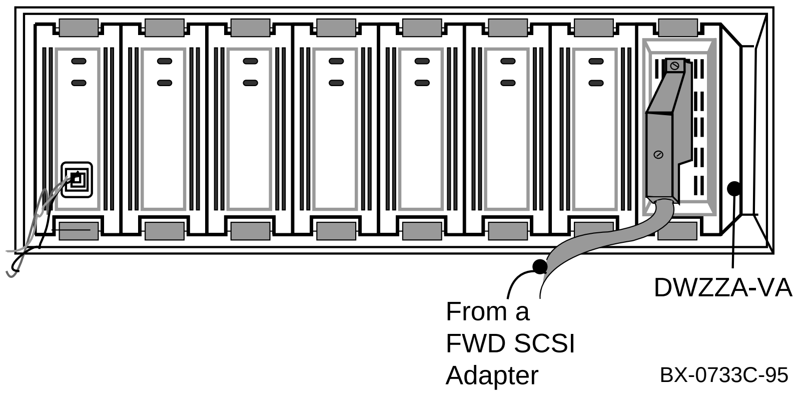
Figure 2–7 Troubleshooting a PCI Shelf



2.1.4 Troubleshooting StorageWorksShelves

StorageWorks devices are mounted in shelves that are mounted horizontally in the 8200 system or expander cabinet. In the 8400, a different StorageWorks shelf is mounted vertically in a PIU. StorageWorks devices can also be mounted in separate StorageWorks cabinets.

Figure 2–8 Troubleshooting StorageWorks Devices and Shelves



There are many StorageWorks devices that can be connected to AlphaServer 8200 and 8400 systems. Here, the discussion is limited to troubleshooting devices and shelves that are mounted in a StorageWorks shelf in a SCSI PIU in an AlphaServer system cabinet or expander cabinet.

Table 2–3 SCSI Power Supply LEDs

Indicator LED	LED State	Meaning
Left (Top) Green LED	Off	Shelf fault
	On	Shelf OK
Right (Bottom) Green LED	Off	Power fault
	On	Power OK

Table 2–4 SCSI Device LEDs

Indicator LED	LED State	Meaning
Left (Top) Green LED	Blinking	Data is being transferred to the device.
	Off	No data transfer to the device is taking place.
Right (Bottom) Yellow LED	Blinking	Data is being transferred from the device.
	Off	No data transfer from the device is taking place.

Table 2–5 Troubleshooting the DWZZA–VA

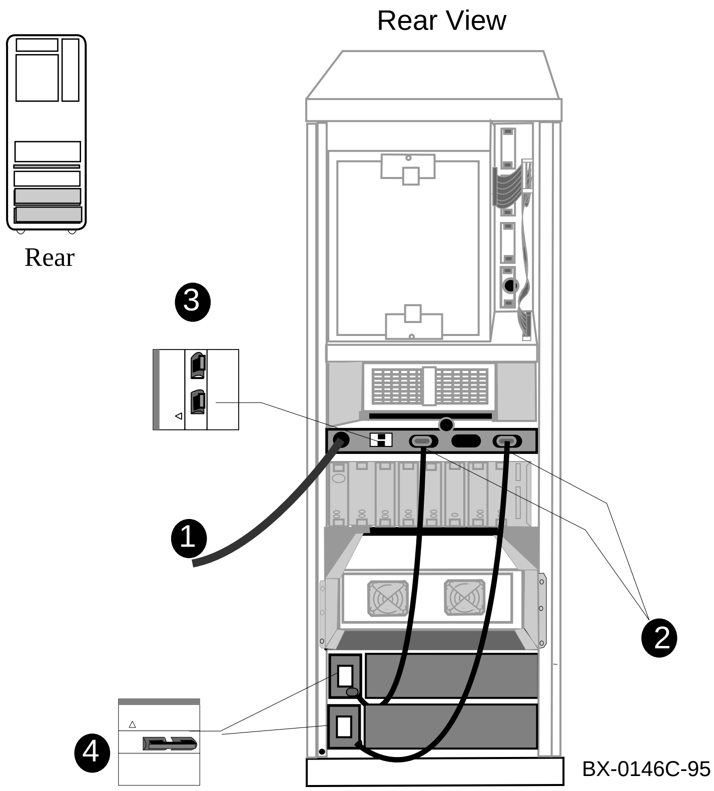
Indicator LED	Meaning
None	If the power supply LEDs are lit, but the device LEDs are not lit, check to see that the connecting cable is properly seated in the DWZZA–VA and, at the other end, in the FWD adapter.

2.2 Troubleshooting the 8200 Power Subsystem

2.2.1 8200 Power Regulators

The 8200 power regulators accept single-phase AC and produce 48 VDC power.

Figure 2–9 8200 Power Regulators — AC Input Side



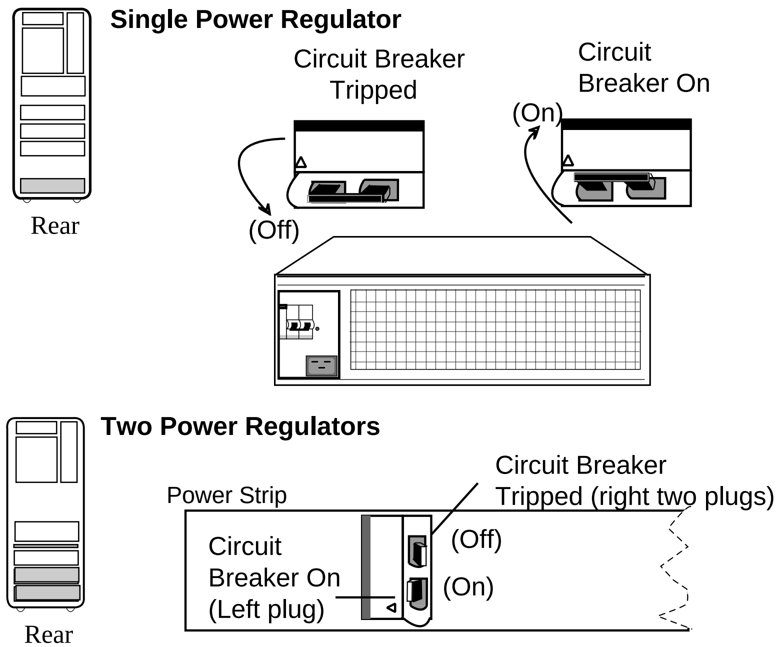
❶ AC input cable to AC power strip. (Used wth two regulators.)

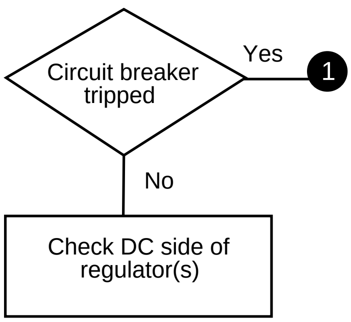
❷ Power plugs and cables providing AC input to the individual regulators.

❸ Circuit breakers on power strip. Lower controls left plug; higher controls right two plugs.

❹ Regulator circuit breaker. (Use power strip breakers if two regulators.).

Figure 2–10 8200 AC Input Troubleshooting Steps





1 Check for breaker trip due to power surge.
Check to make sure no one has intentionally powered the system down. If not, the breaker may have been tripped by an outside power surge or a short within the system. Push the breaker switch to On.

A. **If the breaker does not trip off again,** check if power has returned to other parts of the system. Blower spins up? System self-test completes OK and console prompt comes up? If so, boot the operating system. If not, continue with the DC regulators.

B. **If the breaker does trip to off again,** check for a short circuit within the system. Continue the search with the DC side of the regulators.

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Figure 2–11 8200 Power Regulators — DC Output Side

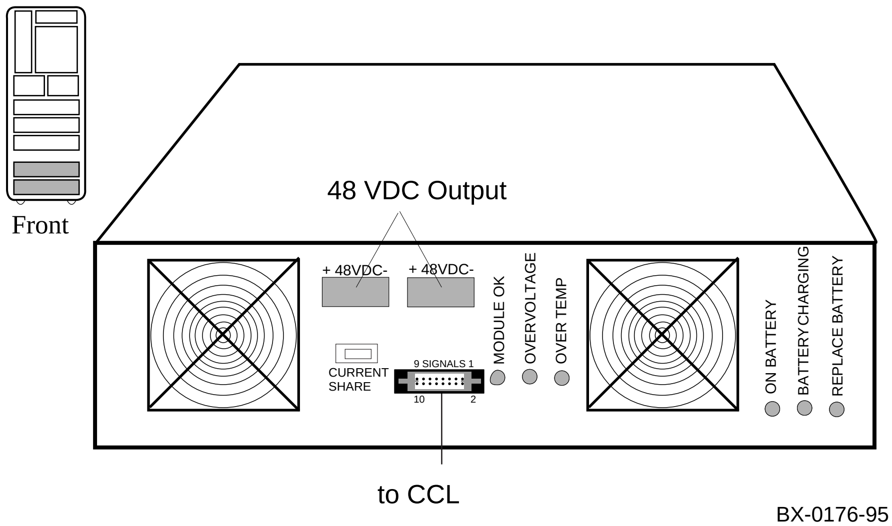
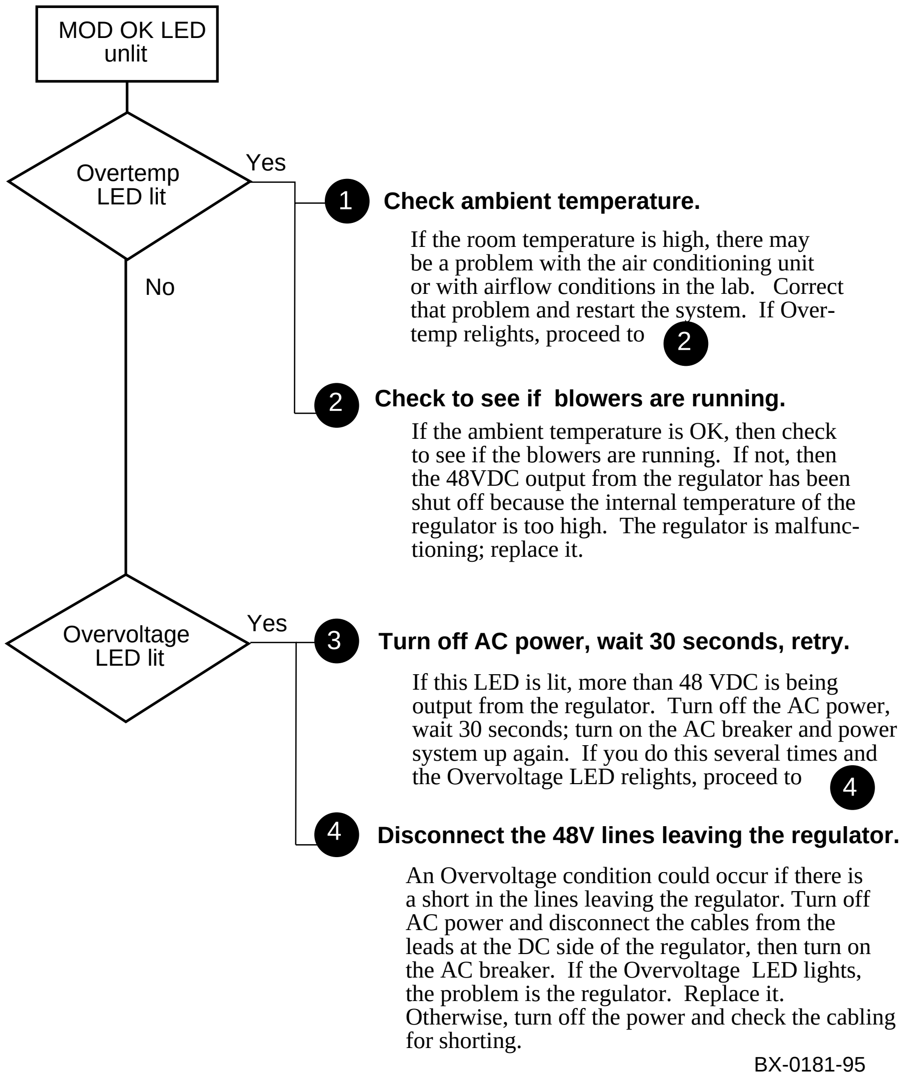


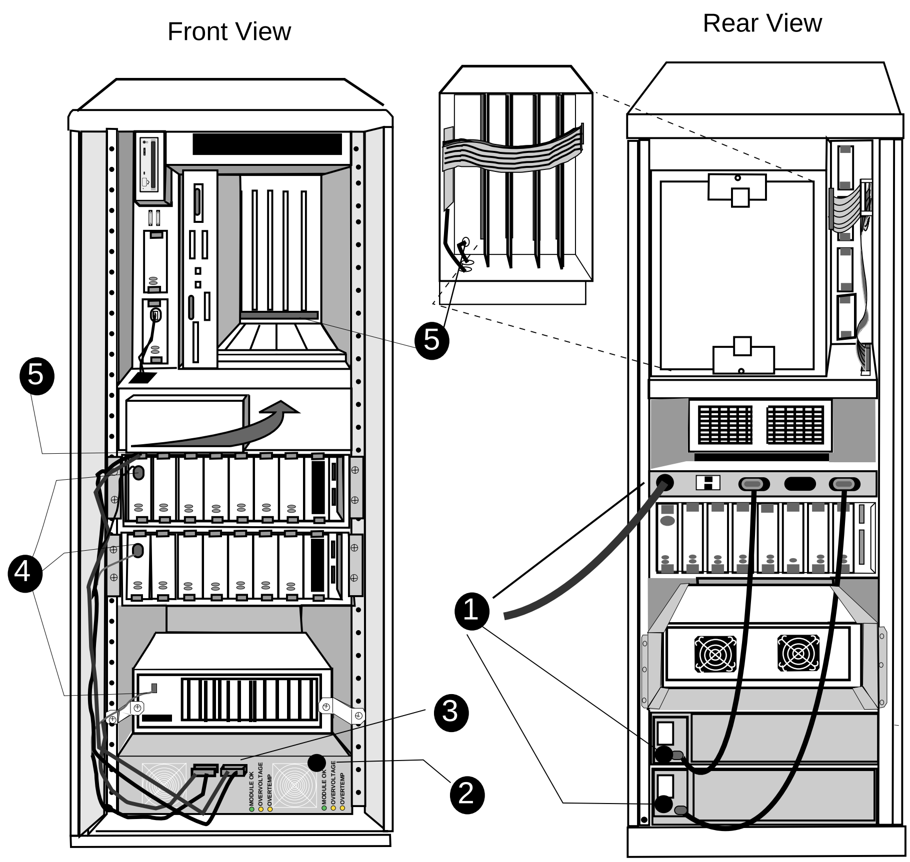
Figure 2–12 Troubleshooting the DC Side of 8200 Regulators



2.2.2 8200 Cabling

If some component of the system is not working, or its LEDs are not lit, check the cabling to the device or component.

Figure 2–13 Checking Power Connections



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❶ Check to make sure that the main AC power cable is plugged into the AC power strip (two regulators) or the one regulator in the system.

❷ Make sure that, if battery backup is in use, it is functioning.

❸ Make sure that the 48 VDC cables are plugged into the outlets in the regulator.

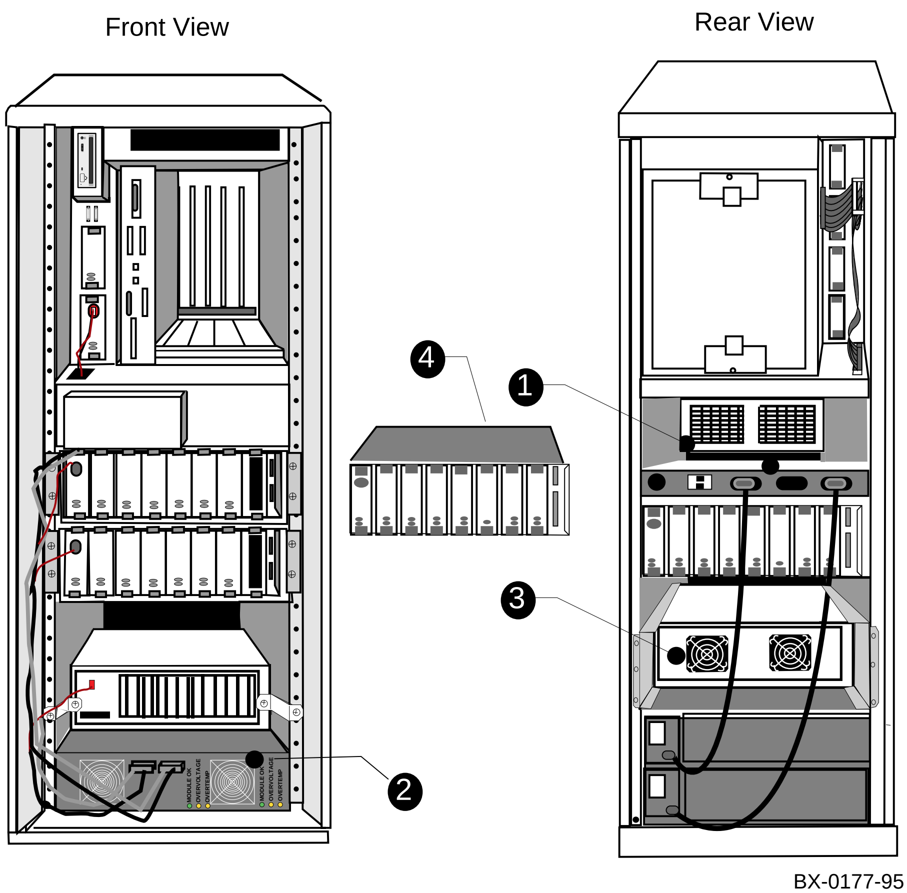
❹ Check the connections to the PCI shelf and StorageWorks shelves.

❺ Check all the cabling that can be seen. Cabling to the TLSB bus enters the control panel, goes beneath the bottom of the bus (see arrow), and reappears near the clock card at the back to supply power to the 48 VDC power bus bar on the centerplane. If there appears to be a problem with power supply to the bus, remove the front panel and check that power and signal cabling connections are in order.

2.3 Troubleshooting the 8200 Cooling Subsystem

The cooling subsystem of the AlphaServer 8200 system consists of several fans. One is located directly under the system bus, behind the control panel. Others are located in the power regulators and in the individual PCI and I/O shelves.

Figure 2–14 LEDs for Temperature and Cooling Fan Locations



The AlphaServer 8200 contains four different types of fans. To test that the fans are working, hold a small slip of paper near the fan, or in the case of the SCSI shelves, near the front of the shelf, and see whether the paper is blown out or drawn in (fan is working) or remains stationary. (Don't let go of the paper, just hold it and see which way it is drawn.)

❶ This is the PSU (processor system unit) cooling fan. It draws air down from the ventilated top of the system, through the TLSB bus and modules, and out the back of the system. A paper placed at the back of the system near the main cooling fan will be blown outward.

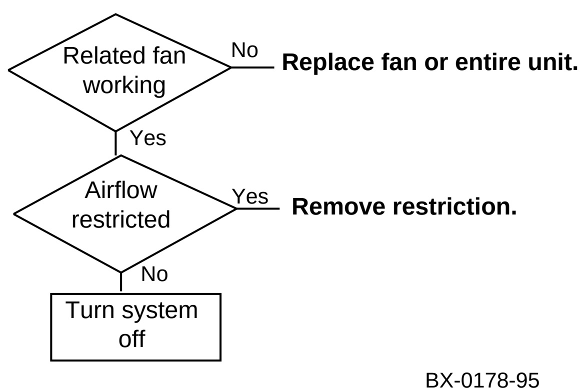
NOTE: Do not place anything on top of the system, as that will restrict airflow and may cause the modules to overheat.

❷ The power regulators have fans at the DC output side of the regulator. The OVERTEMP LED lights if these units overheat. The fans draw air in to the back and through the DC regulators, AC input, and battery backup (if present) components of the system. Paper is drawn in to the fan in this case.

❸ The PCI shelf has two fans that blow air out, drawing air through the vented front of the shelf (where the adapters are). Thus, paper placed near the fans on the PCI shelf are blown outward in this case.

❹ StorageWorks shelves used in the AlphaServer 8200 system have fans mounted in the back of the shelf that draws air inward.

Figure 2–15 Troubleshooting the 8200 Cooling System



2.4 Troubleshooting the 8400 Power Subsystem

2.4.1 8400 AC Input Box

There are two kinds of AC input box for AlphaServer 8400 systems, depending on the type of regulator used.

Figure 2–16 8400 AC Input Box

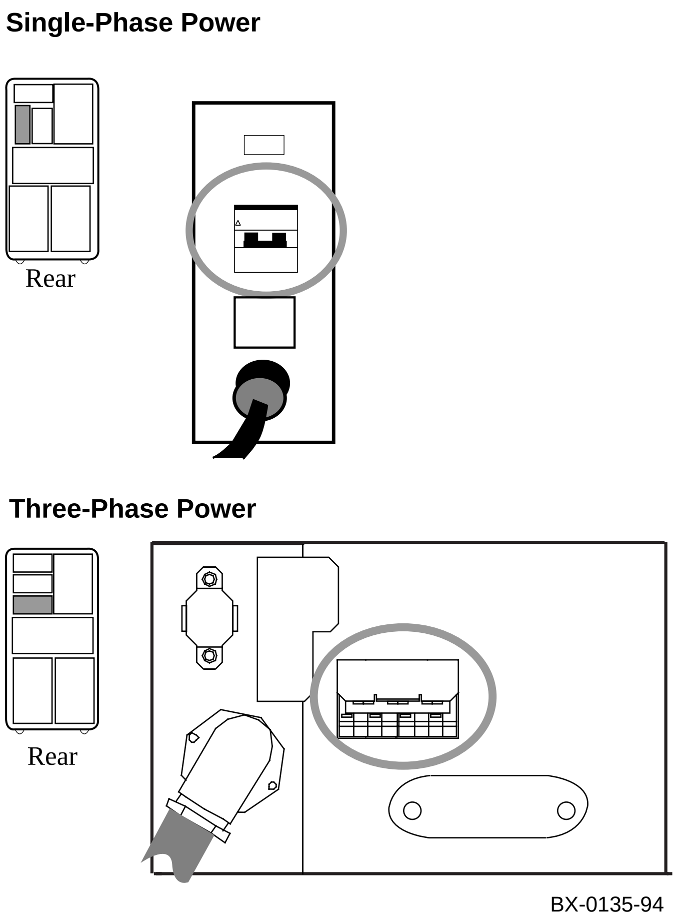
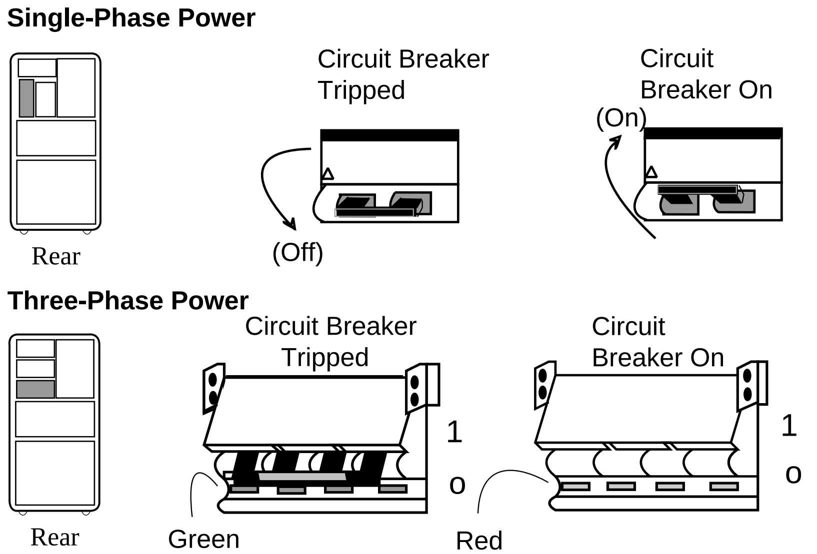
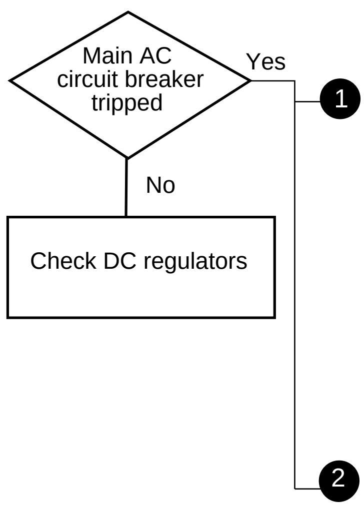


Figure 2–17 8400 AC Input Box Troubleshooting Steps





1 Check for breaker trip due to power surge.

Check to make sure no one has intentionally powered the system down. If not, the breaker may have been tripped by an outside power surge or a short within the system. Push the breaker switch up.

A. **If the breaker does not trip off again,** check to see if power has returned to other parts of the system. Blower spins up? System self-test completes? If so, boot the operating system. If not, check the DC regulators.

B. **If the breaker does trip to off again,** check the fuses in the AC input box, and replace if needed. If fuse blew on transient power surge, replacing the fuse will fix the problem.

2 Check for short within system.

After replacing the blown fuse or fuses, push the breaker switch up again. If power returns to other parts of the system, boot the operating system at the console prompt after system self-test passes successfully. If not, check for a short circuit within the system. Continue the search with the DC regulators.

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2.4.2 H7264 Power Regulators

An AlphaServer 8400 system may include one or two single-phase H7264 power regulators. A second power regulator may be needed if power requirements demand it. LEDs that display the status of each regulator can be seen through the front cover.

Figure 2–18 H7264 Power Regulators and Status LEDs

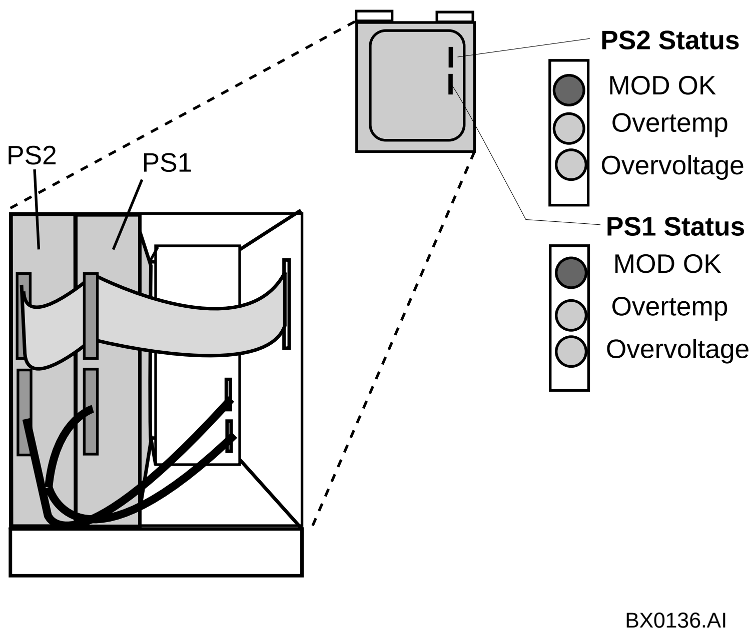
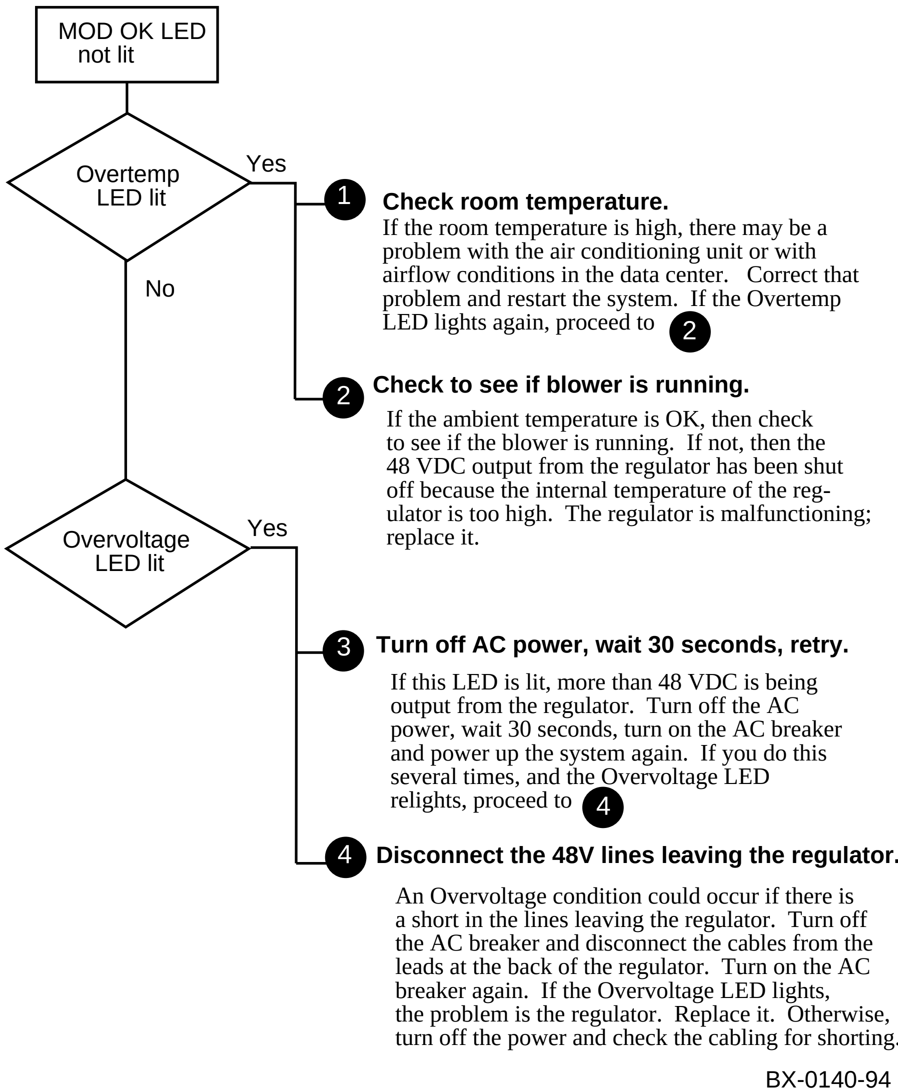


Figure 2–19 Troubleshooting Steps for H7264 Regulator



2.4.3 H7263 Power Regulators

The H7263 power regulators are located in the upper right front of the cabinet. Each power regulator has a Run LED and a Fault LED (see Figure 2–20).

Figure 2–20 H7263 Power Regulator LEDs

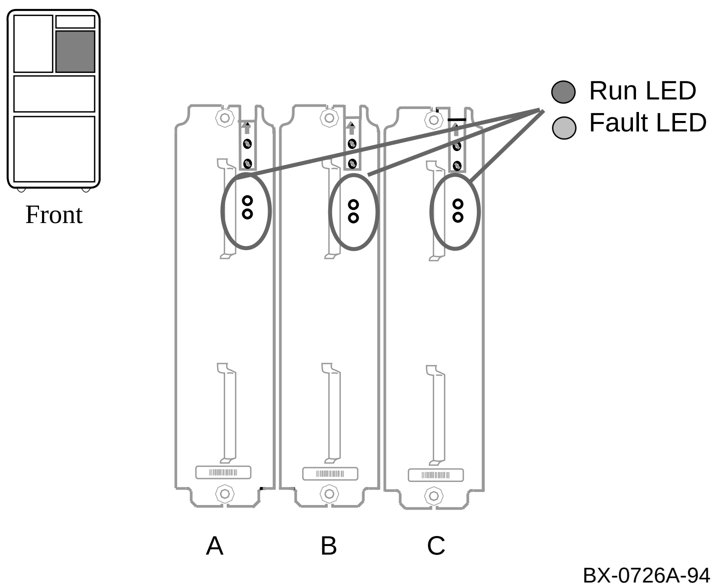
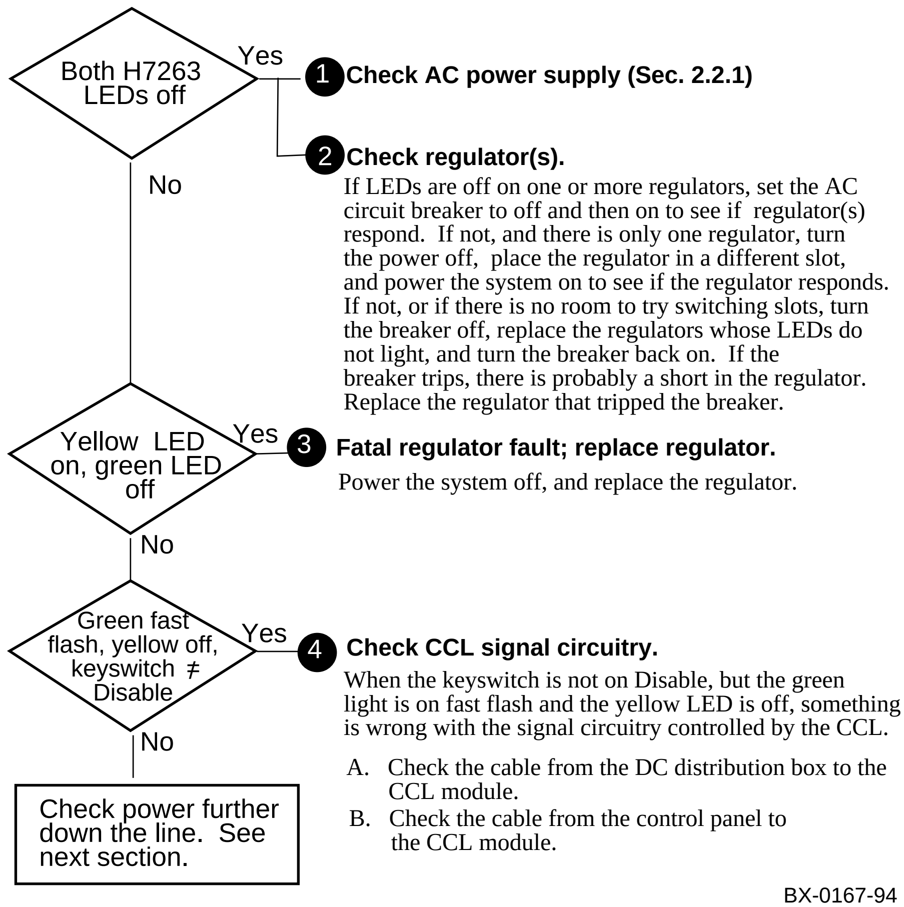


Table 2–6 H7263 Power Regulator LED Summary

Run (Green)	Fault (Yellow)	Condition
Off	Off	No AC power present
Off	On	Fatal fault
Fast flash	Off	AC power present. Keyswitch in Disable position.
On	Fast flash	Nonfatal fault
On	Slow flash	Battery discharge mode
On	Off	Normal operation

Figure 2–21 H7263 Power Regulator Troubleshooting Steps



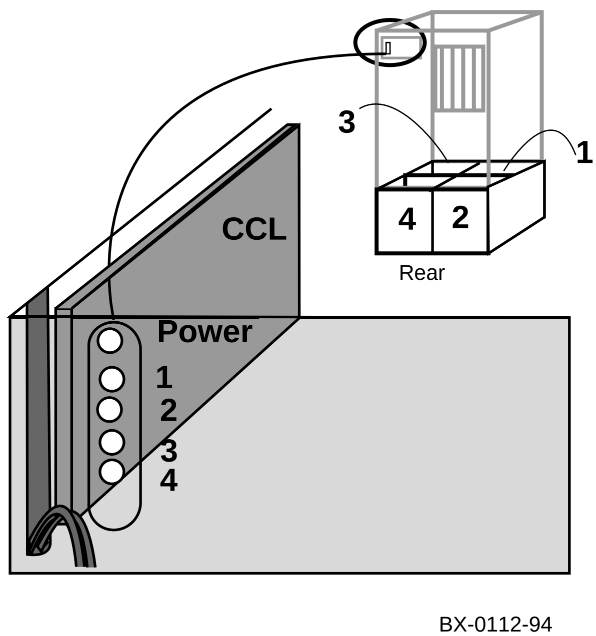
Nonfatal faults include:

- Internal heatsink temperature warning
- Power factor correction stage failed
- Regulator/battery failed battery test (see Chapter 3)
- 48V to CCL module exceeds specified limits

2.4.4 Cabinet Control Logic (CCL) Module

LEDs on the cabinet control logic (CCL) module tell whether power is reaching the CCL module (top LED-yellow) and the four PIU quadrants in the bottom of the cabinet.

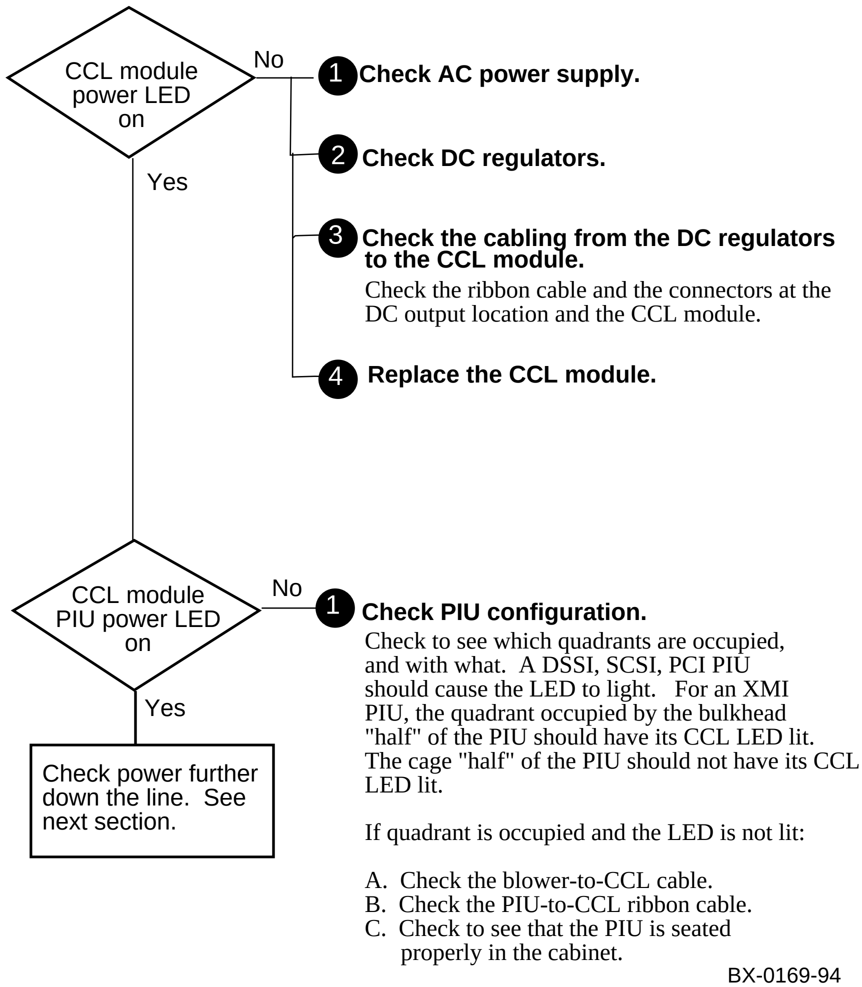
Figure 2–22 8400 CCL Module LEDs



During power sequencing, the CCL power LED (the top one; yellow when lit) goes on to indicate that power is present on the CCL module.

A PIU LED goes on to indicate that a PIU is present in the quadrant and that its power regulators are enabled. Figure 2–23 shows the troubleshooting steps for the CCL module.

Figure 2–23 CCL Module Troubleshooting Steps



2.5 Troubleshooting the 8400 Blower

The blower is located in the center of the cabinet. The blower spins up when you turn the keyswitch to Enable.

Figure 2–24 Blower

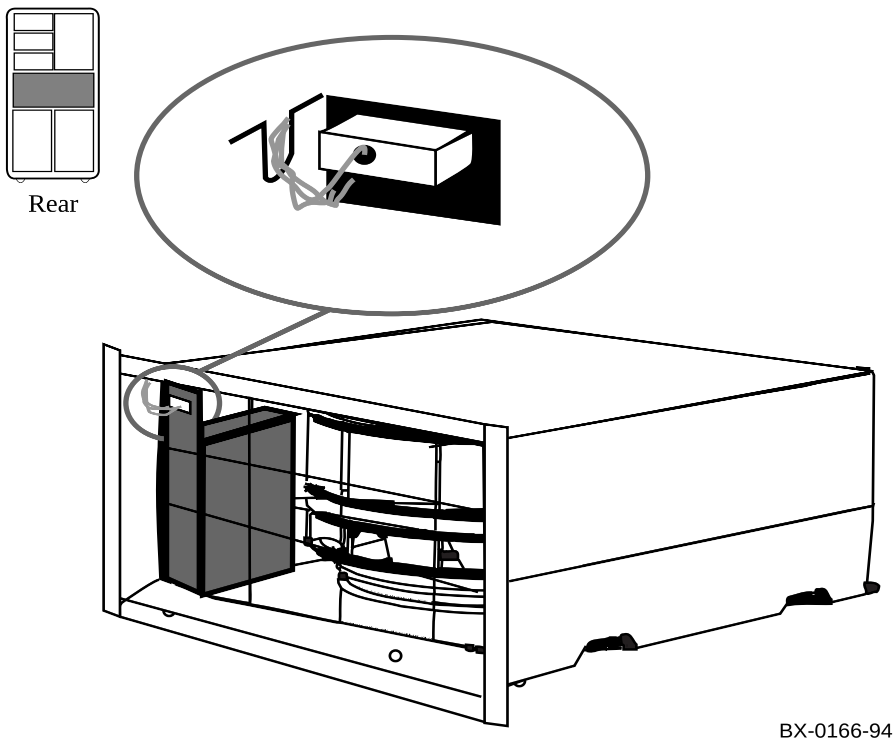
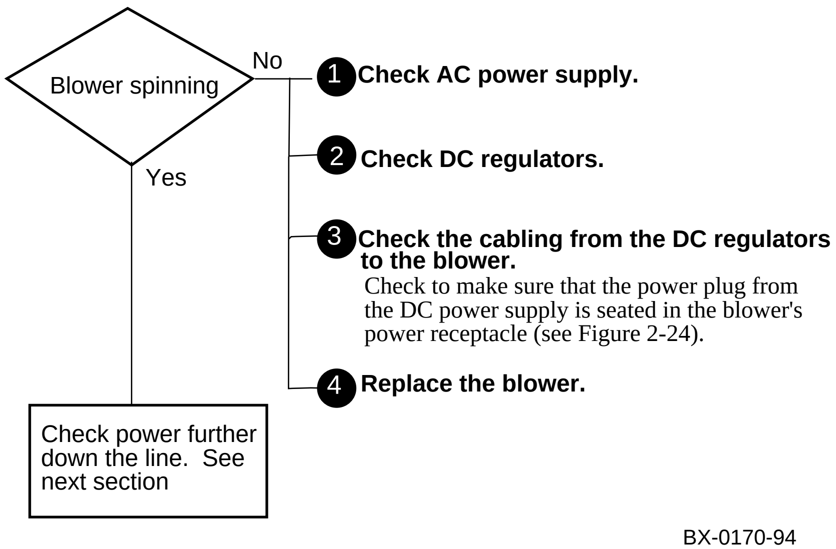


Figure 2–25 shows the troubleshooting steps for the blower.

NOTE: If the blower spins up but the control panel Fault LED blinks for more than 30 seconds, check the BLOWER OK signal cable. If the signal cable is properly connected, then replace the CCL module.

Figure 2–25 Blower Troubleshooting Steps



2.6 Troubleshooting 8400 XMI and Futurebus+

Each XMI and Futurebus+ has two power regulators with LEDs and switches.

Figure 2–26 XMI and Futurebus+ Bus Power Regulator

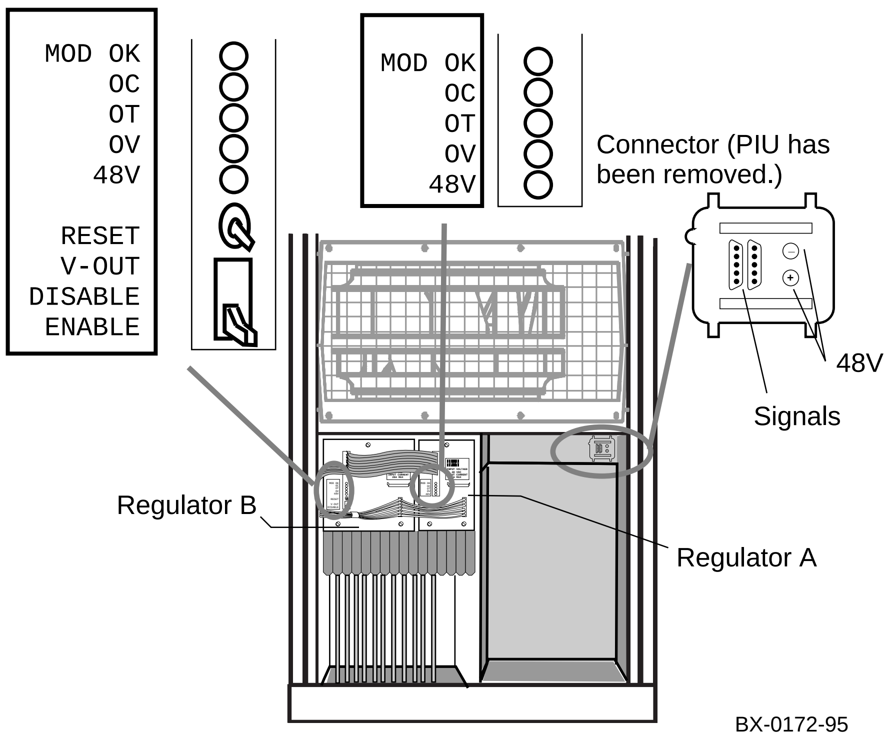


Table 2–7 I/O PIU Power Switches — Regulator B

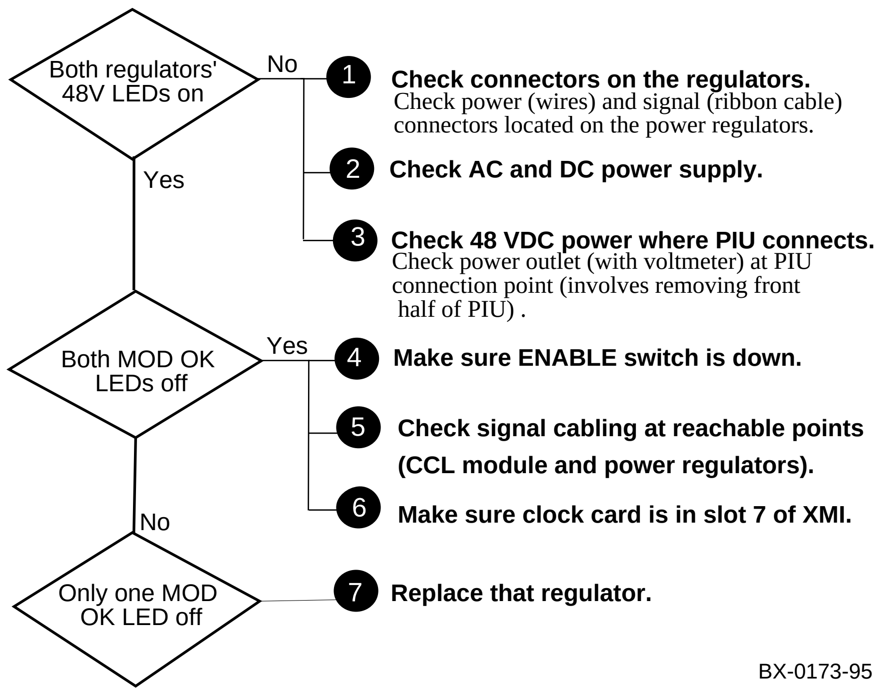
Switch	Function
RESET	Momentary switch resets all LEDs on both regulators.
V-OUT DISABLE ENABLE	When this switch is in the ENABLE position (down), power output for both regulators is enabled. Power output is shut off when this switch is in the DISABLE position (up).

Table 2–8 I/O PIU Power Regulator LEDs

LED	Color	State	Meaning
MOD OK	Green	On	Regulator is working
		Off	Regulator is not working or V-OUT/DISABLE switch is set to DISABLE (down).
48V	Green	On	48V is present
OC[1]	Yellow	On	Overcurrent condition
OT[1]	Yellow	On	Overtemperature condition
OV[1]	Yellow	On	Overvoltage condition

[1] The OC, OT, and OV LEDs are latching indicators. Each LED indicates that a fault condition was or is present. The condition may have been cleared, but the LED remains lit until it is reset.

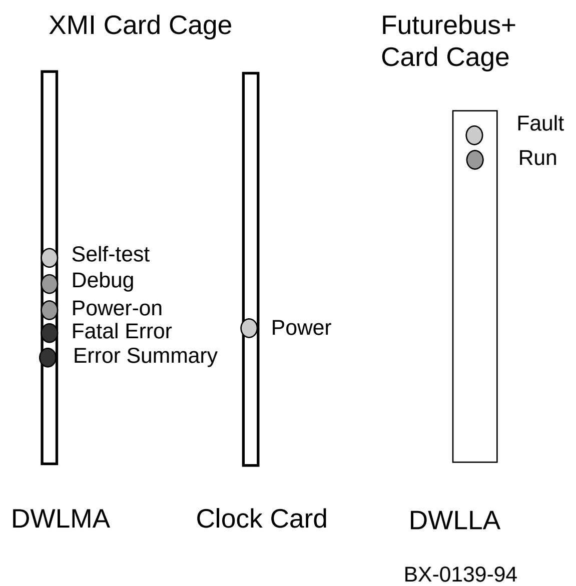
Figure 2–27 Troubleshooting I/O PIUs



2.7 Troubleshooting with 8400 XMI and Futurebus+ I/O Module LEDs

Figure 2–28 shows the LEDs on the DWLMA adapter and clock card for the XMI bus, and on the DWLLA adapter for the Futurebus+.

Figure 2–28 XMI and Futurebus+ Adapter LEDs



DWLMA Bus Adapter LEDs

The DWLMA bus adapter for the XMI bus has five LEDs. Table 2–9 lists the DWLMA LEDs and their self-test passed status.

NOTE: If the DWLMA adapter fails self-test, check the clock card at node 7 in the XMI card cage. If the clock card fails testing (power LED is off), the DWLMA adapter will also fail.

Table 2–9 DWLMA LEDs

LED	Color	Self-Test Passes
STP (Self-test passed)	Yellow	On
DBGDIS (Debug disabled)	Green	On
POK (Power OK)	Green	On
FTLERR (Fatal error)	Red	Off
ES (Error Summary)	Red	Off

Clock Card

The clock card, always at XMI node 7, has a yellow LED that lights to indicate that power is enabled in the XMI card cage. The POWER ENABLE H signal is looped through the clock card so that the XMI power system cannot be enabled unless the clock card is properly installed.

Table 2–10 DWLAA Module LEDs

Fault LED (Yellow)	Run LED (Green)	Meaning
Off	Off	No power to module.
Off	On	Passed self-test; is operational.
On	Off	Operational; fatal error detected.
On	On	Self-test in progress or, self-test failed.

2.8 Troubleshooting an 8400 DSSI PIU

Check the disk control panel. The control panel has four indicator switches. Table 2–11 lists the functions of the indicator switches.

Figure 2–29 DSSI Disk Control Panel

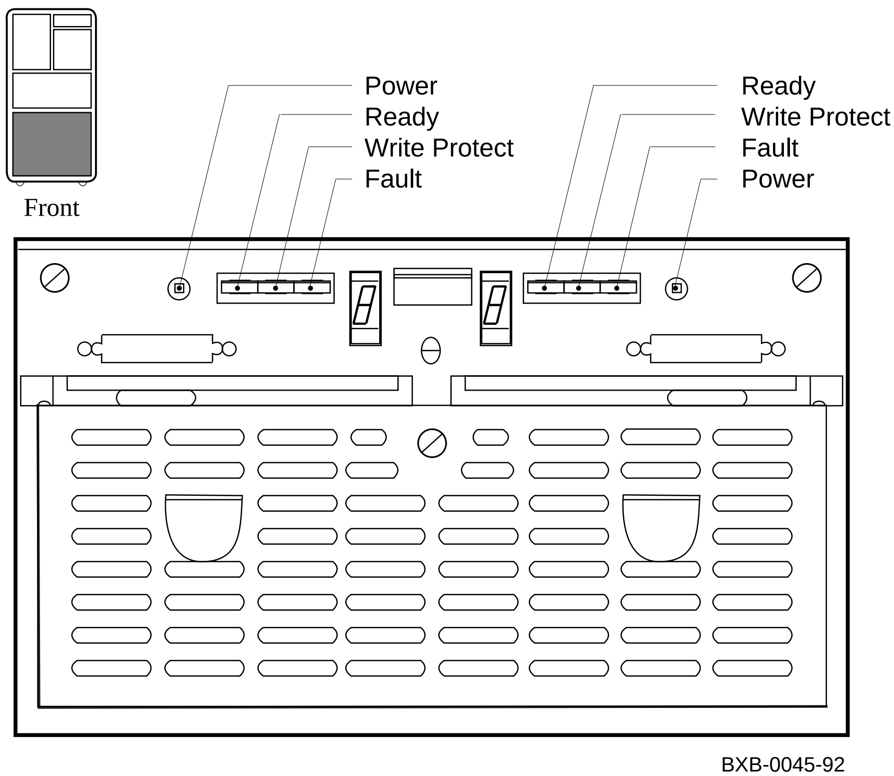


Table 2–11 Indicator Switches on DSSI Disk Control Panel

Indicator Switch	Pushbutton Position	Light	Function
DC Pwr	Out	On	DC power present.
(Green)	In	Off	DC power not present.
Ready	In	On	Integrated storage element on-line.
(Green)	Out	Off	Integrated storage element off-line.
Wrt Prot	In	On	Write protection enabled.
(Yellow)	Out	Off	Write protection disabled.
Fault	Momentary	On	Fault condition
(Red)	Switch	Off	Normal operation

Chapter 3

Console Display and Diagnostics

This chapter describes how hardware diagnostic programs are executed when the system is initialized. Sections include:

- Checking Self-Test Results: Console Display
  - 8200 Self-Test
  - Show Config Display for 8200
  - 8400 Self-Test
  - Show Config Display for 8400
- Running Diagnostics — the Test Command
  - Testing an Entire System
  - Sample Test Command for PCI
- Identifying a Failing SIMM
- Info Command
- Show Power Display: 8400 Three-Phase Power
- Regulator Info Packets on Power Regulator Status: 8400 Three-Phase Power

NOTE: More information on the console commands can be found in the AlphaServer 8200/8400 Operations Manual.

3.1 Checking Self-Test Results: Console Display

3.1.1 8200 Self-Test

The console display for an AlphaServer 8200 self-test gives information for the TLSB modules and the PCI buses in the system.

Example 3–1 8200 System Self-Test Console Display

```
F   E   D   C   B   A   9   8   7   6   5   4   3   2   1   0  NODE # ❶
                            A   M   .   .   P   .   .   .   .  TYP    ❷
                            o   +   .   .  ++   .   .   .   .  ST1    ❸
                            .   .   .   .  EB   .   .   .   .  BPD    ❹
                            o   +   .   .  ++   .   .   .   .  ST2    ❺
                            .   .   .   .  EB   .   .   .   .  BPD    ❻
                            +   +   .   .  ++   .   .   .   .  ST3    ❼
                            .   .   .   .  EB   .   .   .   .  BPD    ❽

                                +   +   +   +   +   +   +   +  C0 PCI+❾
                    .   .   .   .   .   .   .   .   .   .   +  C1 PCI+❿
                                 .  .  .  .  .  +   .   .        EISA +

AlphaServer 8200 Console V1.0, SROM V1.0, Apr 2 1995  08:06:35
P08>>>
```

❶ The first line lists the node numbers on the TLSB and other I/O buses.

❷ This line indicates the type of module at each TLSB node. Processors are type P, memories are type M, and the KFTHA and KFTIA adapter modules are type A. In this example, one dual-processor module is at node 4, a memory is at node 7, and a KFTIA module is at node 8.

❸ This line shows the results of individual processor and memory module tests. Possible values are pass (+) or fail (–). The "o" at node 8 (I/O module) indicates adapter testing has not been done yet.

❹ BPD lines indicate "boot processor determination." After testing individual processors (ST1 tests), the "+" processor with the lowest TLSB node number is selected as boot processor. This process occurs again after ST2 and ST3 testing. "B" indicates boot processor, "E" indicates the processor is enabled to become the boot processor, and "D" indicates that a console command has been issued disabling the processor from the possibility of becoming the boot processor.

❺ During the second round of tests (ST2), all tests are run to make sure that each CPU can send and receive data to and from memory (sometimes called CPU/MEM tests). On line ST2, results are reported for each processor and memory; a plus sign (+) indicates that ST2 testing passed and a minus sign (–) that ST2 testing failed.

❻ If the boot processor selected after ST1 testing fails these tests, another (with the next higher TLSB node number) is selected as boot processor. The boot processor is again reported on the second BPD line.

❼ During the third round of tests (ST3), all processors run multiprocessor tests, and then the KFTIA and KFTHA adapters are tested. Notice that this line displays the results of the adapter testing.

❽ If the boot processor had failed multiprocessor testing, the new boot processor selected would be displayed on this line.

❾ A plus sign (+) at the right of the C0 PCI line means that the internal PCI bus on the KFTIA adapter passed its own self-test. Self-test results for controllers on the KFTIA have also passed their internal self-tests as indicated by the plus signs at nodes 0 – 7. See the illustration for the **show config** command (Section 3.1.2) to see which nodes are which, including the FDDI and NVRAM daughter cards, which are field replaceable (FRUs).

❿ A plus sign (+) at the right of the C1 PCI line means that the PCI adapter on I/O channel 1 (connected to the "hose" of the KFTIA) passed self-test. The adapter in the PCI shelf appears at node 0. See the illustration for the **show config** command (Section 3.1.2) to see what adapter is in this shelf.

3.1.2 Show Config Display for 8200

The show configuration console command is useful to obtain more information about the system configuration, in case you need to replace a module.

Example 3–2 Show Config Sample

```
P08>>> show config
         Name                                 Type      Rev  Mnemonic
TLSB
4++      KN7CC-AB                             8014      0000  kn7cc-ab0❶
7+       MS7CC                                5000      0000  ms7cc0
8+       KFTIA                                2020      0000  kftia0

C0 Internal PCI connected to kftia0                          pci0❷
0+      ISP1020                           10201077      0001  isp00  ❸
1+      ISP1020                           10201077      0001  isp01❸
2+      DECchip 21040-AA                     21011      0023  tulip0❹
3+      DEC PCI FDDI                         F1011      0000  pfi0❺
4+      ISP1020                           10201077      0001  isp02❸
5+      ISP1020                           10201077      0001  isp03❸
6+      DECchip 21040-AA                     21011      0023  tulip1❹
7+      PCI NVRAM                            71011      0000  pci_nvram0❻
C1  PCI  connected to kftia0                                  pci1❼
0+      SIO                                4828086      0003  sio0❽

  Controllers on SIO                                          sio0❾
0+      DECchip 21040-AA                    21011       0023  tulip2
1+      FLOPPY                                  2       0000  floppy0
2+      KBD                                     3       0000  kbd0
3+      MOUSE                                   4       0000  mouse0

  EISA connected to pci1 through sio0                         eisa0
3+      KFESB                              2EA310       0000  P08>>>
```

❶ The first grouping shows the modules on the TLSB bus and their status. In this example, the processor is in slot 4, as shown in the console display of system self-test. A memory is at node 7, and a KFTIA at node 8.

❷ C0 is next, showing the internal PCI bus on the KFTIA module.

❸ At nodes 0, 1, 4, and 5 are the ISP1020 chips that handle the SCSI connections. The single-ended connection is always node 5.

❹ At nodes 2 and 6 are the Ethernet controllers.

❺ Node 3 is the optional FDDI daughter card.

❻ Node 7 is the optional PCI NVRAM daughter card.

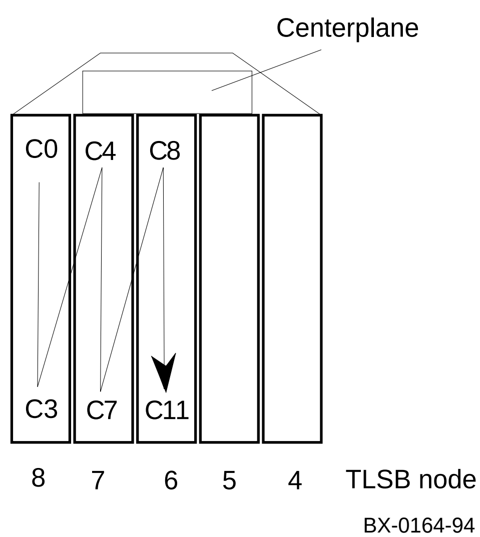
❼ This line shows the hose connection (C1) on the KFTIA adapter.

❽ This is the KFE70 standard I/O PCI/EISA adapter option.

❾ These lines show the controllers on the SIO module.

Figure 3–1 shows the connector (C0, C1, etc) numbering scheme. Each slot has four connector numbers associated with it, as shown. A KFTIA's internal PCI bus will take the topmost number for a given slot, and its hose connector will take the next number. The bottom two numbers are associated with the slot, even though nothing with ever occupy them on a KFTIA. The KFTHA has four hose connectors, numbered in increasing order from top to bottom.

Figure 3–1 Hose Numbering Scheme for KFTIA and KFTHA



3.1.3 8400 Self-Test

An AlphaServer 8400 console display gives the results of system self-test. It also shows the location of modules in the various buses, which can include XMI, Futurebus+, and PCI/EISA buses, memory interleaving, and hardware and firmware revision numbers.

Example 3–3 8400 System Self-Test Console Display

```
F  E   D   C   B   A   9   8   7   6   5   4   3   2   1   0  NODE #❶
                           A   A   M   M   .   .   P   P   P  TYP   ❷
                           o   o   +   -   .   .  .+  -+  ++  ST1   ❸
                           .   .   .   .   .   .  .E  EE  EB  BPD   ❹
                           o   o   +   -   .   .  .+  -+  ++  ST2   ❺
                           .   .   .   .   .   .  .E  EE  EB  BPD   ❻
                           +   +   +   -   .   .  .+  -+  ++  ST3   ❼
                           .   .   .   .   .   .  .E  EE  EB  BPD   ❽

    .   .   .   .   .   .   .   .   .   .   .   .   .   .     C0 FBUS-❾
    +   .   .   .   .   .   +   .   .   .   .   -   .   .     C1 XMI+
    .   .   .   .   .   .   .   .   .   .   .   .   .   .     C2
    .   .   .   .   .   .   .   .   .   .   .   .   .   .     C3

                    .   .   .   +   +   +   +   +   +   +   + C4 PCI+❿
                                                              C5

                                .  A1  A0   .   .   .   .   . ILV
                                . 256 256. .   .   .   .   . 512MB

AlphaServer 8400 Console V1.0, SROM V1.0, Apr 2 1995  08:06:35
P00>>>
```

❶ The first line lists the node numbers on the TLSB and other I/O buses.

❷ This line indicates the type of module at each TLSB node. Processors are type P, memories are type M, and the KFTHA and KFTIA adapter modules are type A. In this example, two dual-processor modules are at nodes 0 and 1, a single-processor module is at node 2, memories are at nodes 5 and 6, and the KFTHA and KFTIA modules are at nodes 7 and 8.

❸ This line shows the results of individual processor and memory module tests. Possible values are pass (+) or fail (–). The "o" at nodes 7 and 8 (I/O modules) indicate adapter testing has not been done yet.

❹ BPD lines indicate “boot processor determination.” After testing individual processors (ST1 tests), the “+” processor with the lowest TLSB node number is selected as boot processor. This process occurs again after ST2 and ST3 testing. “B” indicates boot processor, “E” indicates a processor that is enabled to become the boot processor, and “D” indicates that a console command has been issued disabling the processor from the possibility of becoming the boot processor.

❺ During the second round of tests (ST2), all tests are run to make sure that each CPU can send and receive data to and from memory (sometimes called CPU/MEM tests). Results are reported for each processor and memory; a plus sign (+) indicates that ST2 testing passed; a minus sign (–), ST2 testing failed.

❻ If the boot processor selected after ST1 testing fails these tests, another (with the next-highest TLSB node number) is selected as boot processor. The boot processor is again reported on the second BPD line.

❼ During the third round of tests (ST3), all processors run multiprocessor tests, and then the KFTHA and KFTIA adapters are tested. Notice that this line displays the results of the adapter testing. (Both passed in this case.)

❽ If the boot processor had failed multiprocessor testing, the new boot processor selected would be displayed on this line.

❾ A minus sign (–) at the right of the C0 FBUS+ line means that the DWLLA adapter on I/O channel 0 failed self-test. Self-test results for adapters on this I/O channel are thus not reported. The “+” on the XMI line shows that the DWLMA adapter passed self-test; however, an adapter at node 3 failed on the XMI bus.

❿ This line shows results for a KFTIA module, which shows as a PCI bus, because there is an internal PCI bus on the module. All "nodes" on the KFTIA passed their internal self-test. See Section 3.1.4 to see which nodes are which, including the FDDI and NVRAM field-replaceable options.

3.1.4 Show Config Display for 8400

The show config console command is useful to obtain more information about the system configuration, in case you need to replace a module.

Example 3–4 Show Config Sample

```
P00>>> sho config
        Name                         Type      Rev   Mnemonic
TLSB
0++     KN7CC-AB                     8014      0000  kn7cc-ab0    ❶
1-+     KN7CC-AB                     8014      0000  kn7cc-ab1
2+      KN7CC-AA                     8011      0000  kn7cc-aa0
5-      MS7CC                        5000      0000  ms7cc0
6+      MS7CC                        5000      0000  ms7cc1
7+      KFTIA                        2020      0000  kftia0
8+      KFTHA                        2000      0000  kftha0

C0 Futurebus -    ❷

C1 XMI +❸
3-      CIXCD                        C2F       0211  cixcd0
8+      DWLMA                        102A      0208  dwlma0
E+      KZMSA                        C36       5256  kzmsa0

C4 Internal PCI connected to kftia0                       pci0    ❹
0+    ISP1020                    10201077      0001  isp0    ❺
1+    ISP1020                    10201077      0001  isp1    ❺
2+    DECchip 21040-AA              21011      0023  tulip0  ❻
3+    DEC PCI FDDI                  F1011      0000  pfi0    ❼
4+    ISP1020                    10201077      0001  isp2    ❺
5+    ISP1020                    10201077      0001  isp3    ❺
6+    DECchip 21040-AA              21011      0023  tulip1  ❻
7+    PCI NVRAM                     71011      0000  pci_nvram0 ❽
```

❶ The first grouping shows the modules on the TLSB bus and their status. In this example, the three processors are in slots 0, 1, and 2, as shown in the console display of system self-test. Note that the two-CPU modules have two status symbols. The processor at slot 0, for which both CPUs passed self-test, has ++, the second, at slot 1, at which the first CPU failed, has -+. Memory modules are at nodes 5 and 6. A KFTHA adapter is at node 8, and a KFTIA at node 7.

❷ The configuration listing continues with the adapters connected to (or a part of) the KFTHA (node 8) and KFTIA (node 7) modules. The listing begins with node 8. The C0 hose (top) on the KFTHA is connected to a Futurebus+. Since the Futurebus DWLLA adapter failed self-test, no adapters are shown in the configuration for this bus.

❸ The C1 hose (second from top) on the KFTHA is connected to an XMI bus. Node 3, which was shown in the self-test listing as failing, is a CIXCD module. Node E is a KZMSA module and as always, the DWLMA module is in node 8. The C2 and C3 connectors are not used.

❹ C4 is the internal PCI bus on the KFTIA module.

❺ At nodes 0, 1, 4, and 5 are the ISP1020 chips that handle the SCSI connections. The single-ended connection is always node 5.

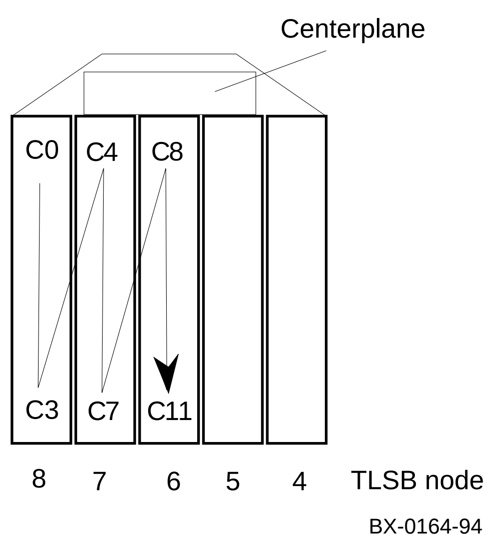
❻ At nodes 2 and 6 are the Ethernet controllers.

❼ Node 3 has the optional FDDI daughter card.

❽ Node 7 has the optional PCI NVRAM daughter card.

Figure 3–2 shows the connector (C0, C1, etc) numbering scheme. Each slot has four numbers associated with it. A KFTIA's internal PCI bus takes the topmost number for a given slot, and its hose connector takes the next number. The bottom two numbers are associated with the slot, even though nothing with ever occupy them. The KFTHA has four hose connectors, numbered in increasing order from top to bottom.

Figure 3–2 Hose Numbering Scheme for KFTIA and KFTHA



3.2 Running Diagnostics — the Test Command

The test command allows you to run diagnostics on the entire system, an I/O subsystem, a single module, a group of devices, or a single device.

Example 3–5 Sample Test Commands

```
P04>>> test                       # Tests the entire system.
                                  # Default run time is 10 minutes.

P04>>> t pci0 -t 60               # Tests all devices associated
                                  # with the PCI0 subsystem.  Test
                                  # run time is 60 seconds.

P04>>> t xmi1                     # Tests all devices associated with
                                  # XMI1.

P04>>> t kzmsa*                   # Tests all KZMSA devices.

P04>>> t -q                       # Status messages will not be
                                  # displayed during system test.
```

You enter the command **test** to test the entire system using exercisers resident in ROM on the boot processor module. No module self-tests are executed when the test command is issued without a mnemonic.

When you specify a subsystem mnemonic or a device mnemonic with **test** such as **test pci0** or **test ms7cc0**, self-tests are executed on the associated modules first and then the appropriate exercisers are run.

3.2.1 Testing an Entire System

A test command with no modifiers runs all exercisers for subsystems and devices on the system.

Example 3–6 Sample Test Command for Entire System

```
P00>>> test
Console is in diagnostic mode
Complete Test Suite for runtime of 600 seconds

Type ^C to stop testing

Configuring system...
polling for units on kzmsa0, slot 9, bus 0, xmi0...
dkf0.0.0.9.8       DKF0                     RZ26L  440C
dkf200.2.0.9.8     DKF200                   RZ26L  440C
dkf300.3.0.9.8     DKF300                   RZ26L  440C
polling for units on tulip1, slot 5, bus 0, hose0...
ewb0.0.0.5.0: 08-00-2B-E2-11-0C
Shutting down units on tulip1, slot 5, bus 0 hose 0...
polling for units on tulip0, slot 12, bus 0, hose0...
ewa0.0.0.12.0: 08-00-2B-E2-8C-56
Shutting down units on tulip0, slot 12, bus 0 hose 0...
polling for units on tulip2, slot 2, bus 0, hose4...
ewc0.0.0.2.4: 08-00-2B-E4-66-97
Shutting down units on tulip2, slot 2, bus 0 hose 4...
polling for units on tulip3, slot 6, bus 0, hose4...
ewd0.0.0.6.4: 08-00-2B-E4-66-8A
Shutting down units on tulip3, slot 6, bus 0 hose 4...
polling for units on demna0, slot 3, bus 0, xmi0...
exa0.0.0.3.8: 08-00-2B-2A-76-44
Shutting down units on demna0, slot 3, bus 0 hose 8...
Starting network exerciser on ewb0.0.0.5.0 (id #377) in internal
loopback mode
Starting network exerciser on ewa0.0.0.12.0 (id #38b) in internal
loopback mode
Starting network exerciser on ewc0.0.0.2.4 (id #39f) in internal
loopback mode
Starting network exerciser on ewd0.0.0.6.4 (id #3b3) in internal
loopback mode
Starting network exerciser on exa0.0.0.3.8 (id #3c7) in internal
loopback mode
```

```
Starting device exerciser on dkf0.0.0.9.8 (id #64e) in READ-ONLY mode
Stopping device exerciser on dkf0.0.0.9.8 (id #64e)
Starting device exerciser on dkf200.2.0.9.8 (id #8a8) in READ-ONLY mode
Stopping device exerciser on dkf200.2.0.9.8 (id #8a8)
Starting device exerciser on dkf300.3.0.9.8 (id #b09) in READ-ONLY mode
Stopping device exerciser on dkf300.3.0.9.8 (id #b09)
Starting device exerciser on dub18.0.0.11.8 (id #d63) in READ-ONLY mode
Stopping device exerciser on dub18.0.0.11.8 (id #d63)
Starting device exerciser on dkf0.0.0.9.8 (id #feb) in READ-ONLY mode
Stopping device exerciser on dkf0.0.0.9.8 (id #feb)
Starting device exerciser on dkf200.2.0.9.8 (id #1245) in READ-ONLY mode
Stopping device exerciser on dkf200.2.0.9.8 (id #1245)
Starting device exerciser on dkf300.3.0.9.8 (id #14a8) in READ-ONLY mode
Stopping device exerciser on dkf300.3.0.9.8 (id #14a8)
Starting device exerciser on dub18.0.0.11.8 (id #1702) in READ-ONLY mode
Stopping device exerciser on dub18.0.0.11.8 (id #1702)
Starting device exerciser on dkf0.0.0.9.8 (id #1989) in READ-ONLY mode
Stopping device exerciser on dkf0.0.0.9.8 (id #1989)
Starting device exerciser on dkf200.2.0.9.8 (id #1be5) in READ-ONLY mode
Stopping device exerciser on dkf200.2.0.9.8 (id #1be5)
Starting device exerciser on dkf300.3.0.9.8 (id #1e45) in READ-ONLY mode
Stopping device exerciser on dkf300.3.0.9.8 (id #1e45)
Starting device exerciser on dub18.0.0.11.8 (id #209f) in READ-ONLY mode
Stopping device exerciser on dub18.0.0.11.8 (id #209f)
Starting device exerciser on dkf0.0.0.9.8 (id #2328) in READ-ONLY mode
Stopping device exerciser on dkf0.0.0.9.8 (id #2328)
Starting device exerciser on dkf200.2.0.9.8 (id #2582) in READ-ONLY mode
Stopping device exerciser on dkf200.2.0.9.8 (id #2582)
Starting device exerciser on dkf300.3.0.9.8 (id #27e2) in READ-ONLY mode
Stopping device exerciser on dkf300.3.0.9.8 (id #27e2)
Stopping all testing
Stopping network exerciser on ewb0.0.0.5.0 (id #377)
Stopping network exerciser on ewa0.0.0.12.0 (id #38b)
Stopping network exerciser on ewc0.0.0.2.4 (id #39f)
Stopping network exerciser on ewd0.0.0.6.4 (id #3b3)
Stopping network exerciser on exa0.0.0.3.8 (id #3c7)

 ---------Testing done ------------

Shutting down drivers...
Shutting down units on demna0, slot 3, bus 0, hose 8...
Shutting down units on kzmsa0, slot 9, bus 0, hose 8...
Shutting down units on tulip2, slot 2, bus 0, hose 4...
Shutting down units on tulip3, slot 6, bus 0, hose 4...
Shutting down units on tulip0, slot 12, bus 0, hose 0...
Shutting down units on tulip1, slot 5, bus 0, hose 0...
P00>>>
```

3.2.2 Sample Test Command for PCI

Using the test command for a PCI shelf exercises the devices connected to the shelf.

Example 3–7 Sample Test Command for PCI

```
P08>>> test pci -t 200
Console is in diagnostic mode
PCI subsystem test selected for runtime of 200 seconds

Type Ctrl/C to stop testing

Configuring tulip0
ewa0.0.0.12.3: 08-00-2B-E2-8C-4D
Shutting down units on tulip0, slot 12, bus 0 hose 3...
Configuring tulip1
ewb0.0.0.2.4: 08-00-2B-E2-B8-44
Shutting down units on tulip1, slot 2, bus 0 hose 4...
Configuring tulip2
ewc0.0.0.6.4: 08-00-2B-E2-B8-45
Shutting down units on tulip2, slot 6, bus 0 hose 4...
Starting network exerciser on ewa0.0.0.12.3 (id #645) in internal
loopback mode
Starting network exerciser on ewb0.0.0.2.4 (id #66e) in internal
loopback mode
Starting network exerciser on ewc0.0.0.6.4 (id #697) in internal
loopback mode
Configuring kfesb0
KFESB is not of required revision
  Device start:
Configuring kfesb1
duc0.0.0.1004.3    R2WUIC$DIA0               RF72
duc5.5.0.1004.3    RF3111$DIA5               RF31
Configuring isp0
Configuring isp1
Configuring isp2
Configuring isp3
Configuring isp4
Configuring isp5
dkh100.1.0.5.4     DKH100                   RZ26L  440C
dkh200.2.0.5.4     DKH200                   RZ26L  440C
dkh300.3.0.5.4     DKH300                   RZ26L  440C
```

```
Starting device exerciser on dkh100.1.0.5.4 (id #89e) in READ-ONLY mode
Stopping device exerciser on dkh100.1.0.5.4 (id #89e)
Starting device exerciser on dkh200.2.0.5.4 (id #95a) in READ-ONLY mode
Stopping device exerciser on dkh200.2.0.5.4 (id #95a)
Starting device exerciser on dkh300.3.0.5.4 (id #9c1) in READ-ONLY mode
Stopping device exerciser on dkh300.3.0.5.4 (id #9c1)
Starting device exerciser on duc0.0.0.1004.3 (id #a30) in READ-ONLY mode
Stopping device exerciser on duc0.0.0.1004.3 (id #a30)
Starting device exerciser on duc5.5.0.1004.3 (id #b83) in READ-ONLY mode
Stopping device exerciser on duc5.5.0.1004.3 (id #b83)
Starting device exerciser on dkh100.1.0.5.4 (id #c9a) in READ-ONLY mode
Stopping device exerciser on dkh100.1.0.5.4 (id #c9a)
Starting device exerciser on dkh200.2.0.5.4 (id #d01) in READ-ONLY mode
Stopping device exerciser on dkh200.2.0.5.4 (id #d01)
Starting device exerciser on dkh300.3.0.5.4 (id #d70) in READ-ONLY mode
Stopping device exerciser on dkh300.3.0.5.4 (id #d70)
Starting device exerciser on duc0.0.0.1004.3 (id #dd4) in READ-ONLY mode
Stopping device exerciser on duc0.0.0.1004.3 (id #dd4)
Starting device exerciser on duc5.5.0.1004.3 (id #f25) in READ-ONLY mode
Time has expired...

Stopping all testing

Stopping device exerciser on duc5.5.0.1004.3 (id #f25)
Stopping network exerciser on ewc0.0.0.6.4 (id #697)
Stopping network exerciser on ewa0.0.0.12.3 (id #645)
Stopping network exerciser on ewb0.0.0.2.4 (id #66e)

 ---------Testing done ------------

 Shutting down drivers...
Shutting down units on isp2, slot 0, bus 0, hose 4...
Shutting down units on isp3, slot 1, bus 0, hose 4...
Shutting down units on tulip1, slot 2, bus 0, hose 4...
Shutting down units on isp4, slot 4, bus 0, hose 4...
Shutting down units on isp5, slot 5, bus 0, hose 4...
Shutting down units on tulip2, slot 6, bus 0, hose 4...
Shutting down units on tulip0, slot 12, bus 0, hose 3...
Shutting down units on kfesb0, slot 2, bus 1, hose 3...
Shutting down units on kfesb1, slot 4, bus 1, hose 3...
Shutting down units on isp0, slot 7, bus 0, hose 3...
Shutting down units on isp1, slot 8, bus 0, hose 3...

P00>>>
```

3.3 Identifying a Failing SIMM

From the console, you can check for flawed or poorly seated SIMMs in memory boards. This information is useful as a simple on-site check as part of a service call, and as a validation procedure after upgrading a memory, or adding or changing SIMMs for any reason. Failing SIMMs are also reported in the error log (see Chapter 4).

Example 3–8 Console Mode: No Failing SIMMs

```
P00>>> set simm_callout on    ❶
P00>>> init ❷
Initializing...

 WARNING: SIMM_CALLOUT environment variable is ON❸

F   E   D   C   B   A   9   8   7   6   5   4   3   2   1   0   NODE #
                            A   .   .   .   .   .   M   M   P   TYP
                            o   .   .   .   .   .   +   +  ++   ST1
                            .   .   .   .   .   .   .   .  EB   BPD
                            o   .   .   .   .   .   +   +  ++   ST2
                            .   .   .   .   .   .   .   .  EB   BPD
                            +   .   .   .   .   .   +   +  ++   ST3
                            .   .   .   .   .   .   .   .  EB   BPD

    +   +   +   .   +   .   +   .   .   .   +   .   +   .       C0 XMI +
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C1
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C2
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C3

                            .   .   .   .   .   .  A1  A0   .   ILV
                            .   .   .   .   .   . 256 256   .   512MB
AlphaServer 8400 Console V1.0, SROM V1.0, May 5 1995 03:38:06
P00>>> show simm❹
No selftest errors found on any memory modules! ❺
P00>>> set simm_callout off❻
P00>>> init❼
Initializing...
```

❶ The **set simm_callout on** command sets an internal environment variable that enables code that isolates failing SIMMs during memory testing. With this variable enabled, system self-test can take up to 40 seconds longer if a faulty SIMM is present.

❷ The **init** command initializes the system and prints the console map.

❸ This line in the console display notes that the SIMM callout environment variable is on.

❹ The **show simm** command requests a display of faulty SIMMs.

❺ In Example 3–8, no faulty SIMMS were found.

❻ The **set simm callout off** command turns off the environment variable that enabled callout of faulty SIMMs.

❼ The **init** command initializes the system in normal mode.

Example 3–9 shows a **show simm** command that calls out some failing SIMMs. Section 5.5 tells how to locate, remove, and replace SIMMs in a memory module.

Example 3–9 Console Mode: Failing SIMMs Found

```
     .
     .    ❶
     .
P01>>> show simm    ❷
The following SIMMs are faulty on memory module in slot 1:❸
J30   J31
```

❶ The **set simm_callout on** and **init** commands are omitted here for brevity.

❷ The **show simm** command requests a display of faulty SIMMs.

❸ SIMMs numbered J30 and J31 on the memory module in slot 1 are found to be faulty.

3.4 Info Command

The info command provides information useful in debugging the system. Some of the information it provides can be helpful in isolating FRUs in the field.

Example 3–10 Examples of the Info Command

```
P04>>> info  ❶
        0.  About the console
        1.  Bitmap    ❷
        2.  PAL symbols
        3.  IMPURE area (abbreviated)
        4.  IMPURE area (full)
        5.  TLSB Registers
        6.  GBUS
        7.  LOGOUT area
        8.  Per Cpu HWRPB areas❷
        9.  LAMB registers
        10.  TLSB register addresses
        11.  Page Tables
        12.  FRU table❷
        13.  Console internals
        14.  Supported Devices
        15.  Console SCB
        16.  PCIA
Enter selection: 5   ❸
              Node0    Node2    Node7    Node8     ❹
              MS7CC    KN7CC-AB KFTIA    KFTHA
base adr    88000000 88800000 89c00000 8a000000
TLDEV       00005000 00008014 00002020 00002000
TLBER       00100000 00800000 00000000 00000000
TLCNR       000fc200 00000220 00000170 00000180
TLVID       00000080 00000054
TLMMR0               00008014 80000010 80000010
TLMMR1               00008014 00000000 00000000
TLMMR2               00008014 00000000 00000000
TLMMR3               00008014 00000000 00000000
TLMMR4               00008014 00000000 00000000
TLMMR5               00008014 00000000 00000000
TLMMR6               00008014 00000000 00000000
```

```
TLMMR7                00008014 00000000 00000000
TLFADR0     0011ab00           00000000 00000000
TLFADR1     07050000           00000000 00000000
TLESR0      00000303 00400303 00000000 00000000
TLESR1      00000c0c 00400c0c 00000000 00000000
TLESR2      00006060 00406060 00000000 00000000
TLESR3      00009090 00409090 00000000 00000000
TLILID0                        00000000 00000000
              Node0    Node2    Node7    Node8
              MS7CC    KN7CC-AB KFTIA    KFTHA
TLILID1                        00000000 00000000
TLILID2                        00000000 00000000
TLILID3                        00000000 00000000
TLCPUMASK                      00000010 00000010
                   .
                   .
                   .
P04>>> info 5 | grep TLBER   ❺
TLBER       00100000 00800000 00000000 00000000
P04>>> info 5 | grep TLMMR*   ❻
TLMMR0                00008014 80000010 80000010
TLMMR1                00008014 00000000 00000000
TLMMR2                00008014 00000000 00000000
TLMMR3                00008014 00000000 00000000
TLMMR4                00008014 00000000 00000000
TLMMR5                00008014 00000000 00000000
TLMMR6                00008014 00000000 00000000
TLMMR7                00008014 00000000 00000000
P04>>>
```

❶ The **info** command lists options available. (This list may change).

❷ The bitmap, HWRPB, and FRU table options only provide relevant information after the operating system has been running and halted with Ctrl/P to return to console mode.

❸ The user enters the selection **5** for a listing of TLSB registers.

❹ The listing of bus registers continues for several pages; this is only the first page and a half, to show that bus registers for all the modules are listed.

❺ The console commands allow the UNIX concept of "piping." Here, an **info** command requesting a listing of TLSB registers is piped into a UNIX **grep** command, which prints all lines produced by the info 5 that contain TLBER.

❻ This is another example of UNIX-type piping, showing the **grep** command with a "wildcard" (*), in which all lines produced by the **info 5** command beginning with TLMMR are printed.

3.5 Show Power Display: 8400 Three-Phase Power

AlphaServer 8400 systems with three-phase power have available the show power command for troubleshooting.

As shown in Example 3–11, the **show power** command can be used to display the power status of 8400 systems with three-phase power. The cabinet contains three power regulators. If the cabinet has fewer than three regulators, the appropriate column (A, B, or C) is left blank. The bottom three lines of output, showing PIU power status, apply only to the main cabinet.

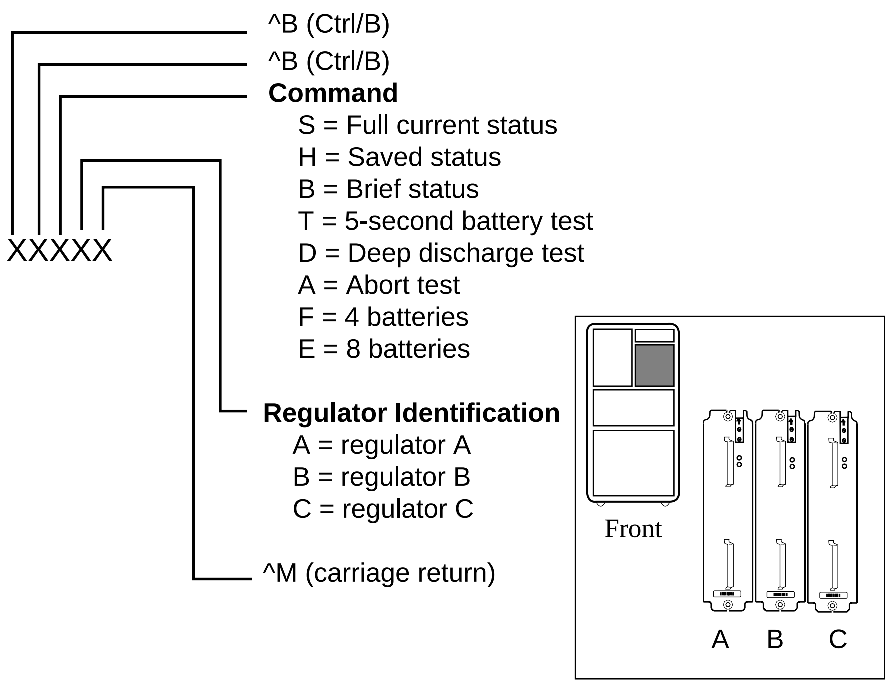
Example 3–11 Show Power Command

```
P00>>> show power
Cabinet:  Main              Regulator:     A          B          C
-----------------------------------------------------------------------
        Primary Micro Firmware Rev:     2.0        2.0        2.0
      Secondary Micro Firmware Rev:     2.0        2.0        2.0
                Power Supply State:   NORMAL     NORMAL     NORMAL
           AC Line Voltage (V RMS):   113.71     114.35     115.93
             DC Bulk Voltage (VDC):   227.02     227.02     227.02
          48V DC Bus Voltage (VDC):    47.57      47.57      47.57
          48V DC Bus Voltage (ADC):    30.17      29.68      29.58
    48V Battery Pack Voltage (VDC):    50.85      50.72      47.91
    24V Battery Pack Voltage (VDC):    25.56      25.56      23.95
 Battery Pack Charge Current (IDC):     2.91       2.90       0
    Ambient Temperature (Degree C):    26.22      24.80      24.75
              Elapsed Time (Hours):   290.00     290.00     290.00
Remaining Battery Capacity (Minutes):   8.00       8.00       8.00
   Battery Cutoff Counter (Cycles):     0          1.00       1.00
           Battery Configuration:  4 Batteries  4 Batteries  4 Batteries
                   Heatsink Status:  NORMAL     NORMAL     NORMAL
               Battery Pack Status:  CHARGING   CHARGING   DISCHG'G
              Last UPS Test Status:  PASSED     PASSED     TESTING
LDC POWER Status      :  OK
PIU Primary Status    :  OK
PIU Secondary Status  :  OK
```

3.6 Regulator Info Packets: 8400 Three-Phase Power

When the console software is not working, but 48V power is being supplied to the system, you can obtain detailed information about the power system by typing a control sequence and data characters that cause a coded data packet to be displayed at the console terminal.

Figure 3–3 Command Format



BX-0185-95

Entering a Command Packet

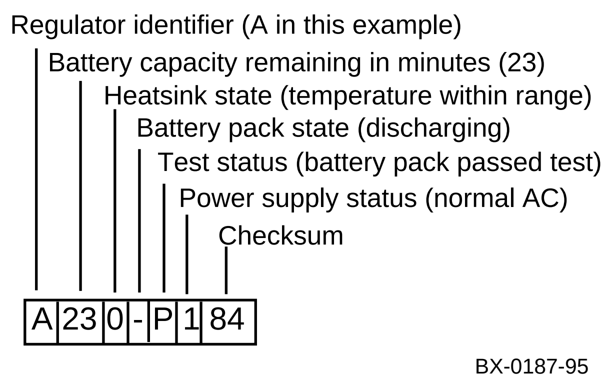
To enter a command packet at the console terminal:

1. Type Ctrl/B two times.
2. Type the one-letter command.
3. Type the power regulator identification letter.
4. Type Ctrl/M to terminate the packet.

3.6.1 Brief Data Packet

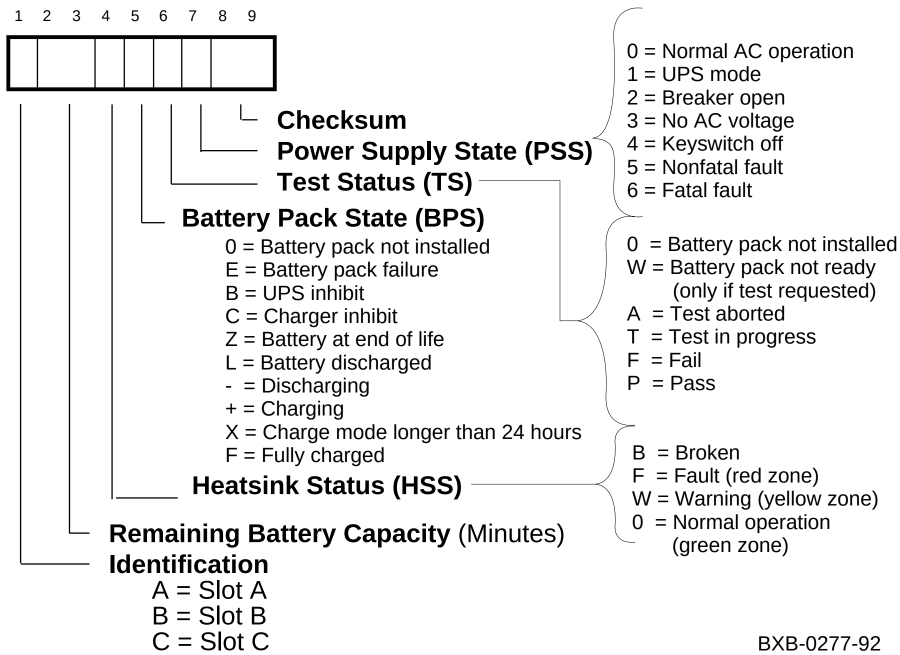
The “B” command packet returns a nine-character summary of power status.

Figure 3–4 Sample Brief Data Packet



The character format is 8 bits, no parity, with one stop bit. The baud rate is 9600.

Figure 3–5 Brief Data Packet Structure



3.6.2 Full Information Data Packet

The “S” or “H” command packet returns a 54-character stream of power information.

Figure 3–6 Full Information Data Packet Structure

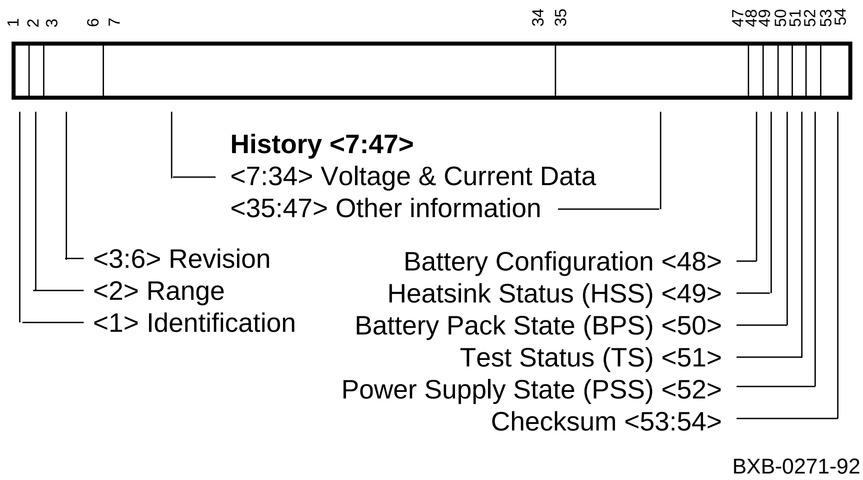


Figure 3–7 Full Data Packet: Values for Characters 1 – 6

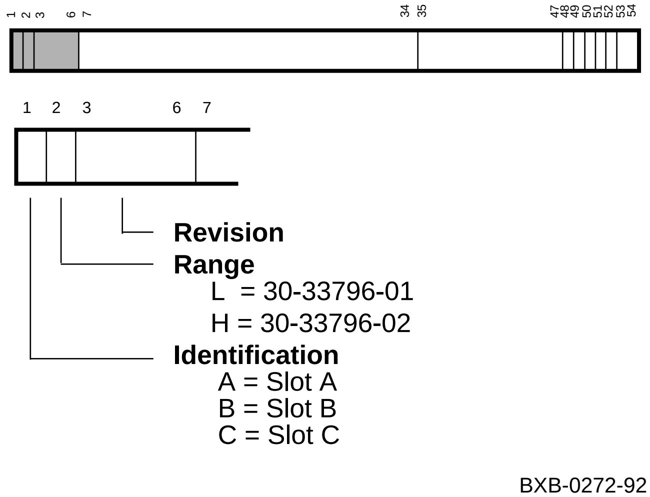
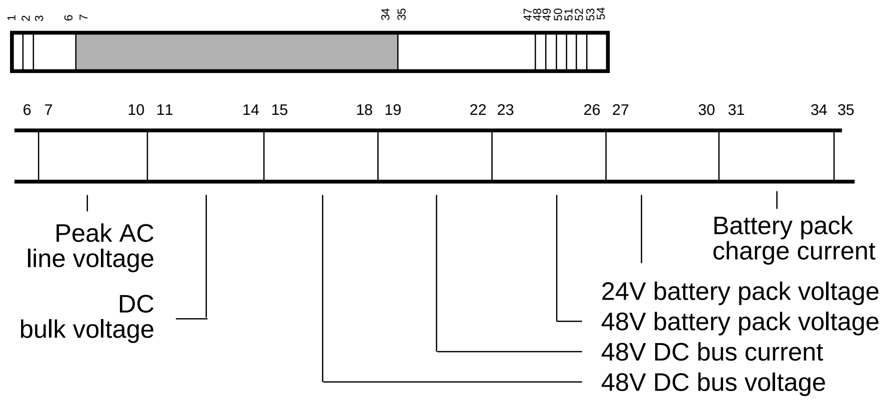


Figure 3–8 Full Data Packet: Values for Characters 7 – 34



Character	Function		Formula	Units
7:10	Peak AC line voltage	If range=L,	value · (230/1024)	Volts
		If range=H,	value · (430/1024)	Volts
11:14	DC bulk voltage	If range=L,	216 + (value ·(22/1024))	Volts
		If range-H,	383 + (value ·(36/1024)	Volts
15:18	48V DC bus voltage		value · (60/1024)	Volts
19:22	48V DC bus current		value · (50/1024)	Amperes
23:26	48V battery pack voltage		value · (70/1024)	Volts
27:30	24V battery pack voltage		value · (35/1024)	Volts
31:34	Battery pack charge current		value · (5/1024)	Amperes

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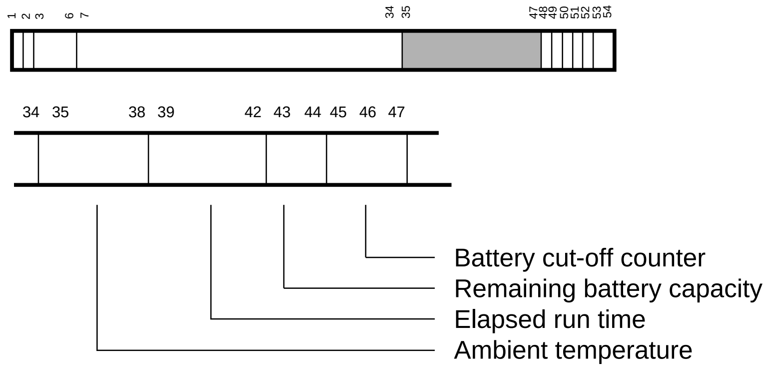
Figure 3–9 Full Data Packet: Values for Characters 35 – 47



Character	Function	Formula	Units
35:38	Ambient temperature	value · (50/1024)	°Celsius
39:42	Elapsed run time	value · (10)	Hours
43:44	Remaining battery capacity	value	Minutes
45:47	Battery cut-off counter	value	Cycles

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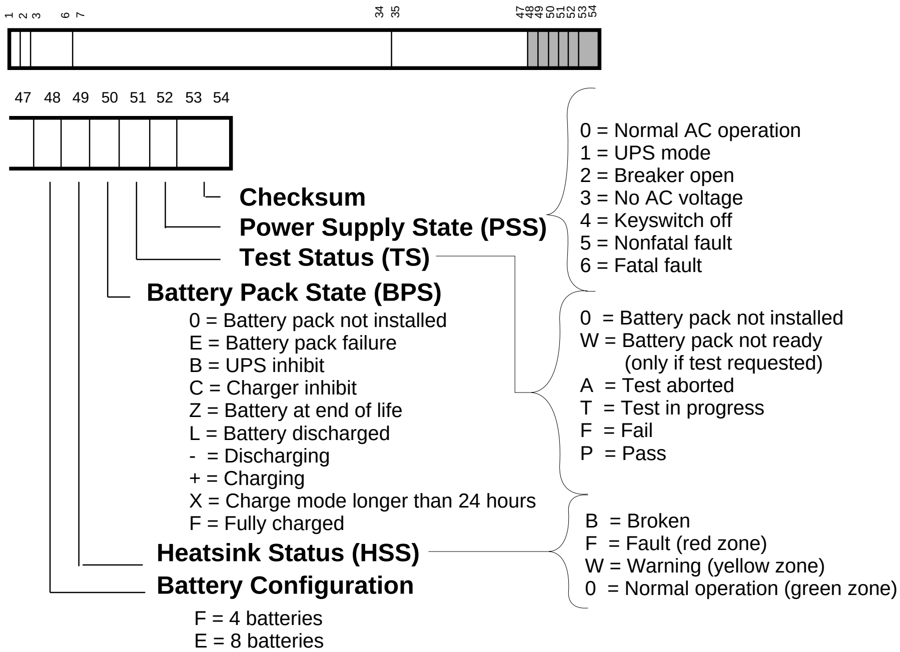
Figure 3–10 Full Data Packet: Values for Characters 48 – 54



BXB-0275-92

Table 3–1 lists the meaning of each value in the following example of a full/history data packet.

Figure 3–11 Sample Full/History Data Packet

A	L	21	21	0665	0513	0795	0921	0750	0754	0597	0696	0007	08	000	F	0	+	P	O	B5

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Table 3–12 Explanation of Sample Full/History Data Packet

Character	Value	Information
1	A	Data packet from power regulator A
2	L	30–33796–01
3–4	21	Secondary master firmware revision 2.1
5–6	21	Secondary slave firmware revision 2.1
7–10	0665	Peak AC line voltage = 149 volts
11–14	0513	DC bulk voltage = 227 volts
15–18	0795	48 VDC bus voltage = 46.6 volts
19–22	0921	48 VDC bus current = 45.0 amps
23–26	0750	48V battery pack voltage = 51.3 volts
27–30	0754	24V battery pack voltage = 25.8 volts
31–34	0597	Battery pack discharge current = 2.92 amps
35–38	0696	Ambient temperature = 34.0 degrees Celsius
39–42	0007	Elapsed run time = 70 hours
43–44	08	Remaining battery capacity = 8 minutes
45–46	000	Battery cutoff = 0 cycles
47–48	F	Configured for four batteries
49	0	Heatsink temperature within range
50	+	Battery pack charging
51	P	Last battery pack test completed successfully
52	0	Normal operation
53–54	B5	Checksum value

Chapter 4

DECevent Error Log

This chapter discusses error logs produced by the DECevent bit-to-text translator. Sections include:

- Brief Description of the TLSB Bus
- Producing an Error Log with DECevent
- Getting a Summary Error Log
- Supported Event Types
- Sample Error Log Entries
- Parse Trees

4.1 Brief Description of the TLSB Bus

The error log entries discussed here are specific to AlphaServer 8200 and 8400 systems. Most of the errors occur during the transmission of commands or data along the TLSB system bus or in buses or storage internal to a particular module.

To understand some of the terms used in the error log, you should understand how data is transferred on the TLSB system bus. The *System Technical Manual* gives this information in detail. Chapter 1 of this manual briefly describes the TLSB modules, and this section gives an overview of the system bus.

The TLSB has two separate buses: a command/address bus and a data bus. Thus, errors can refer to transmissions on either of these buses.

A node that initiates a transaction is called a commander node. The node that responds to the command issued by the commander is called the slave node. CPUs or I/O nodes are always the commander on memory transactions and can be either the commander or the slave on CSR (control and status register) transactions. Memory nodes are never commander nodes.

4.1.1 Command/Address Bus

Table 4–1 lists the eight address bus commands.

Table 4–1 TLSB Address Bus Commands

TLSB CMD <2:0>	Command	Description
000	No-op	Device that won arbitration nulled the command
001	Victim	Victim
010	Read	Read memory
011	Write	Memory write or write update
100	Read Bank Lock	Read memory bank, lock
101	Write Bank Unlock	Write memory bank, unlock
110	CSR Read	Read CSR data
111	CSR Write	Write CSR data

4.1.2 Data Bus

The TLSB transfers data in the sequence order that valid address bus commands are issued. In addition to 256 bits of data, the data bus contains associated ECC bits and some control signals. Three signals are of particular significance in read and write operations.

TLSB_SHARED

When a request is made to access memory, each CPU notes whether that block of memory is currently resident in its cache, and, if so, asserts a signal that the data is shared. Thus, when the slave responds with the data, it asserts the TLSB_SHARED signal on the data bus, so that CPU nodes can take note and make sure that the block being accessed remains valid in the CPU's cache. This signal is valid when driven in response to Read, Read Bank Lock, Write, and Write Bank Unlock commands.

TLSB_DIRTY

This signal is used to indicate that the block being accessed is valid in a CPU cache, and that the copy there is more recent than the copy in memory. TLSB_DIRTY is guaranteed to be valid in response to Read and Read Bank Lock commands.

TLSB_STACHK

This signal is asserted whenever TLSB_SHARED or TLSB_DIRTY is asserted, to ensure that, should an error occur in transmission or reception of either one of these signals, it can be detected. For example, if TLSB_SHARED or TLSB_DIRTY is asserted, but TLSB_STACHK is not, there is an error. Or, if TLSB_STACHK is asserted and TLSB_SHARED or TLSB_DIRTY is not, there is also an error.

4.1.3 Error Checking

The TLSB is designed to implement error detection and, where possible, error correction. The TLSB uses parity protection on the address bus. The data bus is protected by ECC (error correction code). Protocol sequence checking is used on the control signals across both buses. Cache coherency is monitored with the use of the TLSB_SHARED and TLSB_DIRTY signals described above.

PALcode collects error information from module control and status registers and formats it into a "logout frame" that is passed to the operating system, which uses the information to determine the action to take on the error. Some errors are fatal; they can cause the entire system or a specific process to fail. Other errors can be corrected and do not halt processing. The operating system writes the error information as an entry in a binary file that can then be used by the DECevent bit-to-text translator to produce an error log.

4.2 Producing an Error Log with DECevent

The DECevent utility is available for both Digital UNIX and OpenVMS operating systems to help diagnose what are called "intermittent errors." These errors may or may not cause the operating system to crash.

Example 4–1 Producing an Error Log with DECevent

```
$  diagnose/output=errlog.dat

DECevent Version T1.1
```

In this example, the error log information is directed to a file called **errlog.dat**. If the **/output** qualifier is not used, the error log information is displayed on the screen of the console terminal.

4.3 Getting a Summary Error Log

Running DECevent with the /summary qualifier is a good way to start analyzing the error log. It gives you a "table of contents" for the error log.

Example 4–2 Summary Error Log

```
$  diagnose/summary

SUMMARY OF ALL ENTRIES LOGGED ON NODE CLYP01

     unknown major class
       New errorlog created                  1.
       Timestamp                             3.
       Machine check (670 entry)             7.
       Crash Re-start                        2.
       XMI                                   6.
       System startup                        3.
       Volume mount                          3.
       Adapter Error                         4.
       Soft ECC error                        1.
```

4.4 Supported Event Types

The events that DECevent logs for AlphaServer 8200 and 8400 systems can be logged by the CPU modules or one of the TLSB or subsidiary bus I/O adapters. (Memory errors are logged by the CPU.)

Table 4–2 Supported Event Types

Event Types	Description
Machine check 670	670 processor checks
Machine check 660	660 system machine checks
630 error interrupts	B-cache correctable 630 interrupts
620 errors	620 correctable system errors
Extended CRD	Memory single-bit error footprints
Adapter	Adapter is logging entity. Adapters include the KFTxA module, DWLPA motherboard, DWLMA, and DWLLA.

Example 4–3 and Example 4–4 show a Digital UNIX entry for a 670-type machine check and an OpenVMS 620 error entry for a CRD (corrected read data) error. The boxes enclose the area that identifies the event type.

Example 4–3 OSF Event Type Identification

```
************************* ENTRY    1 ***********************
Logging OS                         2. OSF/1
System Architecture                2. AXP
Event sequence number              1.
Timestamp of occurrence               23-JAN-1995 13:57:19
Host name                             clyp01

AXP HW model                          AlphaServer 8200
Number of CPUs (mpnum)    x00000002
CPU logging event (mperr) x00000006

Event validity                     1. Valid
Entry type                       100. CPU Machine Check Errors

CPU Minor class                   1.  Machine check (670 entry)
Event severity                     1. Severe Priority
```

Example 4–4 OpenVMS Event Type Identification

```
*************************** ENTRY  124 ***********************
Logging OS                         1. OpenVMS
System Architecture                2. AXP
OS version                            X5WW-FT2
Event sequence number            102.
Timestamp of occurrence               16-MAR-1995 08:14:12
System uptime in seconds       53886.
Flags                          x0000
Host name                             CLYP01

AXP HW model                          AlphaServer 8400
Unique CPU ID             x00000005
Entry type                       14.  11/790 CRD log
Memory Minor class                2   CRD Entry
```

4.5 Sample Error Log Entries

4.5.1 Machine Check 660 Error

You can identify problem FRUs in an error log entry by checking the contents of the registers against the parse trees (Section 4.6).

The following steps (relating to the callouts in Example 4–5) isolate the error and the FRU most likely responsible, using the parse tree in Figure 4–2.

Table 4–3 Parsing a Sample 660 Error (Example 4–5)

❶ This line identifies the error log entry as a machine check 660 error.

❷ The parse tree for machine check 660 errors starts with the EI_STAT register. In the example, however, no bits specified in the parse tree are set, so proceed to the next branch of the parse tree.

❸ The TLBER register is next in the parse tree, but the only bit set is bit 23, which is not called out in the parse tree. Proceed to the next branch.

❹ The TLEPAERR register has bit 5 set. In the parse tree, this is shown as a duplicate tag status parity error, and the FRU identified (with high probability) is a CPU.

❺ The WHAMI (who am I) register identifies the faulty CPU module as the one in slot 0.

Example 4–5 Sample Machine Check 660 Error Log Entry

```
************************** ENTRY   16 ***************************
Logging OS                         2. OSF/1
System Architecture                2. AXP
Event sequence number              7.
Timestamp of occurrence               11-JAN-1995 18:31:54
Host name                             ruby9

AXP HW model                          AlphaServer 8400
Number of CPUs (mpnum)    x00000002
CPU logging event (mperr) x00000001

Event validity                     1. Valid
Event severity                     1. Severe Priority
Entry type                       100. CPU Machine Check Errors
```

```
CPU Minor class                  2. 660 Entry    ❶
---TurboLaser 660---
Software Flags           x00000000
Active CPUs              x00000003
Hardware Rev             x00000000
System Serial Number
Module Serial Number
System Revision          x00000000
MCHK Reason Mask         x0000FFF0
MCHK Frame Rev           x00000000
PAL SHADOW REG 0         x0000000000000000
PAL SHADOW REG 1         x0000000000000000
PAL SHADOW REG 2         x0000000000000000
PAL SHADOW REG 3         x0000000000000000
PAL SHADOW REG 4         x0000000000000000
PAL SHADOW REG 5         x0000000000000000
PAL SHADOW REG 6         x0000000000000000
PAL SHADOW REG 7         x0000000000000000
PALTEMP0                 x0000000000000001
PALTEMP1                 x00000000000061A8
PALTEMP2                 xFFFFFC0000456780
PALTEMP3                 x0000000000005890
PALTEMP4                 x0000000000000000
PALTEMP5                 x0000000000002000
PALTEMP6                 x0000000000000000
PALTEMP7                 xFFFFFC0000456210
PALTEMP8                 x1F1E161514020100
PALTEMP9                 xFFFFFC0000456500
PALTEMP10                xFFFFFC0000457FF4
PALTEMP11                xFFFFFC0000456360
PALTEMP12                xFFFFFC00004566F0
PALTEMP13                xFFFFFFF00FFFFFFF
PALTEMP14                x0000000000000000
PALTEMP15                x0000000000000004
PALTEMP16                x0000020306600109
PALTEMP17                x000000006B10216F
PALTEMP18                x000000011FFFF840
PALTEMP19                xFFFFFFFFB50DEC40
PALTEMP20                x0000000019608000
PALTEMP21                xFFFFFC0000456720
PALTEMP22                xFFFFFC00006C30A0
PALTEMP23                x000000000723DA58
EXC_ADDR                 xFFFFFC0000457FF4
                                    Native-mode instruction
                                    Exception PC  x3FFFFF0000115FFD
EXC_SUM                  x0000000000000000
EXC_MSK                  x0000000000000000
```

```
PAL_BASE                 x0000000000018000
                                    Base address for palcode
x0000000000000006
ISR                      x0000000080000000
                                    Ext. HW intr. Sys. Mchk (IPL31)
                                  AST requests 3 - 0  x0000000000000000
ICSR                     x0000004160000000
                                    Timeout Bit Not Set
                                    PAL Shadow Registers Enabled
                                    Correctable Err Intrpts Enabled
                                    MBOX packet selected
                                    ICACHE BIST Successful
IC PERR STAT             x0000000000000000
DC PERR STAT             x0000000000000000
Virtual Address          x0000000140568000
MM STAT                  x00000000000078D1
                                    Ref which caused err was a write
                                    Ref resulted in DTB miss
                                    Ra Field  x0000000000000003
Opcode Field   x000000000000000F
SC ADDR                  xFFFFFF000001D06F
SC STAT                  x0000000000000000
BC TAG ADDRESS           xFFFFFF80148DCFFF
                                    External cache hit
                                    Parity for ds and v bits
                                    Cache block dirty
                                    Cache block shared
                                    Cache block valid
                                    Tag address is   x0000000000006E7F
LD LOCK                  xFFFFFF000070003F
EI ADDRESS               xFFFFFFFFFFFFFFFF
FILL SYNDROME            x000000000000F2DD
EI STAT                  xFFFFFFF00FFFFFFF   ❷
                                    Error occurred during D-ref fill
WHAMI                          x01  TLSB NODE ID  0. ❺
                                    CPU1
MISCR                          x55  B-Cache Size  4 Mbyte Bcache
                                    Two Processors
                                    TLSB RUN Signal
                                    CPU0 Running console
TLDEV                 x00008014  Device Type Turbo-Laser Dual CPU, 4meg
                                                 Bcache
                                    Device Rev  x00000000
TLBER                    x00800000  Data Syndrome 3   ❸
TLCNR                    x00000200
TLVID                    x00000010
TLESR0                   x00400303  CPU0 is Data Source
```

```
TLESR1                    x00400C0C  CPU0 is Data Source
TLESR2                    x00406060  CPU0 is Data Source
TLESR3                    x00409090  CPU0 is Data Source
TLEPAERR                  x00000020   ❹
MODCONFIG                 x00098AD4  Lockout Enable
                                     Command Piping To EV5 Disabled
                                     Bcache Size:   4 MB
                                     Bcache Idle Cycles Before 11.
                                     Max Command Queue Entries 2.
                                     Max Bus Queue Entries   4.
TLEPMERR                  x00000000
TLEPDERR                  x00000000
TL INTR MASK 0            x000001FF  UART 0 Interrupt Enable
                                     IPL 14 Interrupt Enable
                                     IPL 15 Interrupt Enable
                                     IPL 16 Interrupt Enable
                                     IPL 17 Interrupt Enable
                                     Interprocessor Interrupt Enable
                                     Interval Timer Interrupt Enable
                                     CPU Halt Enable
                                     Control/P Halt Enable
TL INTR MASK 1            x000000FE  IPL 14 Interrupt Enable
                                     IPL 15 Interrupt Enable
                                     IPL 16 Interrupt Enable
                                     IPL 17 Interrupt Enable
                                     Interprocessor Interrupt Enable
                                     Interval Timer Interrupt Enable
                                     CPU Halt Enable
TL INTR SUM 0             x00000000
TL INTR SUM 1             x00000000
TLEP VMG                  x00000000
Palcode Revision          x0000000000000000
```

4.5.2 Machine Check 620 Error

Machine check 620 errors are nearly always soft errors; that is, they do not cause the system to crash. Correctable write data errors (CWDE) on CSR writes are the exception.

Example 4–6 shows a sample machine check 620 error. In this case, all nodes on the TLSB are presented in the error log entry. The parse tree shown in Figure 4–4 isolates machine check 620 errors. The steps in Table 4–4 isolate the error and the FRU most likely responsible, using the parse tree in Figure 4–4.

Table 4–4 Parsing a Sample 620 Error (Example 4–6)

❶ This line identifies the error as a machine check 620 error.

❷ The parse tree for machine check 620 errors starts with the EI_STAT register. In this case, bits 30 and 31 of EI_STAT are set, but bit 39 of EI_ADDR is not set, so we follow branch 3.

❸ The next branch on the parse tree denotes TLBER<18>. Checking the first TLBER entry here shows that TLBER<18> is set, but not TLBER<24>, the next step down. This indicates following branch 4 at this place in the parse tree.

❹ Branch 4 of the parse tree asks that we look at all memories on the TLSB. There is only one, at node 7. Looking at that memory's TLBER register, we see that bit 18 is set as well as bit 24. Of bits <23:20>, bit 20 is set, and the parse tree indicates we should examine the memory's TLESR0 register.

❺ Bit 17 of the TLESR0 is not set, so we follow the branch down and examine EI_STAT<34>, which is not set. Following the branch further shows a corrected read data error on a data stream read, and that the fault occurred in a SIMM.

❻ The error log identifies the SIMM where the error occurred as J23. UNIX lists each occurrence of a corrected read data error. Before replacing the SIMM, you would probably want to examine other 620 entries to see if the error on SIMM J23 was repeated.

Example 4–6 Sample Machine Check 620 Error Log Entry

```
*************************** ENTRY    1 **********************************
Logging OS                        2. OSF/1
System Architecture               2. Alpha
Event sequence number             2.
Timestamp of occurrence              29-FEB-2020 11:42:15
Host name                            clyp01

System type register      x0000000C  AlphaServer 2x000
Number of CPUs (mpnum)    x00000002
CPU logging event (mperr) x00000000

Event validity                    1. Valid
Event severity                    5. Low Priority
Entry type                      100. CPU Machine Check Errors

CPU Minor class                   4. 620 System Correctable Error ❶

--TLaser 620 Corr Error--
Software Flags            x00000001  TLSB Error Log Snapshot Packet
Present
Active CPUs               x00000003
Hardware Rev              x00000000
System Serial Number
Module Serial Number
System Revision           x00000000
MCHK Reason Mask          x00000086
MCHK Frame Rev            x00000000
EI STAT                   xFFFFFFF0C2FFFFFF   ❷
                                     Error Source is memory or system
                                     Correctable ECC error
                                     Error occurred during D-ref fill
                                     EV5 Chip Rev 2
EI ADDRESS                xFFFFFF0002D4420F
FILL SYNDROME             x00000000000000CB
                                     Data Bit = 001
ISR                       x0000000100000000
                                     Correctable ECC errors (IPL31)
                                     AST requests 3 -0x0000000000000000
WHAMI                           x00  TLSB NODE ID  0.
                                     CPU0
MISCR                           x55  B-Cache Size  4 Mbyte Bcache
                                     Two Processors
                                     TLSB RUN Signal
                                     CPU0 Running console
```

```
TLDEV                      x00008014  Device Type  TLaser Dual CPU, 4meg
                                                   Bcache
                                      Device Rev  x00000000
TLBER                      x00140000  Correctable Read Data Error   ❸
                                      Data Syndrome 0
TLESR0                     x00A0CBCB  ECC Syndrome  x000000CB
                                      Correctable Read ECC Error
                                      CPU1 is Data Source
TLESR1                     x00400C0C
TLESR2                     x00406060
TLESR3                     x00409090
Palcode Revision           x0000002200000303

*TLaser CPU Registers*
TLSB Node Number                   0.
TLDEV                          x8014  Turbo-Laser Dual CPU, 4meg Bcache

TLBER                      x00100000
TLCNR                      x00000200
TLVID                      x00000010
TLESR0                     x0080CBCB
TLESR1                     x00400C0C
TLESR2                     x00406060
TLESR3                     x00409090
TLEPAERR                   x00000000
MODCONFIG                  x00098AD4  Lockout Enable
                                      Command Piping To EV5 Disabled
                                      Bcache Size:   4 MB
                                      Bcache Idle Cycles Before 11.
                                      Max Command Queue Entries 2.
                                      Max Bus Queue Entries   4.
TLEPMERR                   x00000000
                           x00000000
TLEP Interrupt Mask 0      x000000FE  IPL 14 Interrupt Enable
                                      IPL 15 Interrupt Enable
                                      IPL 16 Interrupt Enable
                                      IPL 17 Interrupt Enable
                                      Interprocessor Interrupt Enable
                                      Interval Timer Interrupt Enable
                                      CPU Halt Enable
TLEP Interrupt Summary 0  x00000000
TLEP Interrupt Mask 1      x00000000
TLEP Interrupt Summary 1  x00000000

* TLaser I/O Registers *
TLSB Node Number                   6.
TLDEV                          x2020  Turbo-Laser Integrated I/O Module
```

```
TLBER                    x00800000
TLESR0                   x00000000
TLESR1                   x00000000
TLESR2                   x00000000
TLESR3                   x00000000
CPU Interrupt Mask       x00000001  Cpu Interrupt Mask =   x00000001
ICCMSR                   x00000000  Arbitration Control  Minimum
Latency Mode
                                    Suppress Control  Suppress after 16
                                                     Transactions
ICCNSE                   x80000000  Interrupt on NSES Set
ICCMTR                   x00000000
IDPNSE-0                 x00000006  Hose Power OK
                                    Hose Cable OK
IDPNSE-1                 x00000000
IDPNSE-2                 x00000000
IDPNSE-3                 x00000000
IDPVR                    x00000CF0
TLMBPR                   x0000000000000000
IDPDR0                   x20000000
IDPDR1                   x00000000
IDPDR2                   x00000000
IDPDR3                   x00000000

* TLaser Memory Regs *
TLSB Node Number                 7.
TLDEV                        x5000  Turbo-Laser Memory Module

TLBER                    x01140000  Correctable Read Data Error    ❹
                                    Data Syndrome 0
                                    Data Transmitter During Error
TLCNR                    x000FC270
TLVID                    x00000080
FADR0                    x02D44200
FADR1                    x07020000
TLESR0                   x0021CBCB  ECC Syndrome  x000000CB ❺
                                    Transmitter During Error
                                    Correctable Read ECC Error
  ECC Code                     xCB  Failing SIMM Number = J23  ❻
  Second ECC Code              xCB  Failing SIMM Number = J23

TLESR1                   x00000C0C
TLESR2                   x00006060
TLESR3                   x00009090
TMIR                     x80000001  Interleave  x00000001
TMCR                     x00000234  128MB Module (E2035-BA)
```

```
                                    4 MB
                                    70ns DRAM
                                    Strings Installed =   2
                                    DRAM timing:   Bus Spd = 13.8-15.0;
                                                   Refresh Cnt = 1008
TMER                      x00000000  Failing String =   x00000000
TMDRA                     x10000000  Refresh Rate   2X Default
TDDR0                     x00008100
TDDR1                     x00000000
TDDR2                     x00000000
TDDR3                     x00000000

* TLaser I/O Registers *
TLSB Node Number                  8.
TLDEV                         x2000  Turbo-Laser I/O Module

TLBER                     x00000000 ❼
TLESR0                    x00000000
TLESR1                    x00000000
TLESR2                    x00000000
TLESR3                    x00000000
CPU Interrupt Mask        x00000001  Cpu Interrupt Mask =   x00000001
ICCMSR                    x00000000  Arbitration Control  Minimum
Latency Mode
                                     Suppress Control  Suppress after 16
                                                      Transactions
ICCNSE                    x80000000  Interrupt on NSES Set
ICCMTR                    x00000000
IDPNSE-0                  x00000000
IDPNSE-1                  x00000006  Hose Power OK
                                     Hose Cable OK
IDPNSE-2                  x00000000
IDPNSE-3                  x00000000
IDPVR                     x00000800
TLMBPR                    x0000000000000000
IDPDR0                    x00000000
IDPDR1                    x00000000
IDPDR2                    x00000000
IDPDR3                    x00000000
```

4.5.3 DWLPA Motherboard (PCIA) Adapter Error Log

Registers on the DWLPA motherboard are printed in the error log when one of these errors occur. You use the parse tree for the DWLPA motherboard to determine the most likely FRU.

Table 4–5 Parsing a DWLPA Motherboard Error (Example 4–7)

Example 4–7 shows a sample DWLPA motherboard (PCIA) adapter error. The corresponding parse tree is shown in Figure 4–6. The following steps isolate the error and the FRU most likely responsible.

❶ This line identifies the error as a PCIA (DWLPA motherboard) adapter error.

❷ The parse tree for the DWLPA motherboard starts with the ERR0 register. No bits are set in this register, so we follow the tree down.

❸ The ERR1 register is also all zeros, so we follow the tree down.

❹ The ERR2 register's last digit is a 9, indicating that bit 0 is set, and bit 3 is set. The FRUs identified for this branch of the parse tree are the KFTxA (high probability), PCIA (DWLPA motherboard) medium probability, and hose (I/O cable connecting KFTxA to DWLPA motherboard) low probability.

Example 4–7 Sample DWLPA Motherboard Error Log Entry

```
***************************** ENTRY    1 *****************************

Logging OS                         1. OpenVMS
System Architecture                2. Alpha
OS version                            T6.2-FT3
Event sequence number            140.
Timestamp of occurrence               25-APR-1995 11:26:16
System uptime in seconds          51.
Flags                          x0000
Host name                             CLYP01

Alpha HW model                        AlphaServer 8200 Model 5/300
Unique CPU ID              x00000005

Entry type                        28. Adapter Error

SWI Minor class                    8. Adapter Error
```

```
SWI Minor sub class              5. PCIA ❶

Software Flags            x00280000  PCIA Subpacket Present
                                     PCI Bus Snapshot Present
Base Phys Addr of TIOP    x000000FF89800000
-TLaser PCIA Registers-
Channel No.                   x0001
PCI Slots Present         x00000000  Contents of PCI0-Slot 0  No Card
                                     Contents of PCI0-Slot 1  No Card
                                     Contents of PCI0-Slot 2  No Card
                                     Contents of PCI0-Slot 3  No Card
                                     Contents of PCI1-Slot 0  No Card
                                     Contents of PCI1-Slot 1  No Card
                                     Contents of PCI1-Slot 2  No Card
                                     Contents of PCI1-Slot 3  No Card
                                     Contents of PCI2-Slot 0  No Card
                                     Contents of PCI2-Slot 1  No Card
                                     Contents of PCI2-Slot 2  No Card
                                     Contents of PCI2-Slot 3  No Card
                                     Module Revision  x00000000
CTL0                      x01E00100  Config Cycle Type  PCI Type 0
                                                        Configuration
                                     Memory Block Size  64 Bytes
                                     PCI Cut Through Threshold x00000000
                                     IO Space HW Addr Ext.  x00000000
                                Mem Read Mult Pre-fetch S 4 Cache Blocks
                               I/O Port Up Hose Buffers  3 Buffers (TIOP
                                                               and IOP)
                                    Scatter/Gather Map RAM Si 128KB (32K
                                                        entries-default)
                                PCI Arbitration Control  Round Robin for
                                                          all Masters
                                     PCI Cut Through Enable
                                     Memory Read Multiple Enable
MRETRY 0                  x00400000
ERR 0                     x00000000    ❷
FADR0                     x00000000  DMA Read from Memory
IMask PCI Interrupt 0     x01030000  Error Interrupt Enable
                                     Device Interrupt Priority IPL 14
DIAG0                     x00000000  Generate Correct parity
                                     HPC Gate Array Revision = 0.
                                     RM Down Hose Translate Ad x00000000
IPEND 0                   x00000000
IPROG 0                   x00000000  Interrupt Source  Slot 0 INTA
Window Mask Reg A0        x007F0000  Window Size =  8 MB
Window Base Reg A0        x00800003  Scatter/Gather Enable
                                     Window Enable
```

```
                                    Window Base Address =   x00000080
Translation Base Reg A0   x00000000  Translated Base Address = x00000000
Window Mask Reg B0        x3FFF0000  Window Size =  1 GB
Window Base Reg B0        x40000002  Window Enable
                                     Window Base Address =   x00004000
Translation Base Reg B0   x00000000  Translated Base Address = x00000000
Window Mask Reg C0        x0FFF0000  Window Size =  256 MB
Window Base Reg C0        xF0000003  Scatter/Gather Enable
                                     Window Enable
                                     Window Base Address =   x0000F000
Translation Base Reg C0   x00000000  Translated Base Address = x00000000
Error Vector 0            x00000945  Interrupt Vector  x00000945
Dev Vec 0 Slot 0, IntA    x00000B70  Interrupt Vector   x00000B70
Dev Vec 0 Slot 0, IntB    x00000B80  Interrupt Vector   x00000B80
Dev Vec 0 Slot 0, IntC    x00000B90  Interrupt Vector   x00000B90
Dev Vec 0 Slot 0, IntD    x00000BA0  Interrupt Vector   x00000BA0
Dev Vec 0 Slot 1, IntA    x00000905  Interrupt Vector   x00000905
Dev Vec 0 Slot 1, IntB    x00000BC0  Interrupt Vector   x00000BC0
Dev Vec 0 Slot 1, IntC    x00000BD0  Interrupt Vector   x00000BD0
Dev Vec 0 Slot 1, IntD    x00000BE0  Interrupt Vector   x00000BE0
Dev Vec 0 Slot 2, IntA    x00000BF0  Interrupt Vector   x00000BF0
Dev Vec 0 Slot 2, IntB    x00000C00  Interrupt Vector   x00000C00
Dev Vec 0 Slot 2, IntC    x00000C10  Interrupt Vector   x00000C10
Dev Vec 0 Slot 2, IntD    x00000C20  Interrupt Vector   x00000C20
Dev Vec 0 Slot 3, IntA    x00000C30  Interrupt Vector   x00000C30
Dev Vec 0 Slot 3, IntB    x00000C40  Interrupt Vector   x00000C40
Dev Vec 0 Slot 3, IntC    x00000C50  Interrupt Vector   x00000C50
Dev Vec 0 Slot 3, IntD    x00000C60  Interrupt Vector   x00000C60
CTL 1                     x01E00100  Config Cycle Type  PCI Type 0
                                                        Configuration
                                     Memory Block Size  64 Bytes
                                     PCI Cut Through Threshold x00000000
                                     IO Space HW Addr Ext.  x00000000
                                Mem Read Mult Pre-fetch S 4 Cache Blocks
                               I/O Port Up Hose Buffers  3 Buffers (TIOP
                                                               and IOP)
                                    Scatter/Gather Map RAM Si 128KB (32K
                                                       entries-default)
                                PCI Arbitration Control  Round Robin for
                                                            all Masters
                                     PCI Cut Through Enable
                                     Memory Read Multiple Enable
MRETRY 1                  x00400000
ERR 1                     x00000000    ❸
FADR 1                    x00000000  DMA Read from Memory
IMask PCI Interrupt Mask  x01030000  Error Interrupt Enable
                                     Device Interrupt Priority IPL 14
```

```
DIAG 1                     x00000000  Generate Correct parity
                                      HPC Gate Array Revision = 0.
                                      RM Down Hose Translate Ad x00000000
IPEND 1                    x00000000
IPROG 1                    x00000000  Interrupt Source  Slot 0 INTA
Window Mask Reg A1         x007F0000  Window Size =  8 MB
Window Base Reg A1         x00800003  Scatter/Gather Enable
                                      Window Enable
                                      Window Base Address =   x00000080
Translation Base Reg A1    x00000000  Translated Base Address = x00000000
Window Mask Reg B1         x3FFF0000  Window Size =  1 GB
Window Base Reg B1         x40000002  Window Enable
                                      Window Base Address =   x00004000
Translation Base Reg B1    x00000000  Translated Base Address = x00000000
Window Mask Reg C1         x0FFF0000  Window Size =  256 MB
Window Base Reg C1         xF0000003  Scatter/Gather Enable
                                      Window Enable
                                      Window Base Address =   x0000F000
Translation Base Reg C1    x00000000  Translated Base Address = x00000000
Error Vector 1             x00000956  Interrupt Vector  x00000956
Dev Vec 1 Slot 0, IntA     x00000C70  Interrupt Vector   x00000C70
Dev Vec 1 Slot 0, IntB     x00000C80  Interrupt Vector   x00000C80
Dev Vec 1 Slot 0, IntC     x00000C90  Interrupt Vector   x00000C90
Dev Vec 1 Slot 0, IntD     x00000CA0  Interrupt Vector   x00000CA0
Dev Vec 1 Slot 1, IntA     x00000CB0  Interrupt Vector   x00000CB0
Dev Vec 1 Slot 1, IntB     x00000CC0  Interrupt Vector   x00000CC0
Dev Vec 1 Slot 1, IntC     x00000CD0  Interrupt Vector   x00000CD0
Dev Vec 1 Slot 1, IntD     x00000CE0  Interrupt Vector   x00000CE0
Dev Vec 1 Slot 2, IntA     x00000CF0  Interrupt Vector   x00000CF0
Dev Vec 1 Slot 2, IntB     x00000D00  Interrupt Vector   x00000D00
Dev Vec 1 Slot 2, IntC     x00000D10  Interrupt Vector   x00000D10
Dev Vec 1 Slot 2, IntD     x00000D20  Interrupt Vector   x00000D20
Dev Vec 1 Slot 3, IntA     x00000D30  Interrupt Vector   x00000D30
Dev Vec 1 Slot 3, IntB     x00000D40  Interrupt Vector   x00000D40
Dev Vec 1 Slot 3, IntC     x00000D50  Interrupt Vector   x00000D50
Dev Vec 1 Slot 3, IntD     x00000D60  Interrupt Vector   x00000D60
CTL 2                      x01E00100  Config Cycle Type  PCI Type 0
                                                         Configuration
                                      Memory Block Size  64 Bytes
                                      PCI Cut Through Threshold x00000000
                                      IO Space HW Addr Ext.  x00000000
                                 Mem Read Mult Pre-fetch S 4 Cache Blocks
                                I/O Port Up Hose Buffers  3 Buffers (TIOP
                                                                and IOP)
                                     Scatter/Gather Map RAM Si 128KB (32K
                                                         entries-default)
                                 PCI Arbitration Control  Round Robin for
```

```
                                                     all Masters
                                     PCI Cut Through Enable
                                     Memory Read Multiple Enable
MRETRY 2                  x00400000
ERR 2                     x00000009  Error Summary    ❹
                                     CSR Overrun Error
FADR 2                    x00000000  DMA Read from Memory
IMask PCI Interrupt Mask  x01030000  Error Interrupt Enable
                                     Device Interrupt Priority IPL 14
DIAG 2                    x00000000  Generate Correct parity
                                     HPC Gate Array Revision = 0.
                                     RM Down Hose Translate Ad x00000000
IPEND 2                   x00000000
IPROG 2                   x00000000  Interrupt Source  Slot 0 INTA
Window Mask Reg A2        x007F0000  Window Size =  8 MB
Window Base Reg A2        x00800003  Scatter/Gather Enable
                                     Window Enable
                                     Window Base Address =   x00000080
Translation Base Reg A2   x00000000  Translated Base Address = x00000000
Window Mask Reg B2        x3FFF0000  Window Size =  1 GB
Window Base Reg B2        x40000002  Window Enable
                                     Window Base Address =   x00004000
Translation Base Reg B2   x00000000  Translated Base Address = x00000000
Window Mask Reg C2        x0FFF0000  Window Size =  256 MB
Window Base Reg C2        xF0000003  Scatter/Gather Enable
                                     Window Enable
                                     Window Base Address =   x0000F000
Translation Base Reg C2   x00000000  Translated Base Address = x00000000
Error Vector 2            x00000967  Interrupt Vector  x00000967
Dev Vec 2 Slot 0, IntA    x00000D70  Interrupt Vector   x00000D70
Dev Vec 2 Slot 0, IntB    x00000D80  Interrupt Vector   x00000D80
Dev Vec 2 Slot 0, IntC    x00000D90  Interrupt Vector   x00000D90
Dev Vec 2 Slot 0, IntD    x00000DA0  Interrupt Vector   x00000DA0
Dev Vec 2 Slot 1, IntA    x00000DB0  Interrupt Vector   x00000DB0
Dev Vec 2 Slot 1, IntB    x00000DC0  Interrupt Vector   x00000DC0
Dev Vec 2 Slot 1, IntC    x00000DD0  Interrupt Vector   x00000DD0
Dev Vec 2 Slot 1, IntD    x00000DE0  Interrupt Vector   x00000DE0
Dev Vec 2 Slot 2, IntA    x00000DF0  Interrupt Vector   x00000DF0
Dev Vec 2 Slot 2, IntB    x00000E00  Interrupt Vector   x00000E00
Dev Vec 2 Slot 2, IntC    x00000E10  Interrupt Vector   x00000E10
Dev Vec 2 Slot 2, IntD    x00000E20  Interrupt Vector   x00000E20
Dev Vec 2 Slot 3, IntA    x00000E30  Interrupt Vector   x00000E30
Dev Vec 2 Slot 3, IntB    x00000E40  Interrupt Vector   x00000E40
Dev Vec 2 Slot 3, IntC    x00000E50  Interrupt Vector   x00000E50
Dev Vec 2 Slot 3, IntD    x00000E60  Interrupt Vector   x00000E60

--TLaser PCI Registers--
```

```
Node Qty                          1.

CONFIG Address            x0000000000000018
Device Name               x00021011  DECchip 21040-A
Vendor ID                     x1011
Device ID                     x0002
Command                       x0007
Status                        x0280  Fast Back-to-Back Capable
                                     DEVSEL  Medium
Revision ID                     x23
Class Code                  x020000
Cache Line S                    x00
Latency T.                      xFF
Header Type                     x00
Bist                            x00
Base Address Register 1   x00180001
Base Address Register 2   x01000000
Base Address Register 3   x00000000
Base Address Register 4   x00000000
Base Address Register 5   x00000000
Base Address Register 6   x00000000
Expansion Rom Base Addres x00000000
Interrupt P1                    xE5
Interrupt P2                    x01
Min Gnt                         x00
Max Lat                         x00
```

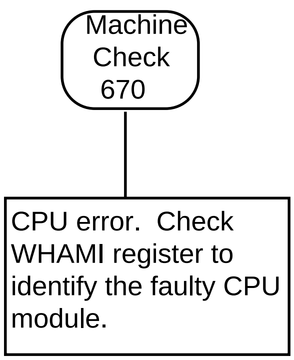
4.6 Parse Trees

Use the contents of the registers shown in the error log to follow the branches of the parse tree until you find a match. The box at the end of the branch identifies the FRU most likely responsible for the error. FRUs are listed in order of decreasing probability.

4.6.1 Parse Tree for Machine Check 670 Errors

Machine check 670 errors always cause the system to crash. They are errors that occur in the transfer of data between caches internal to a CPU chip or the B-cache on a particular processor module.

Figure 4–1 Machine Check 670 Error



BX-0189-95

The DECevent bit-to-text listing prints contents of registers that can be used to identify what component on a particular CPU module failed. To identify a FRU to be replaced, however, all you need to do is look at the WHAMI (who am I) register to identify the faulty CPU module. (Note that the WHAMI register is described in the *8200/8400 System Technical Manual* under its full name as the GBUS$WHAMI register.)

4.6.2 Machine Check 660 Errors

Most machine check 660 errors are system-specific (inside the system, but outside the CPU chip) fatal errors.

Figure 4–2 Machine Check 660 Error

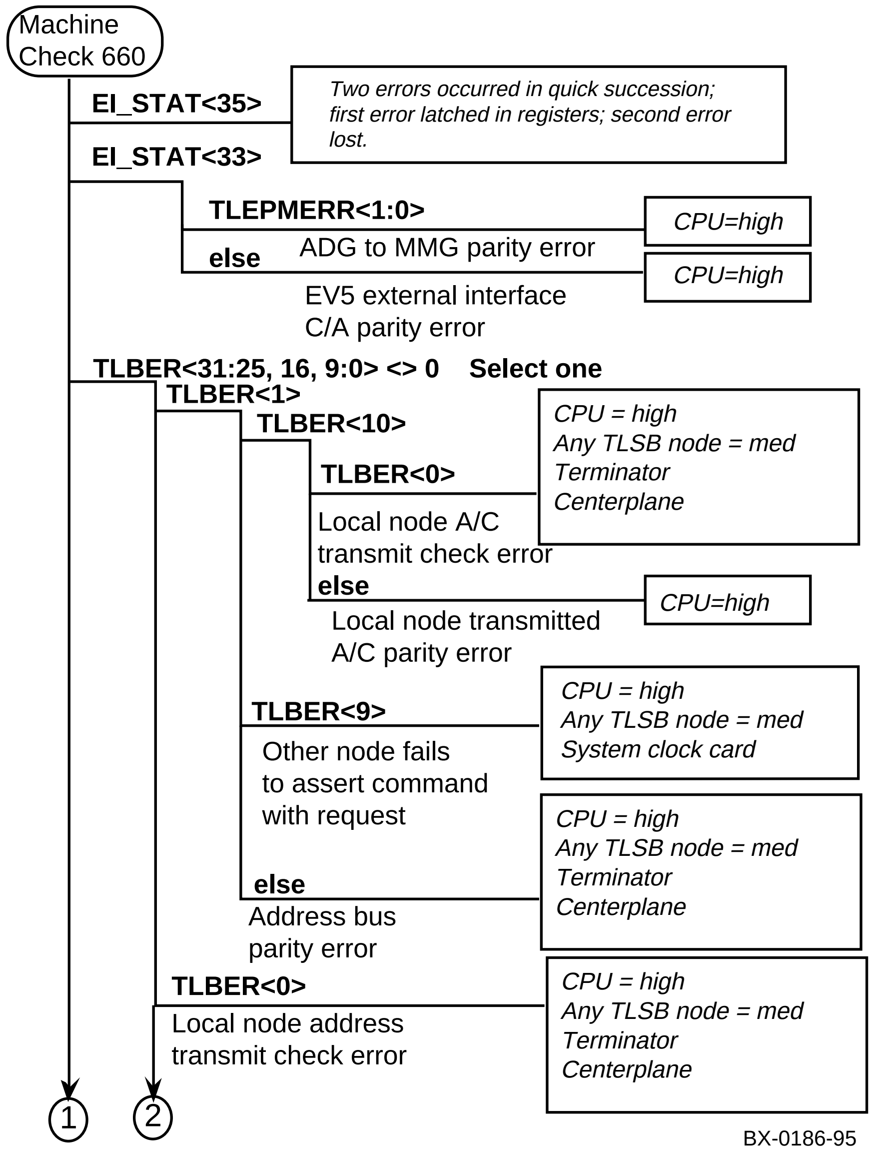


Figure 4–2 Machine Check 660 Error (Continued)

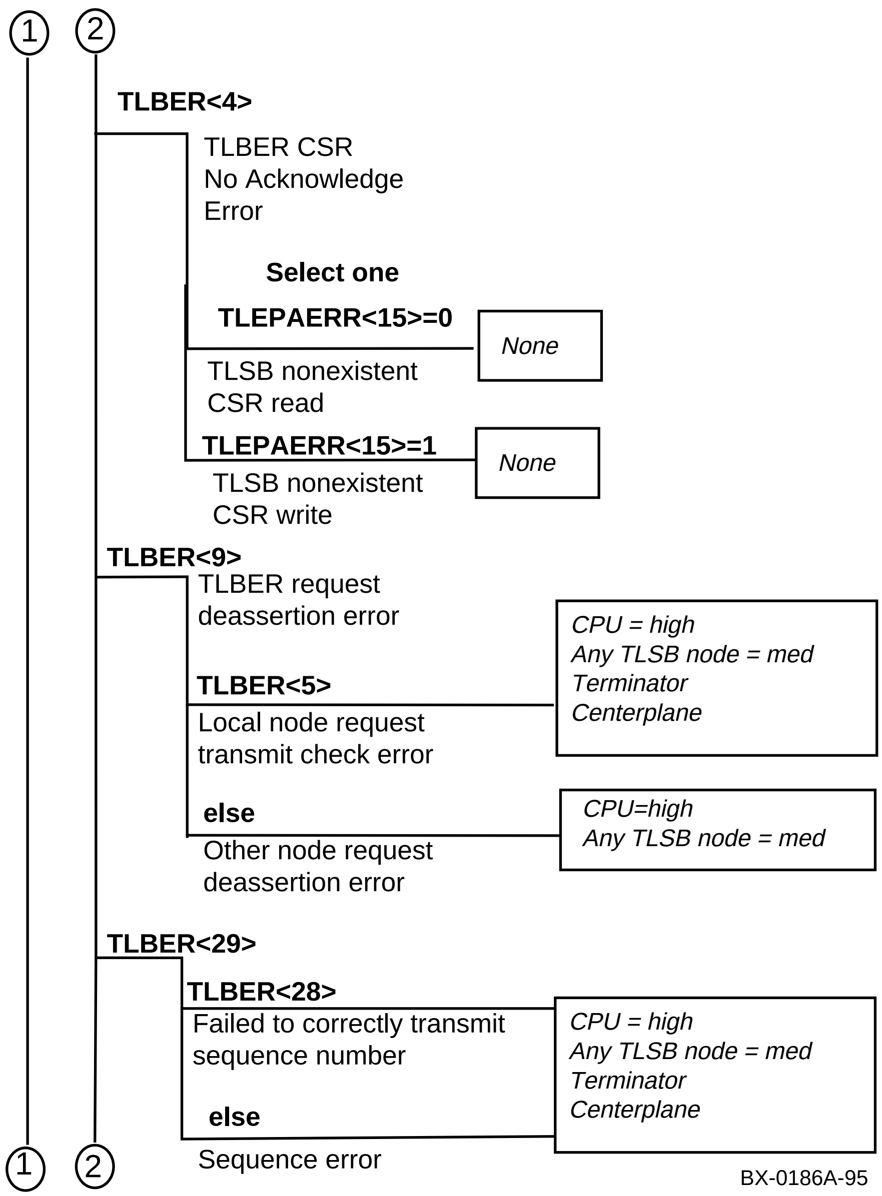


Figure 4–2 Machine Check 660 Error (Continued)

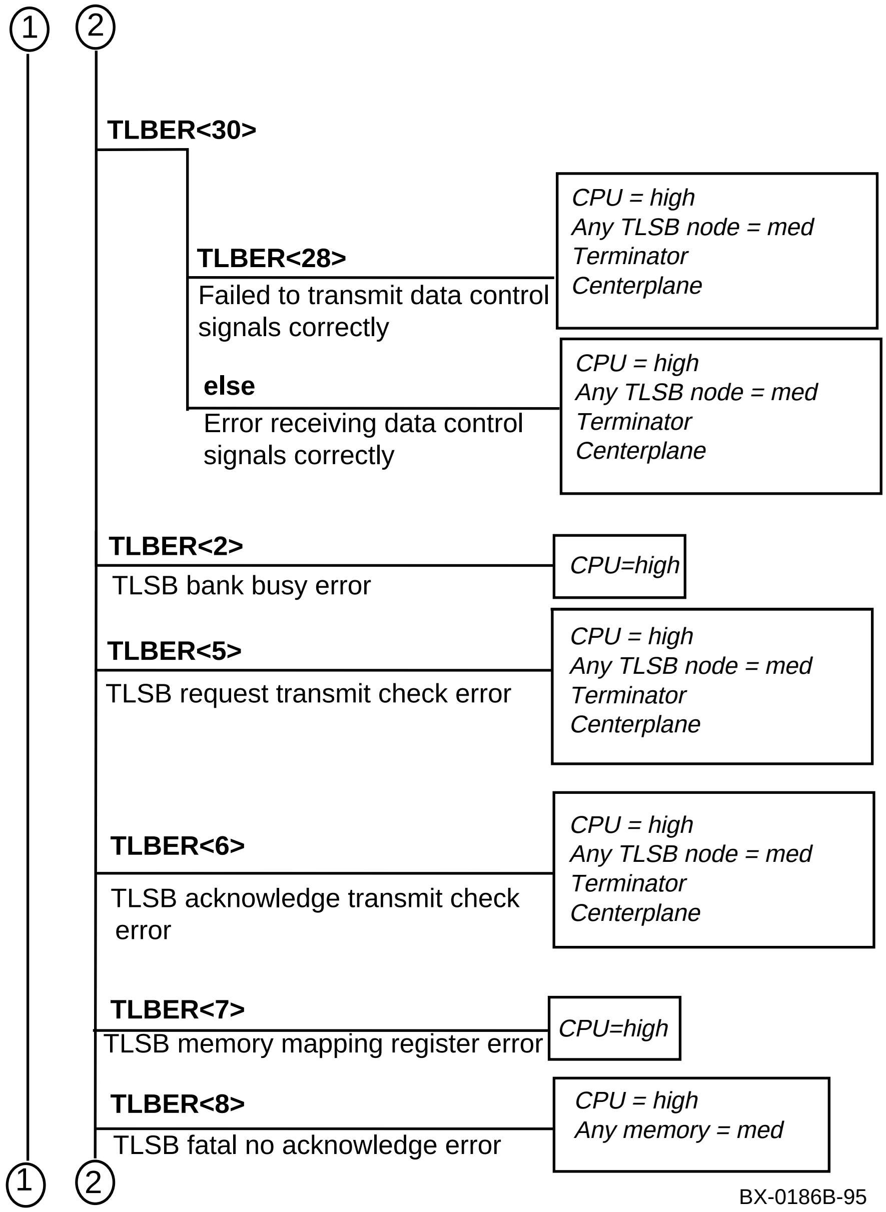


Figure 4–2 Machine Check 660 Error (Continued)

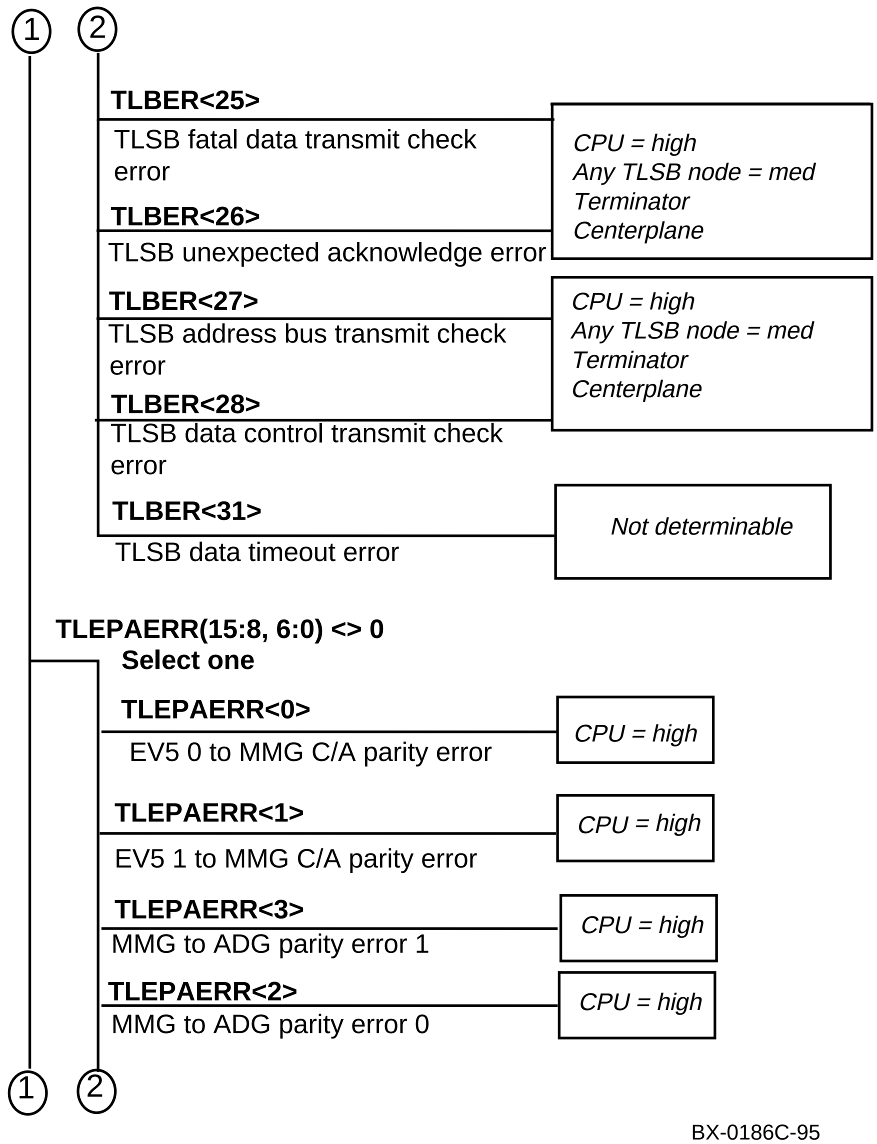


Figure 4–2 Machine Check 660 Error (Continued)

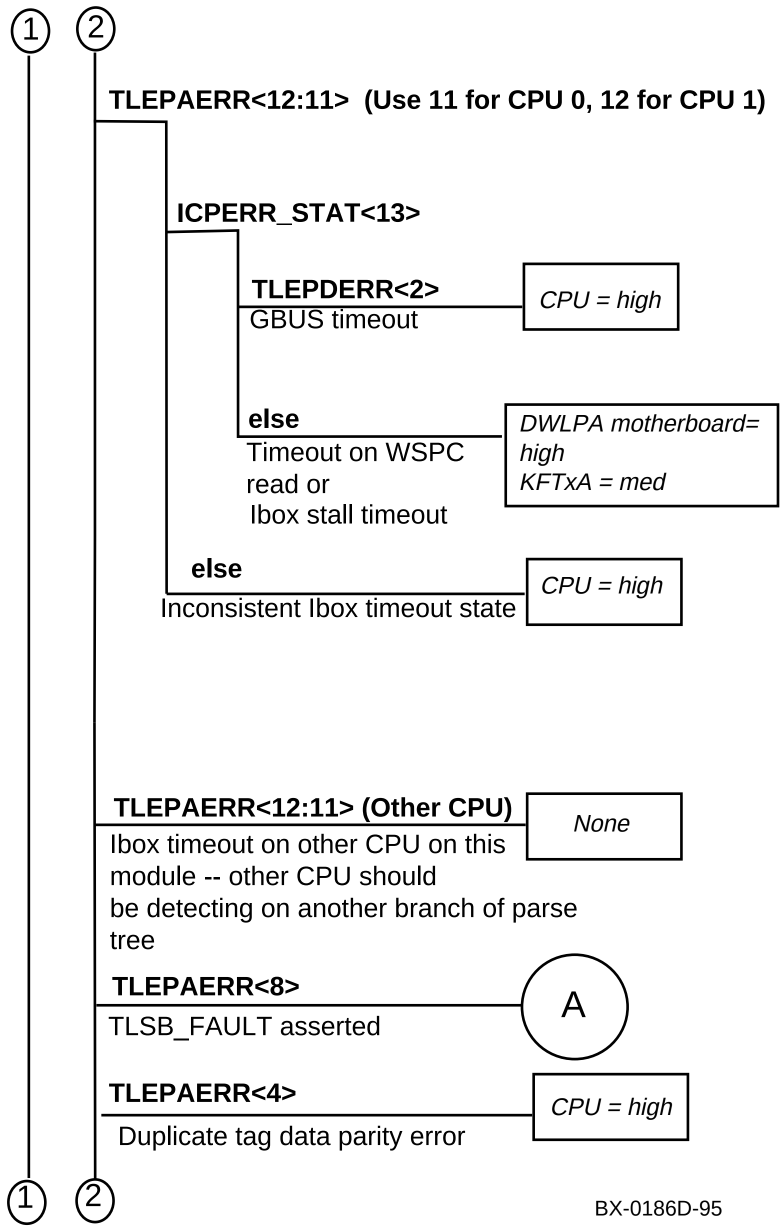


Figure 4–2 Machine Check 660 Error (Continued)

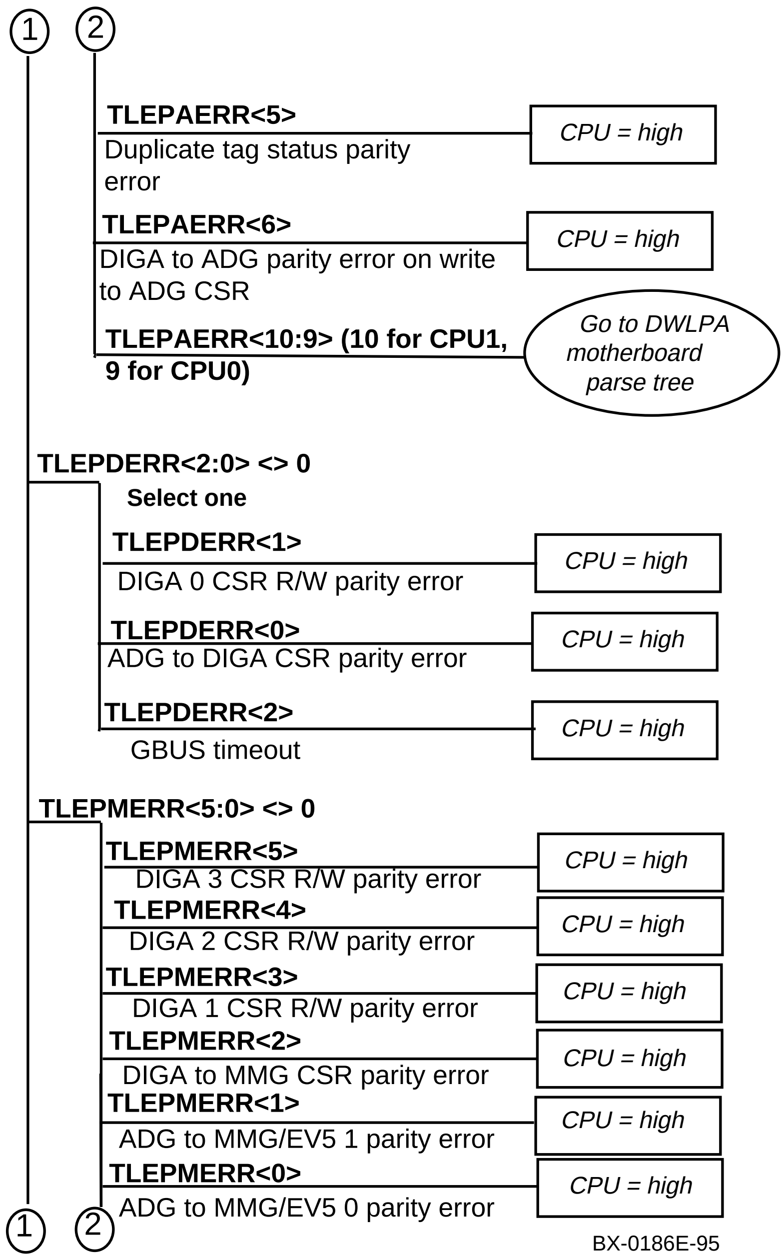


Figure 4–2 Machine Check 660 Error (Continued)

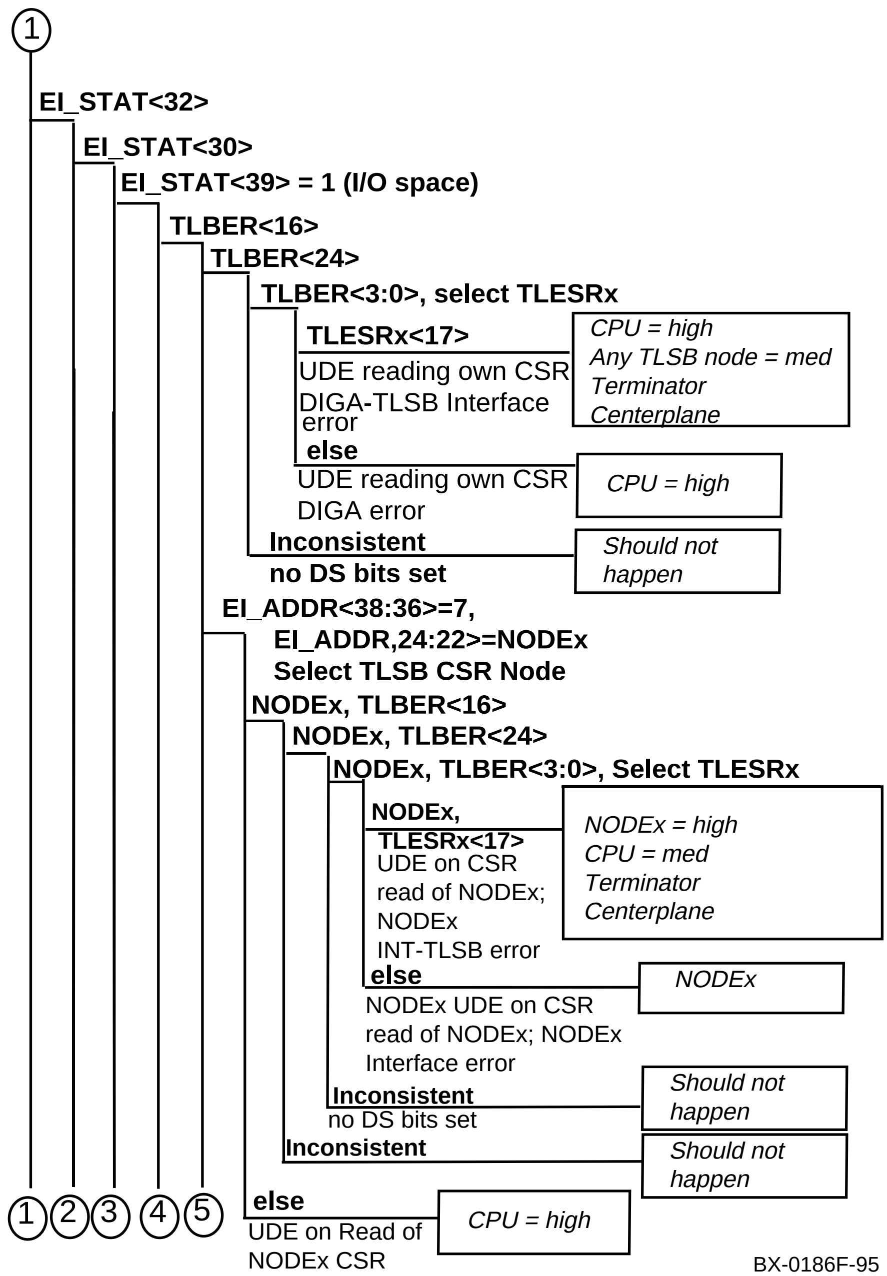


Figure 4–2 Machine Check 660 Error (Continued)

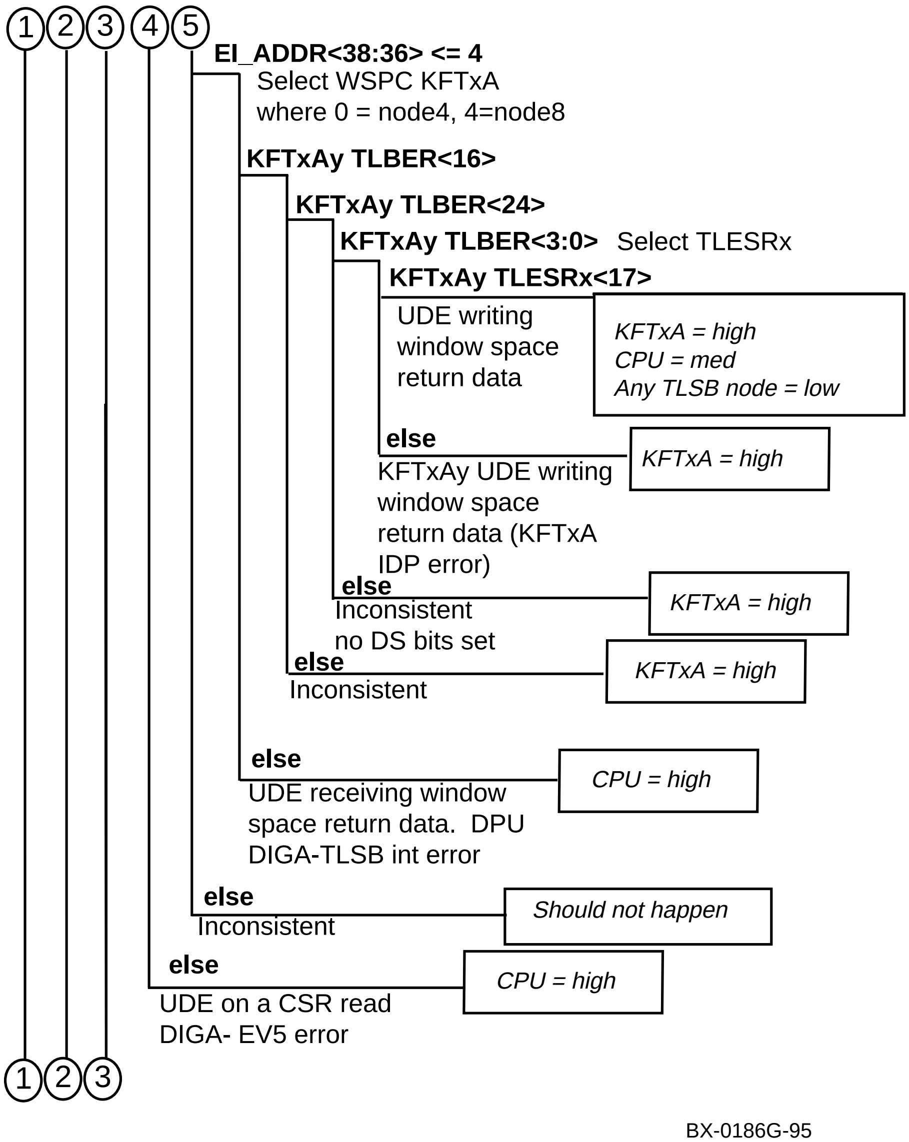


Figure 4–2 Machine Check 660 Error (Continued)

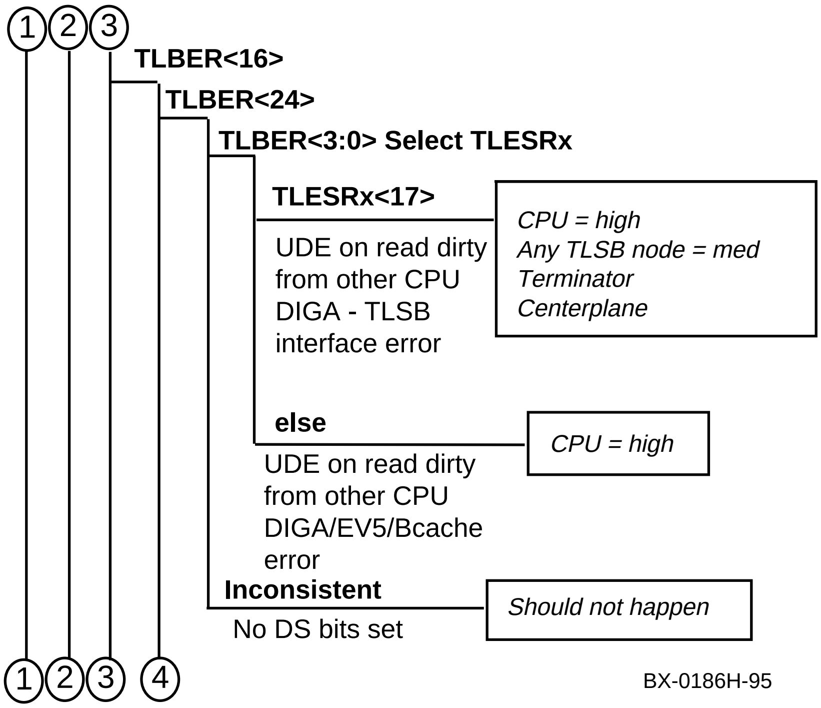


Figure 4–2 Machine Check 660 Error (Continued)

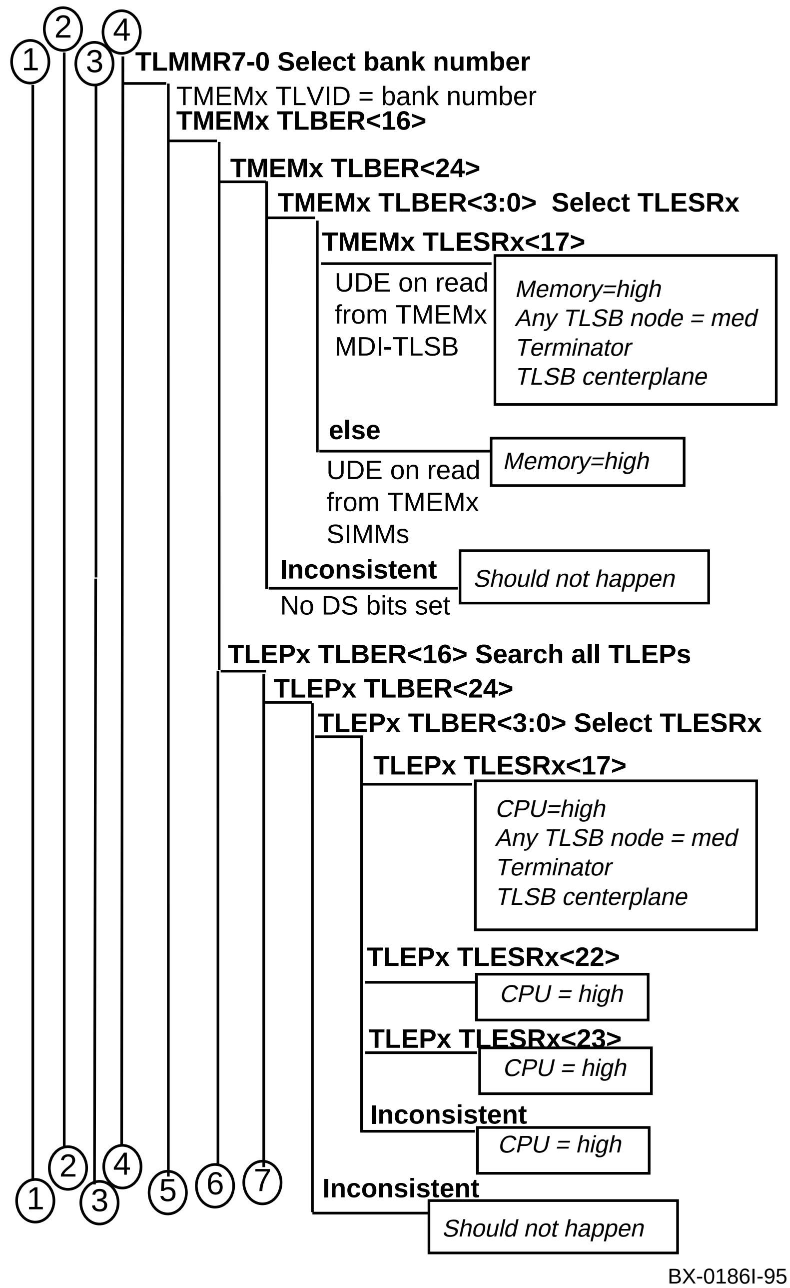


Figure 4–2 Machine Check 660 Error (Continued)

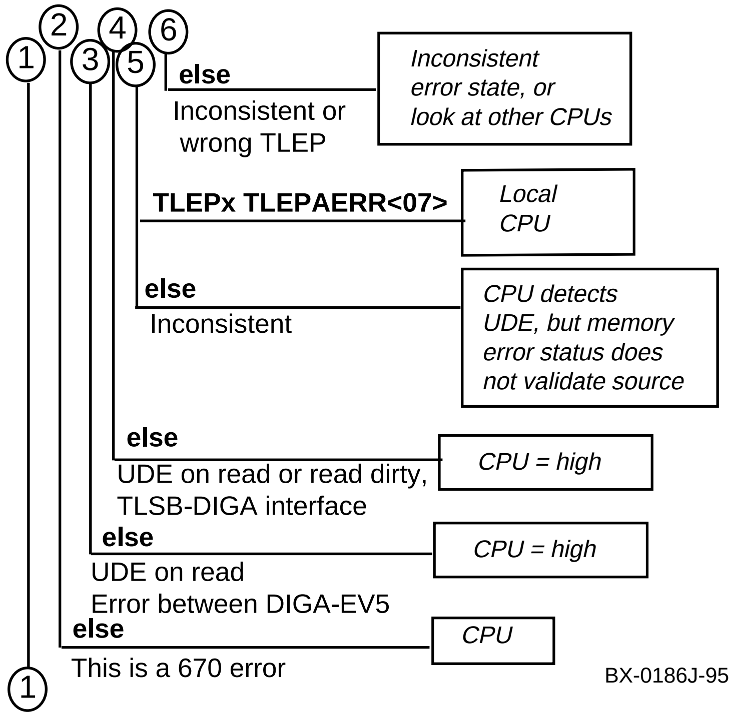


Figure 4–2 Machine Check 660 Error (Continued)

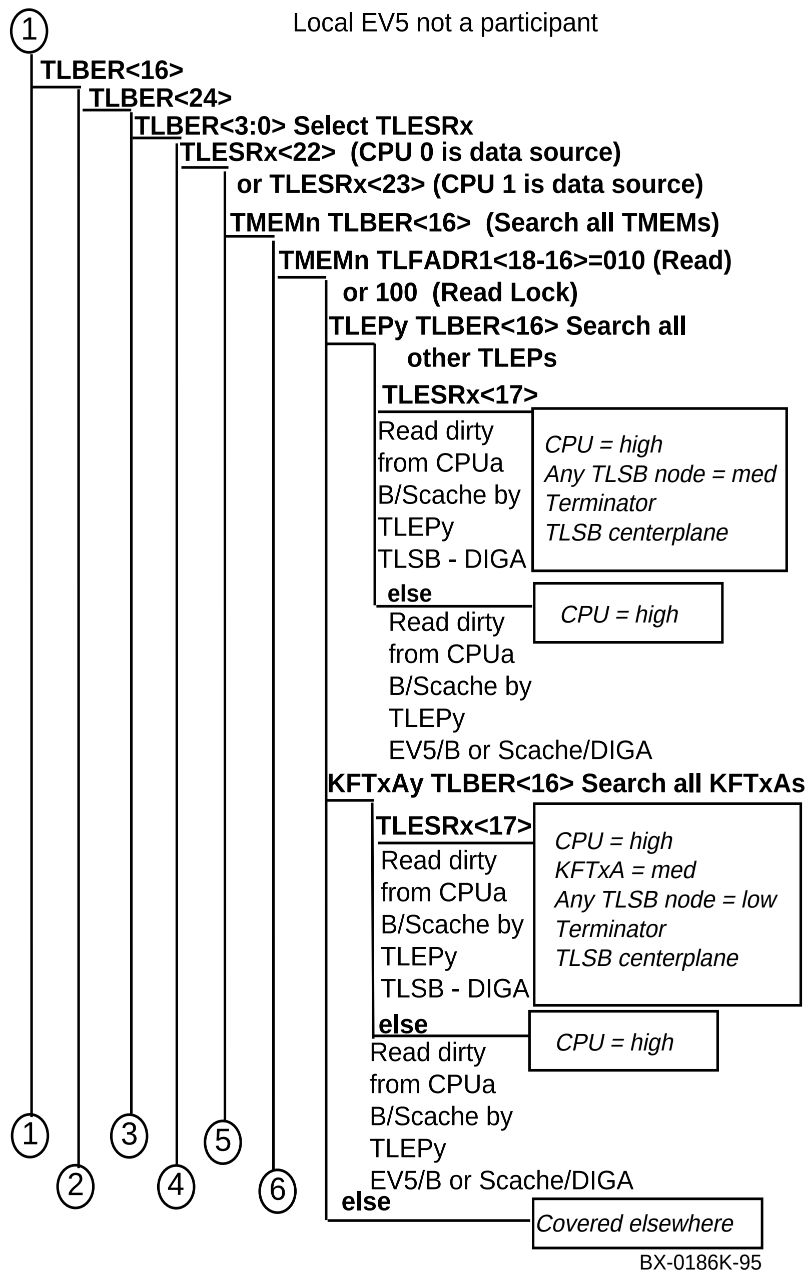


Figure 4–2 Machine Check 660 Error (Continued)

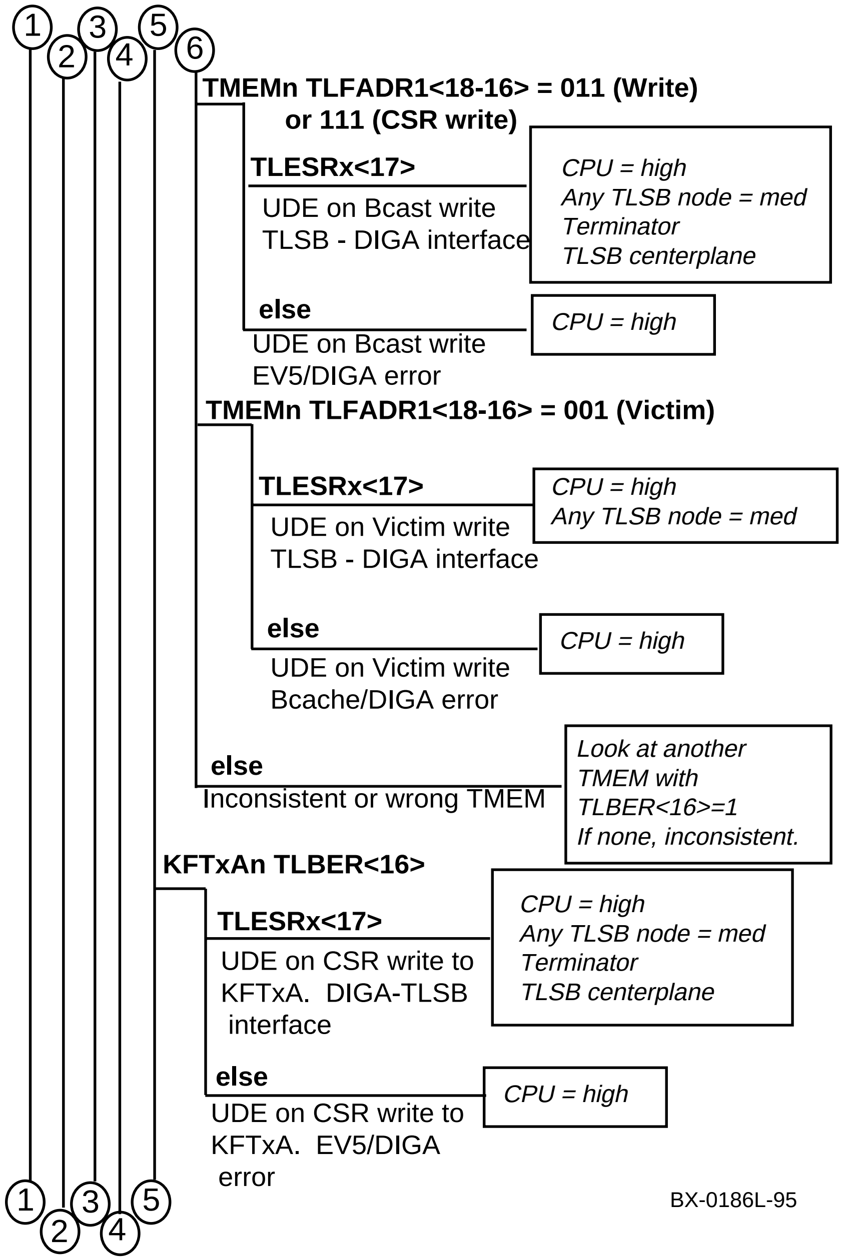


Figure 4–2 Machine Check 660 Error (Continued)

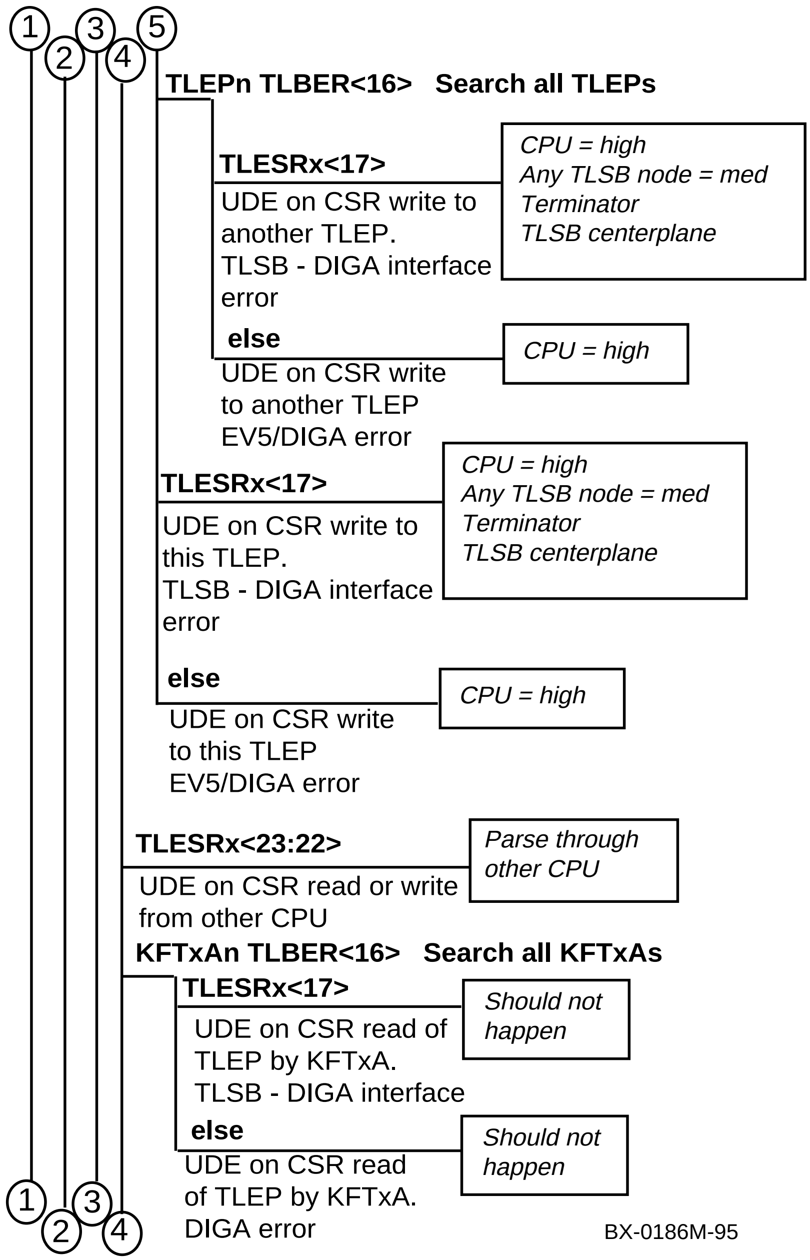


Figure 4–2 Machine Check 660 Error (Continued)

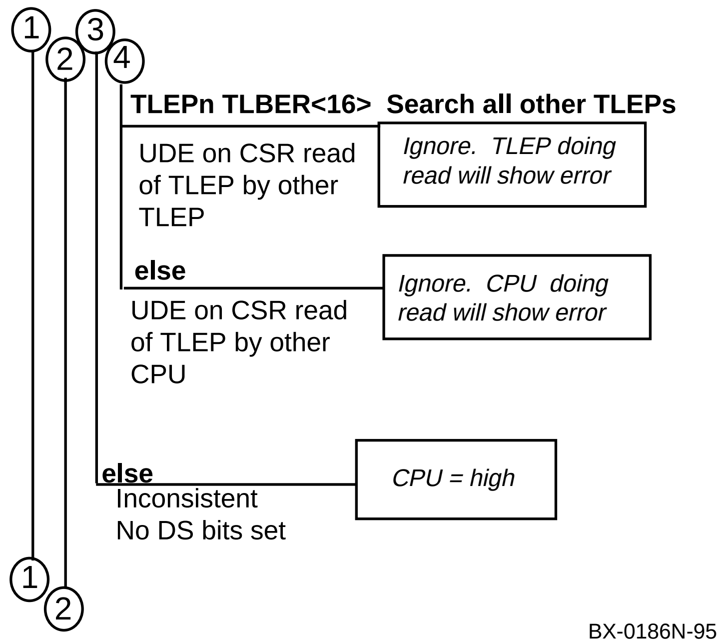


Figure 4–2 Machine Check 660 Error (Continued)

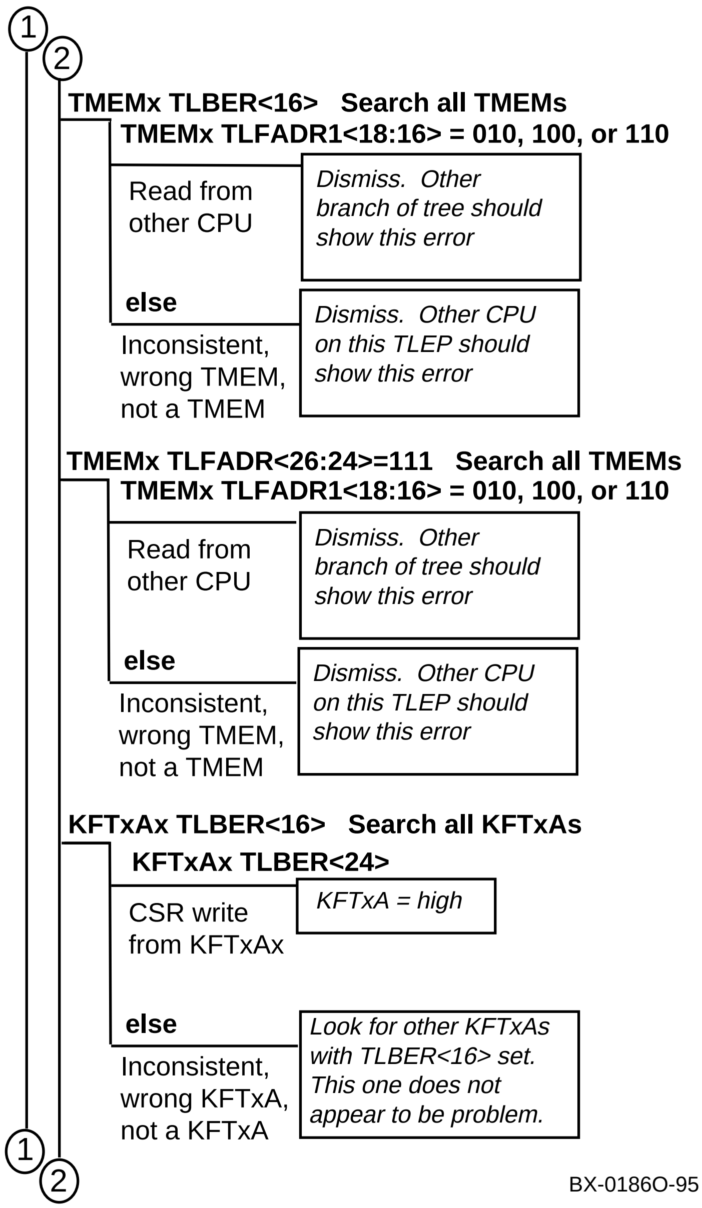


Figure 4–2 Machine Check 660 Error (Continued)

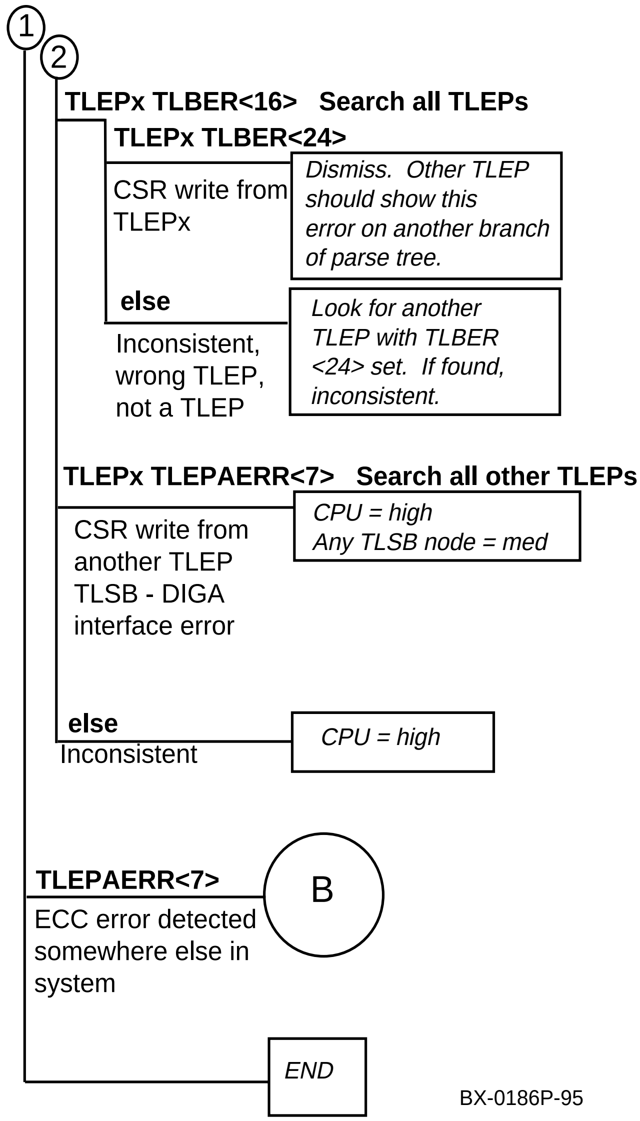


Figure 4–2 Machine Check 660 Error (Continued)

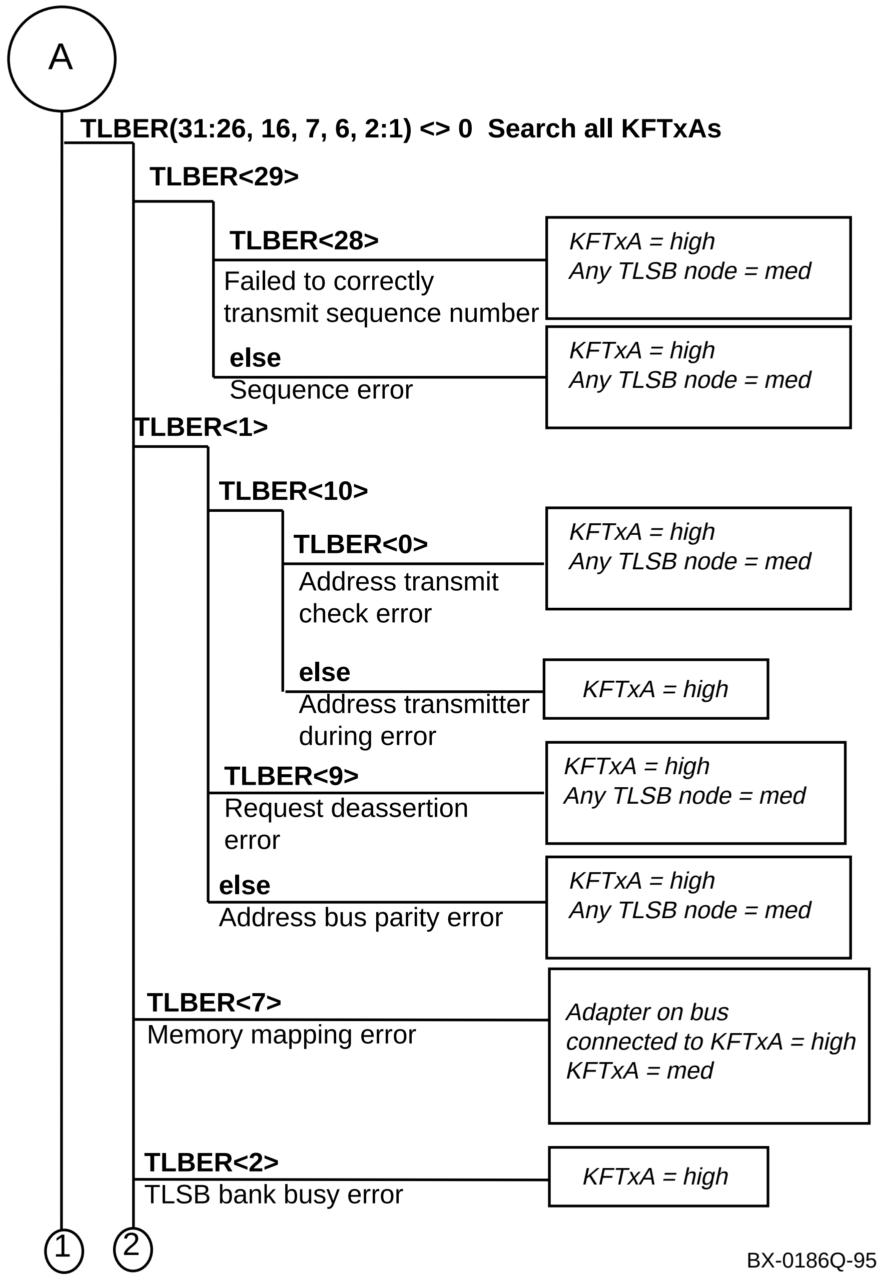


Figure 4–2 Machine Check 660 Error (Continued)

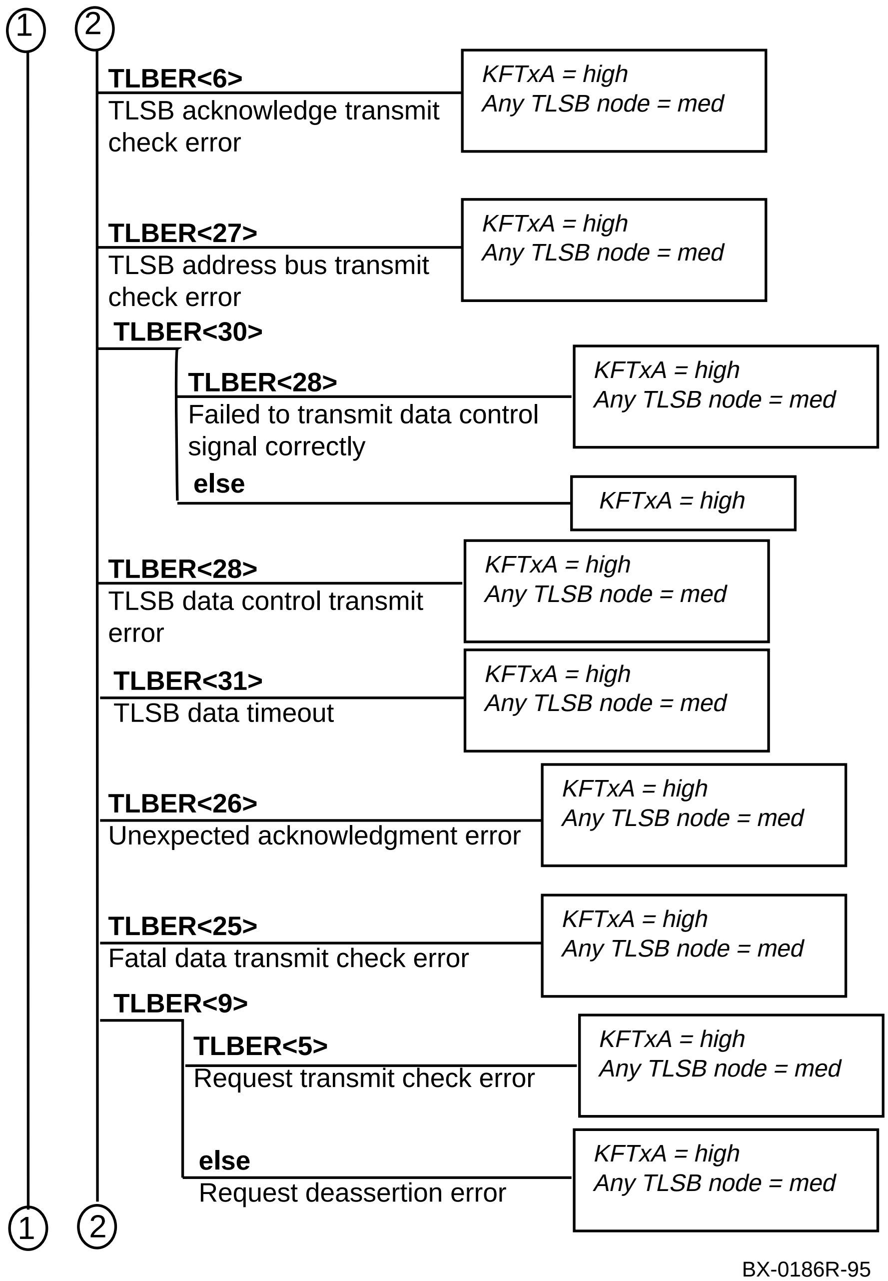


Figure 4–2 Machine Check 660 Error (Continued)

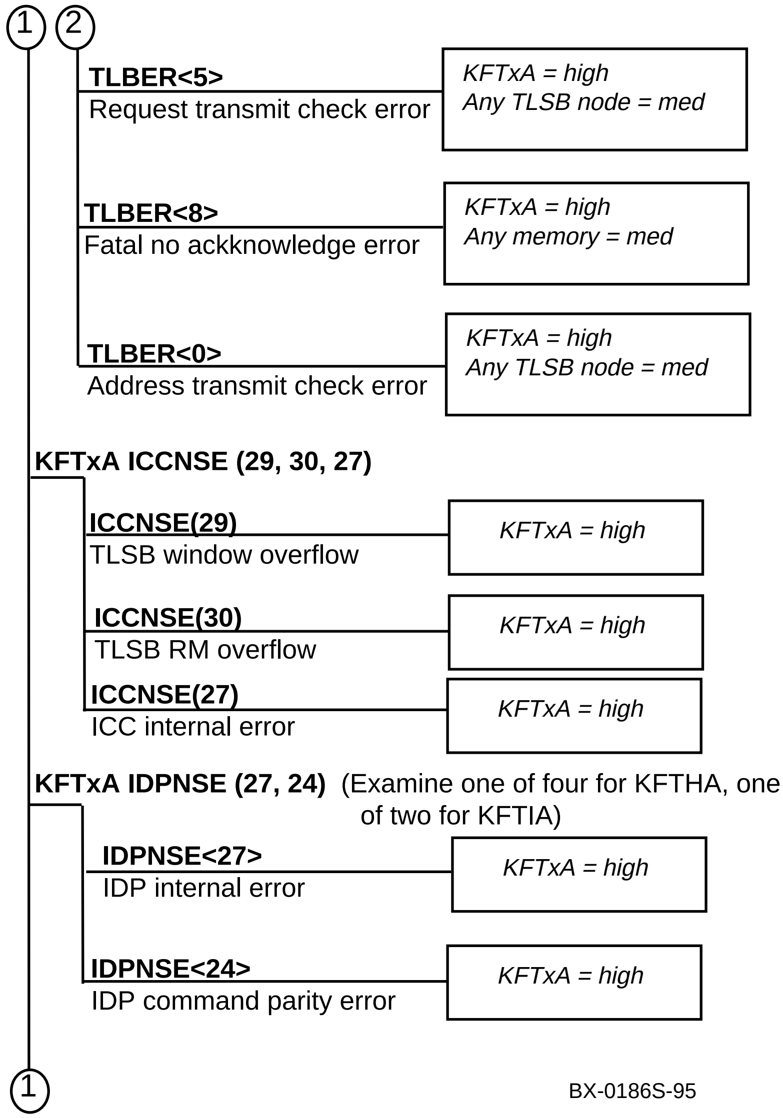


Figure 4–2 Machine Check 660 Error (Continued)

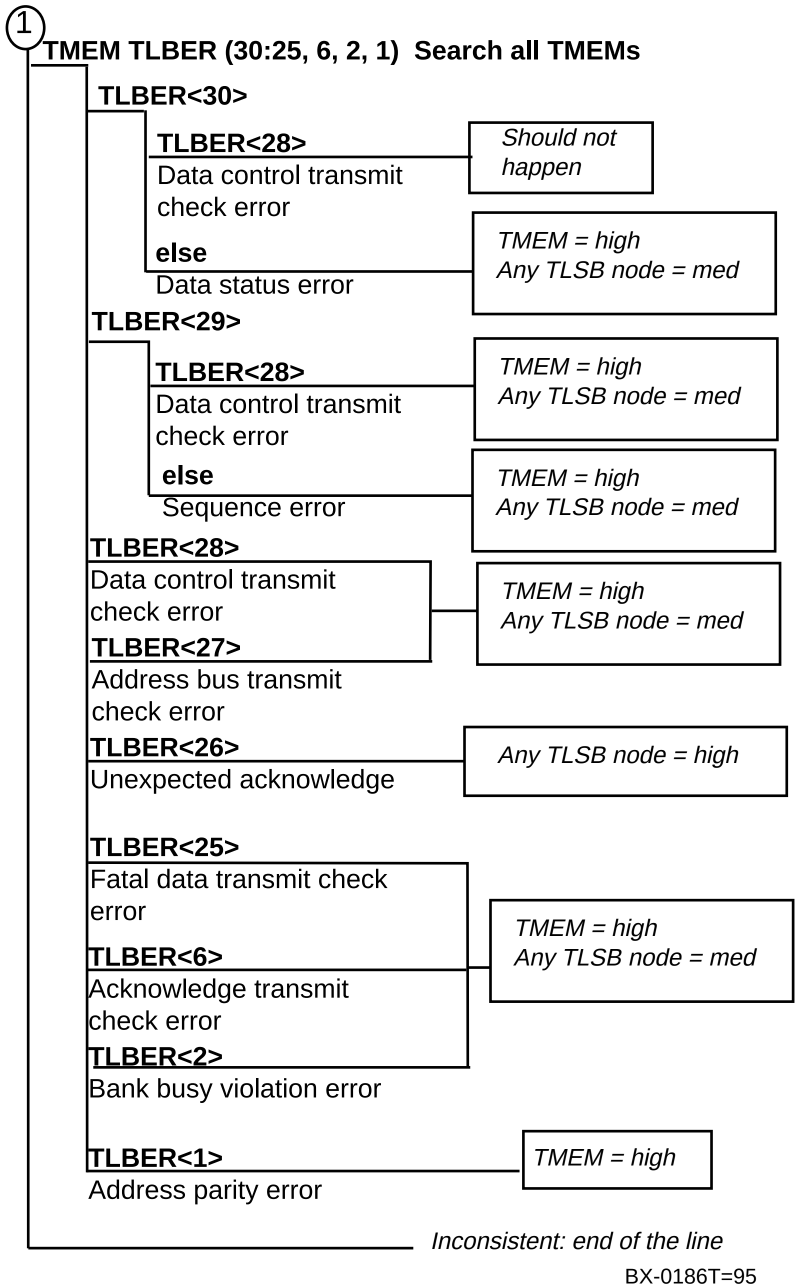


Figure 4–2 Machine Check 660 Error (Continued)

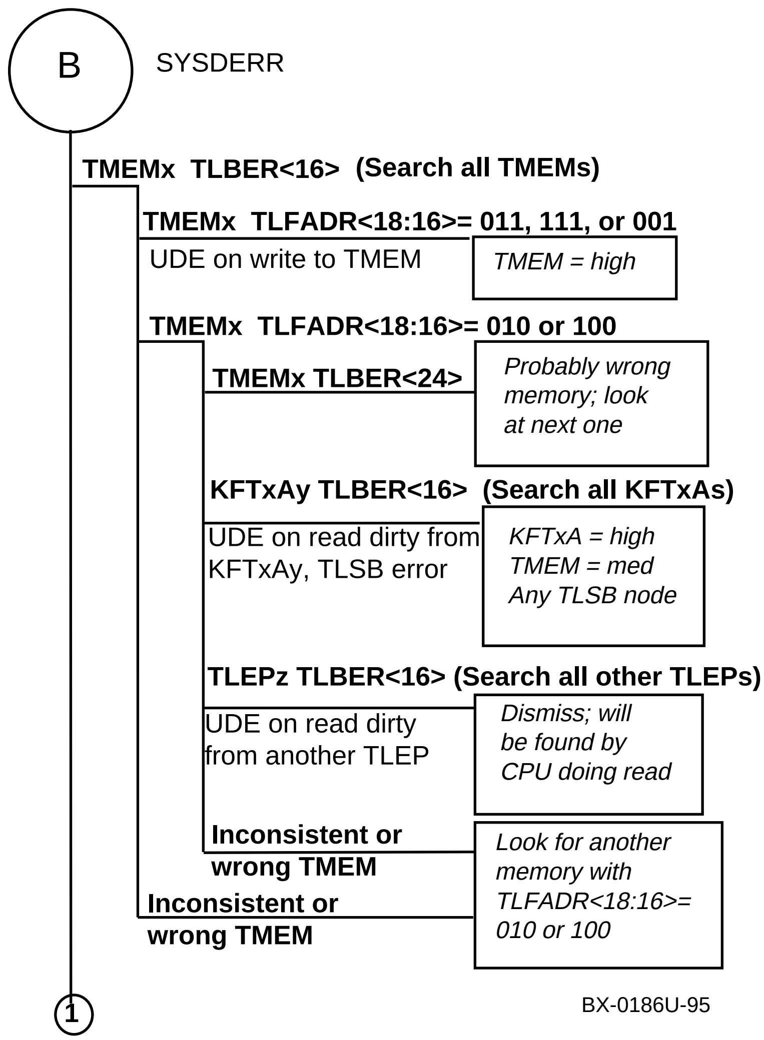


Figure 4–2 Machine Check 660 Error (Continued)

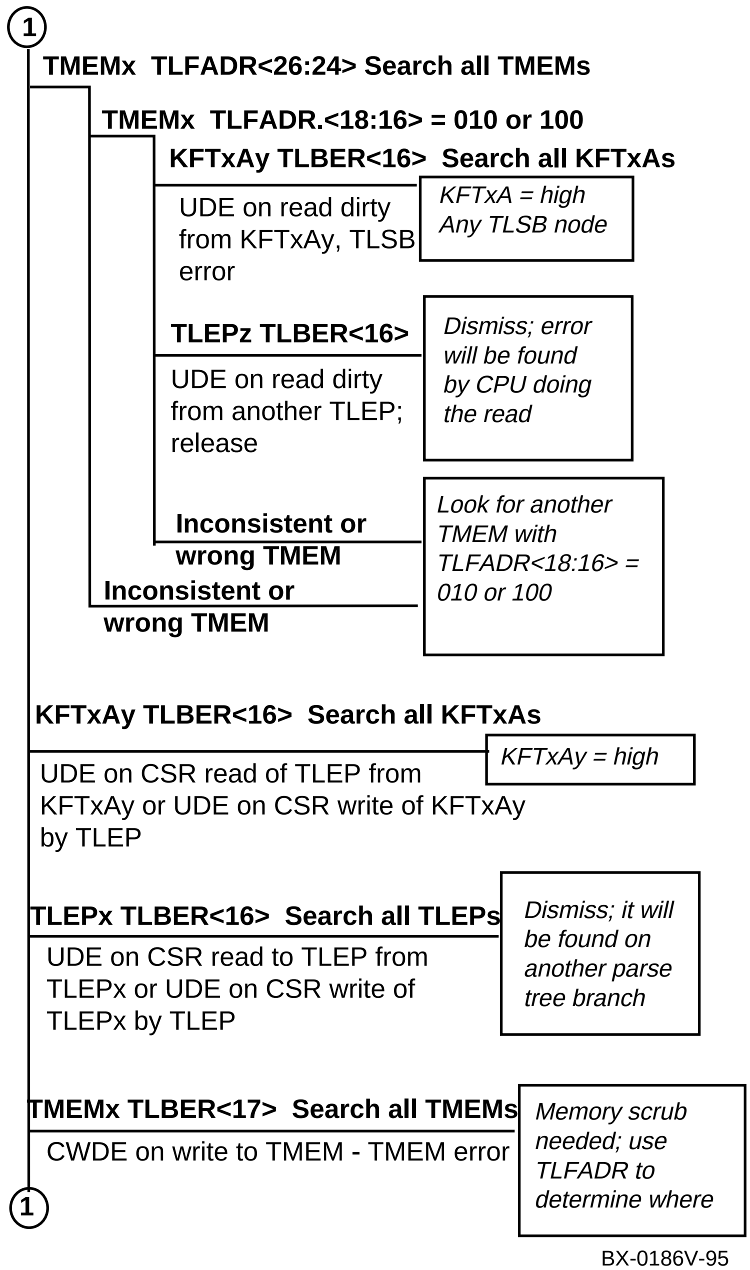


Figure 4–2 Machine Check 660 Error (Continued)

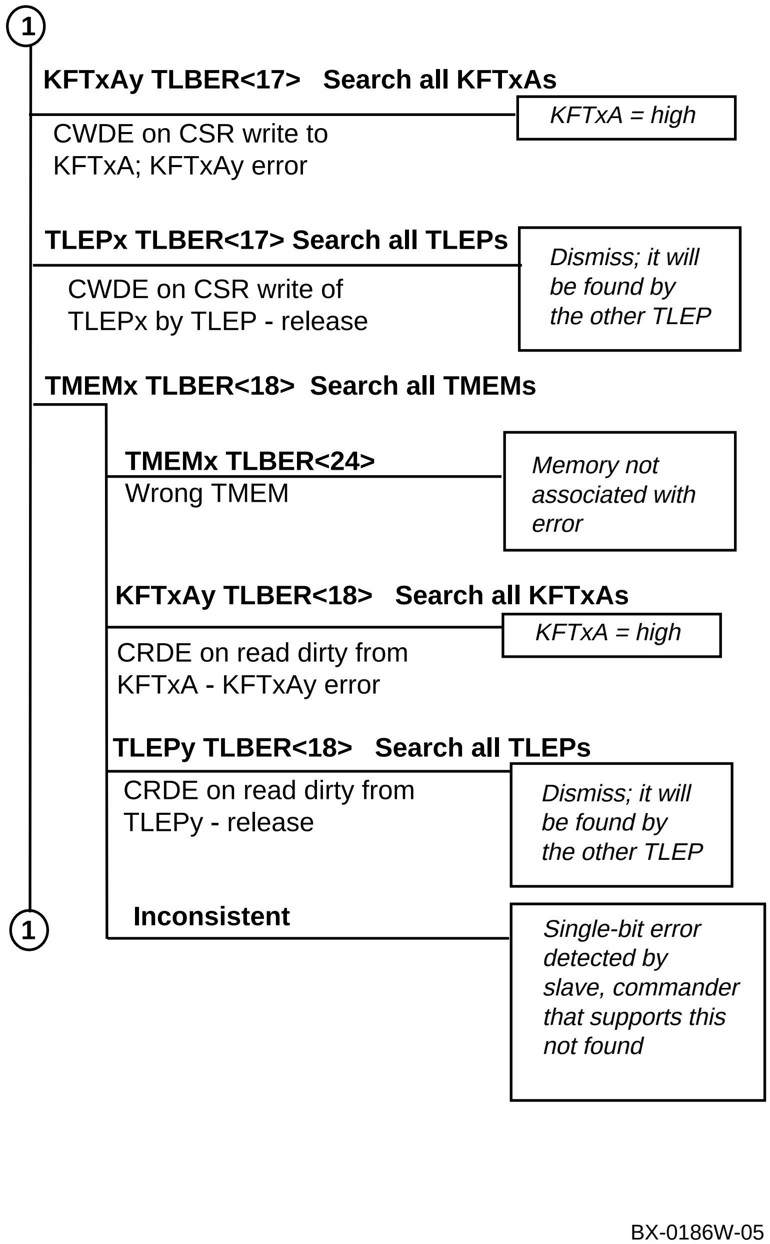


Figure 4–2 Machine Check 660 Error (Continued)

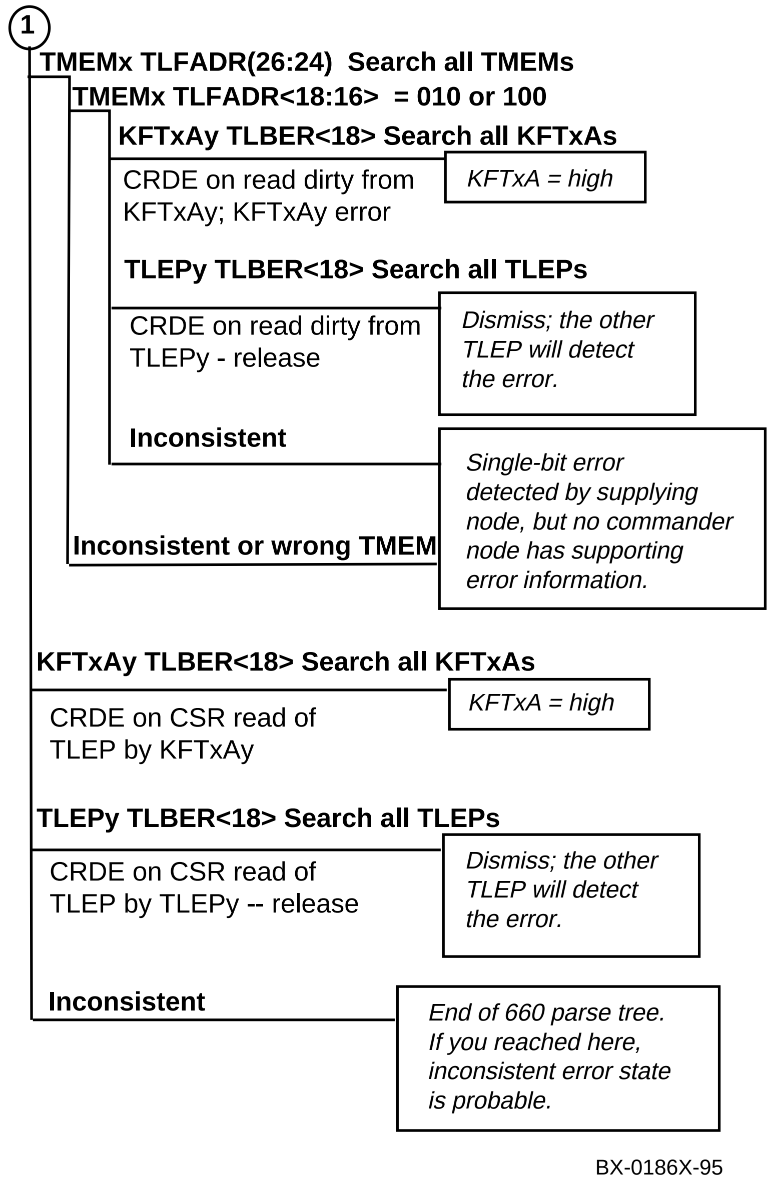


Figure 4–2 Machine Check 660 Error (Continued)

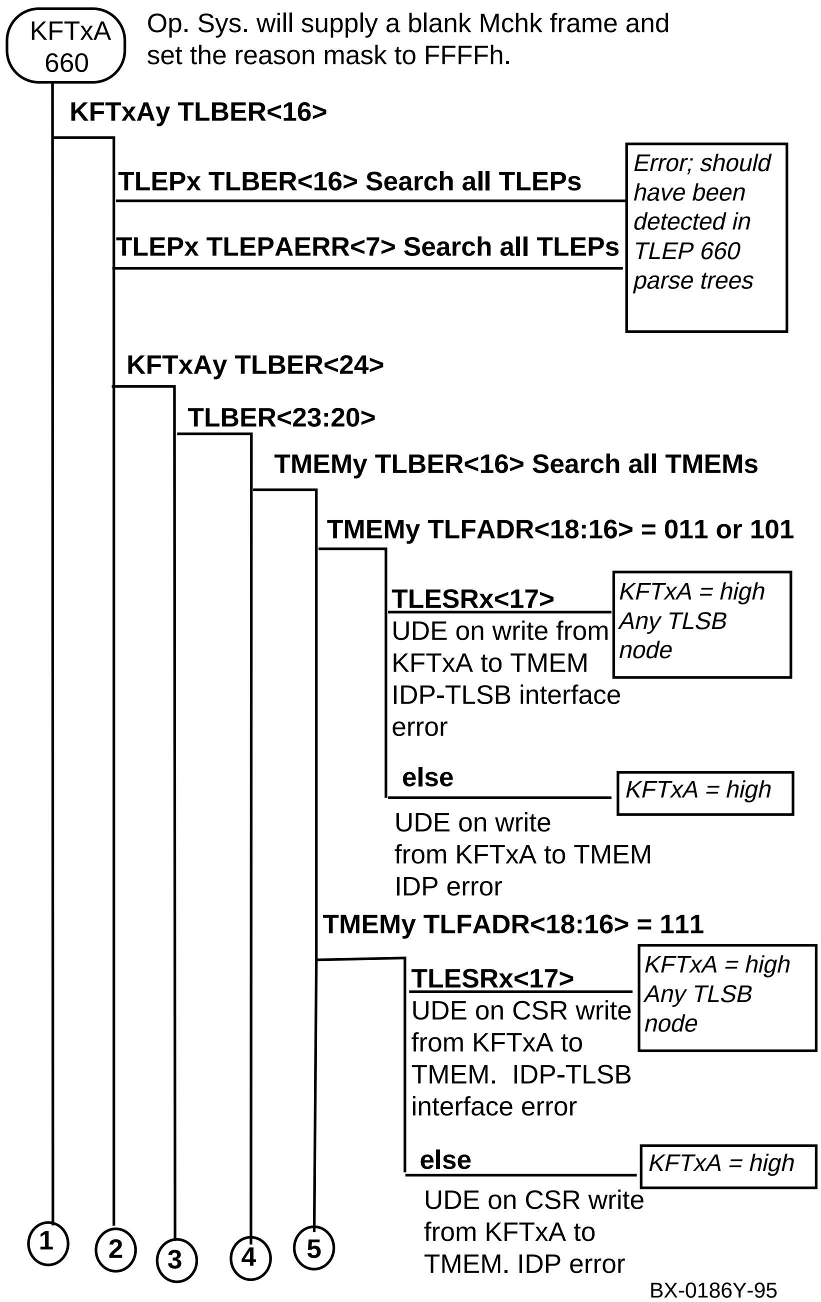
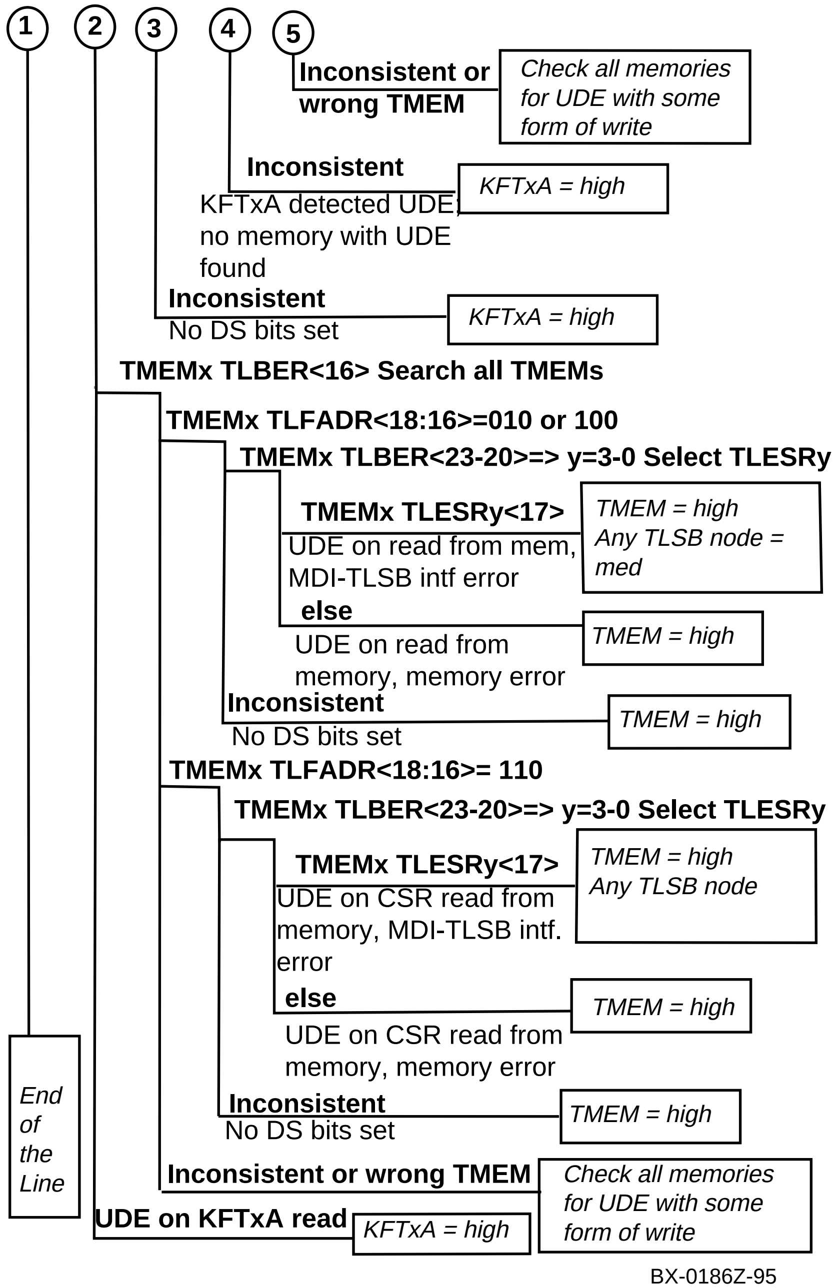


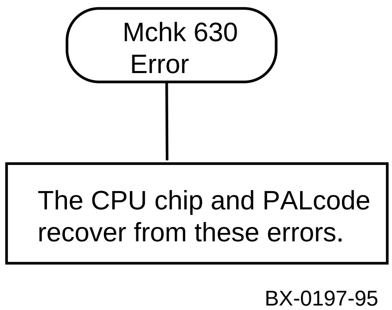
Figure 4–2 Machine Check 660 Error (Continued)



4.6.3 Machine Check 630 Error

Machine check 630 errors are soft errors; all are ECC errors in the B-cache on the chip. All other ECC errors are reported in 620 error entries.

Figure 4–3 Machine Check 630 Errors



4.6.4 Machine Check 620 Error

Machine check 620 errors are all ECC errors outside the CPU chip or B-cache.

Figure 4–4 Machine Check 620 Error

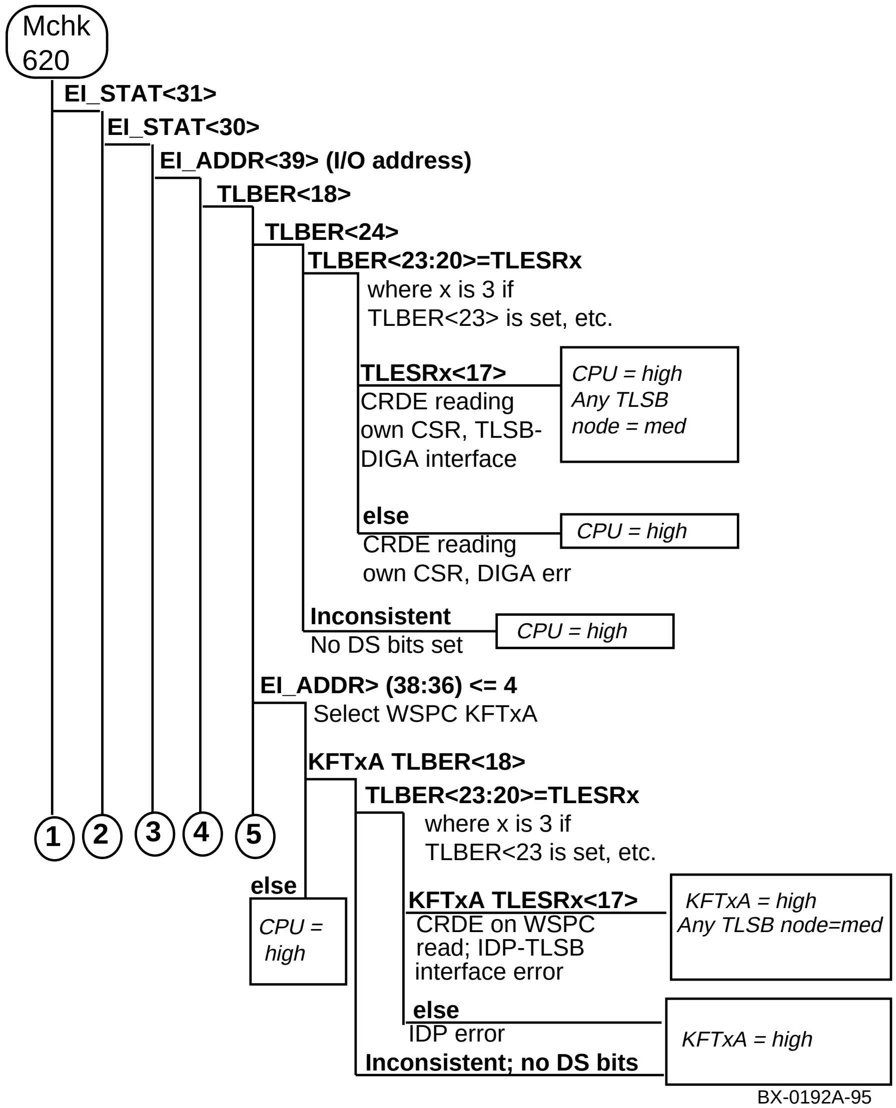


Figure 4–4 Machine Check 620 Error (Continued)

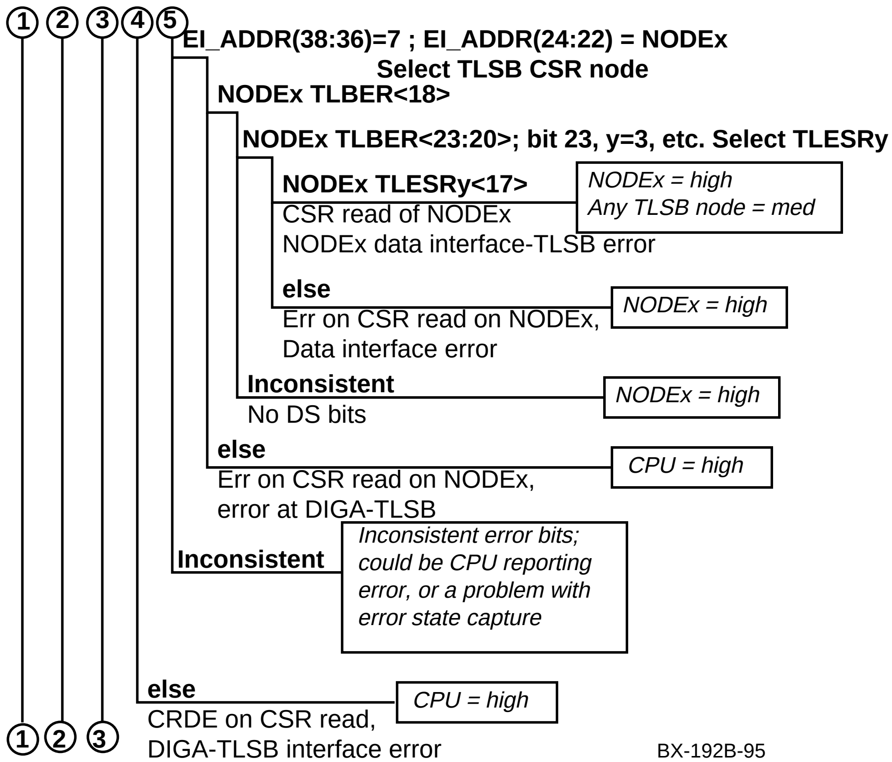


Figure 4–4 Machine Check 620 Error (Continued)

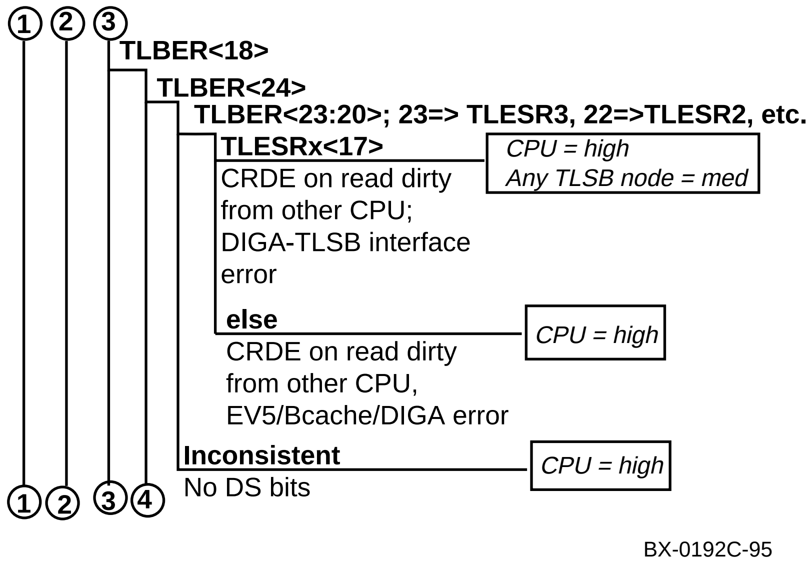


Figure 4–4 Machine Check 620 Error (Continued)

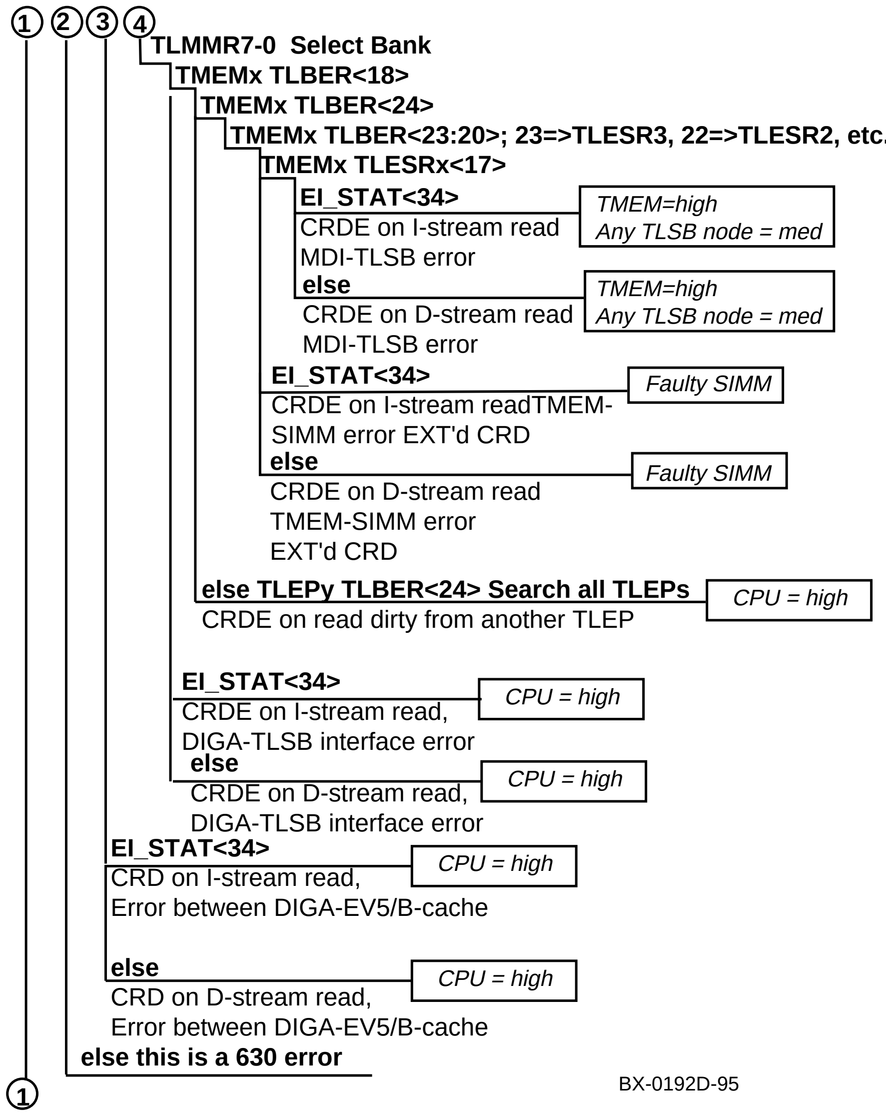


Figure 4–4 Machine Check 620 Error (Continued)

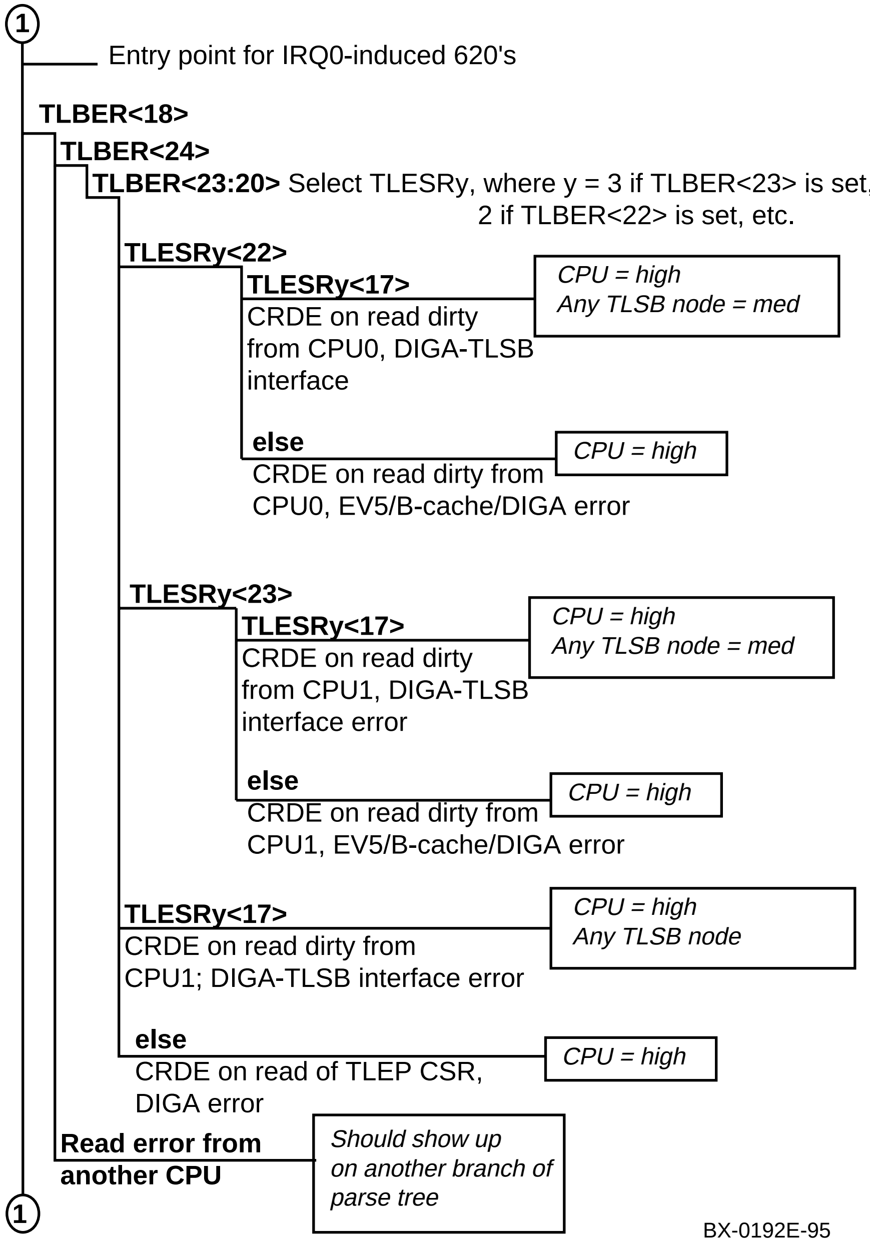


Figure 4–4 Machine Check 620 Error (Continued)

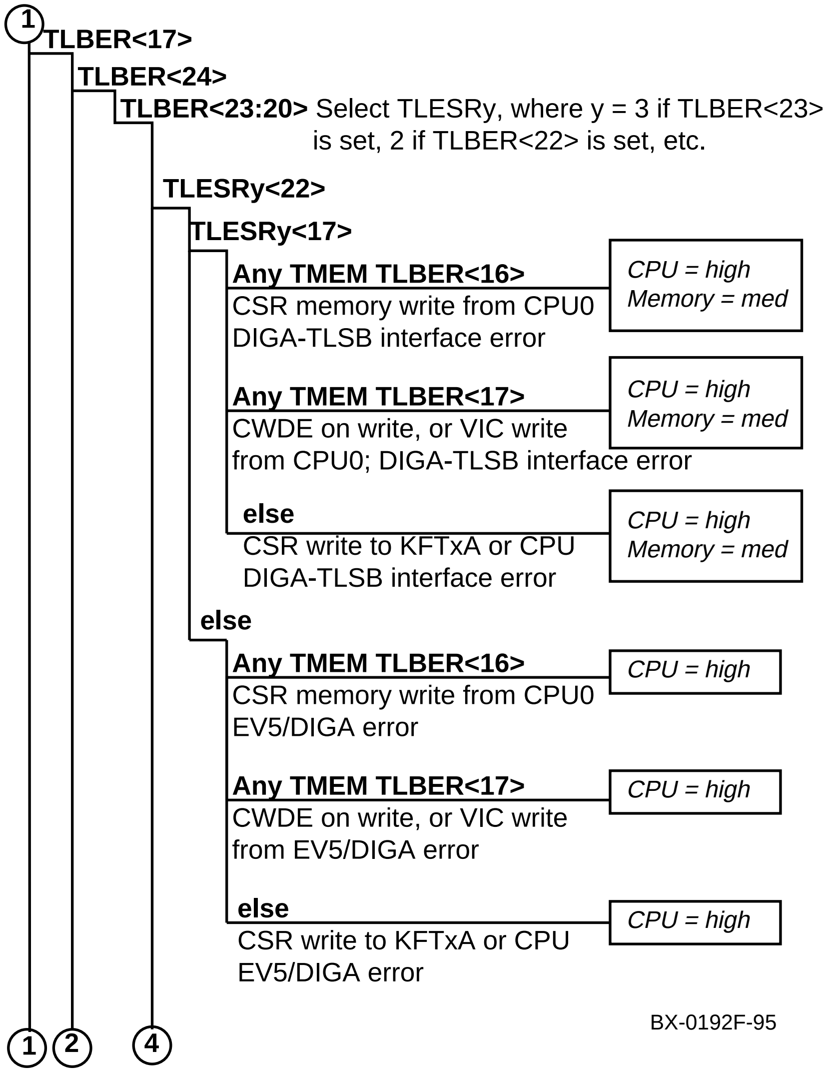


Figure 4–4 Machine Check 620 Error (Continued)

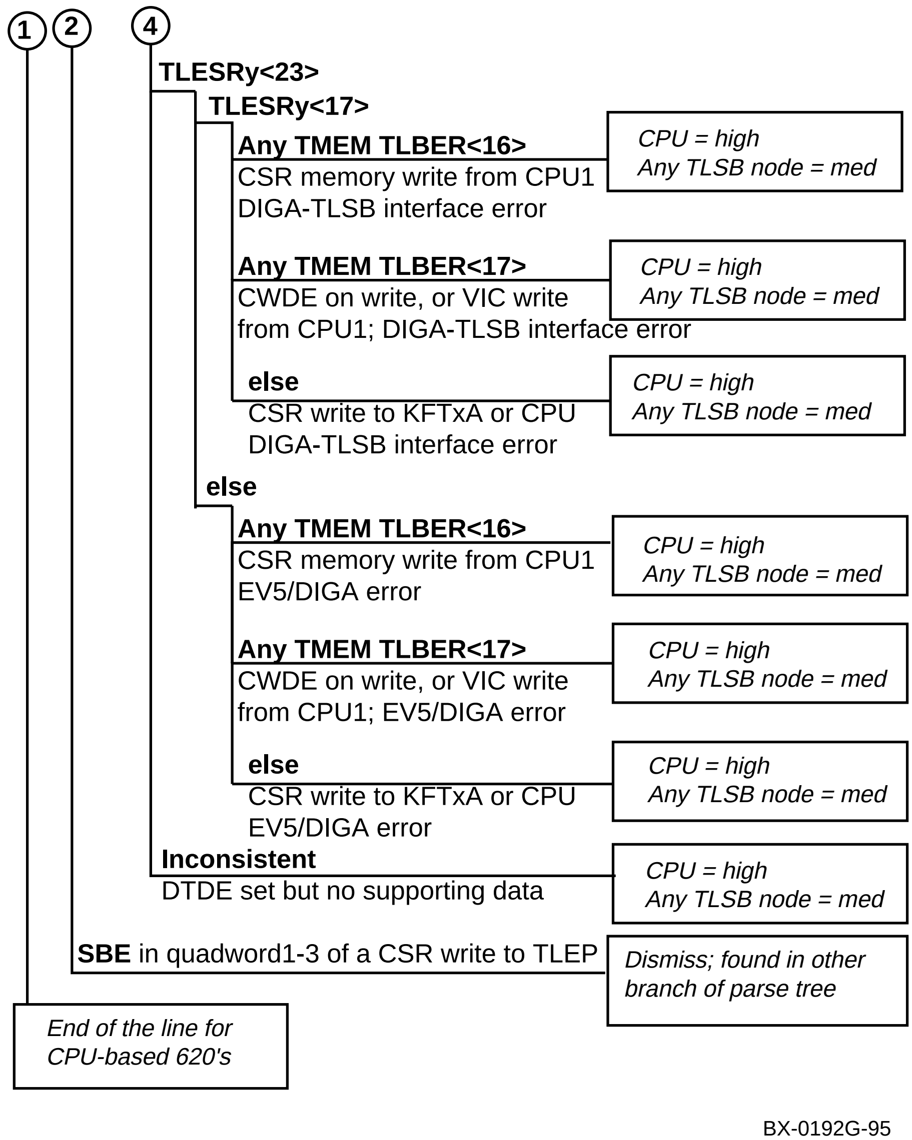


Figure 4–4 Machine Check 620 Error (Continued)

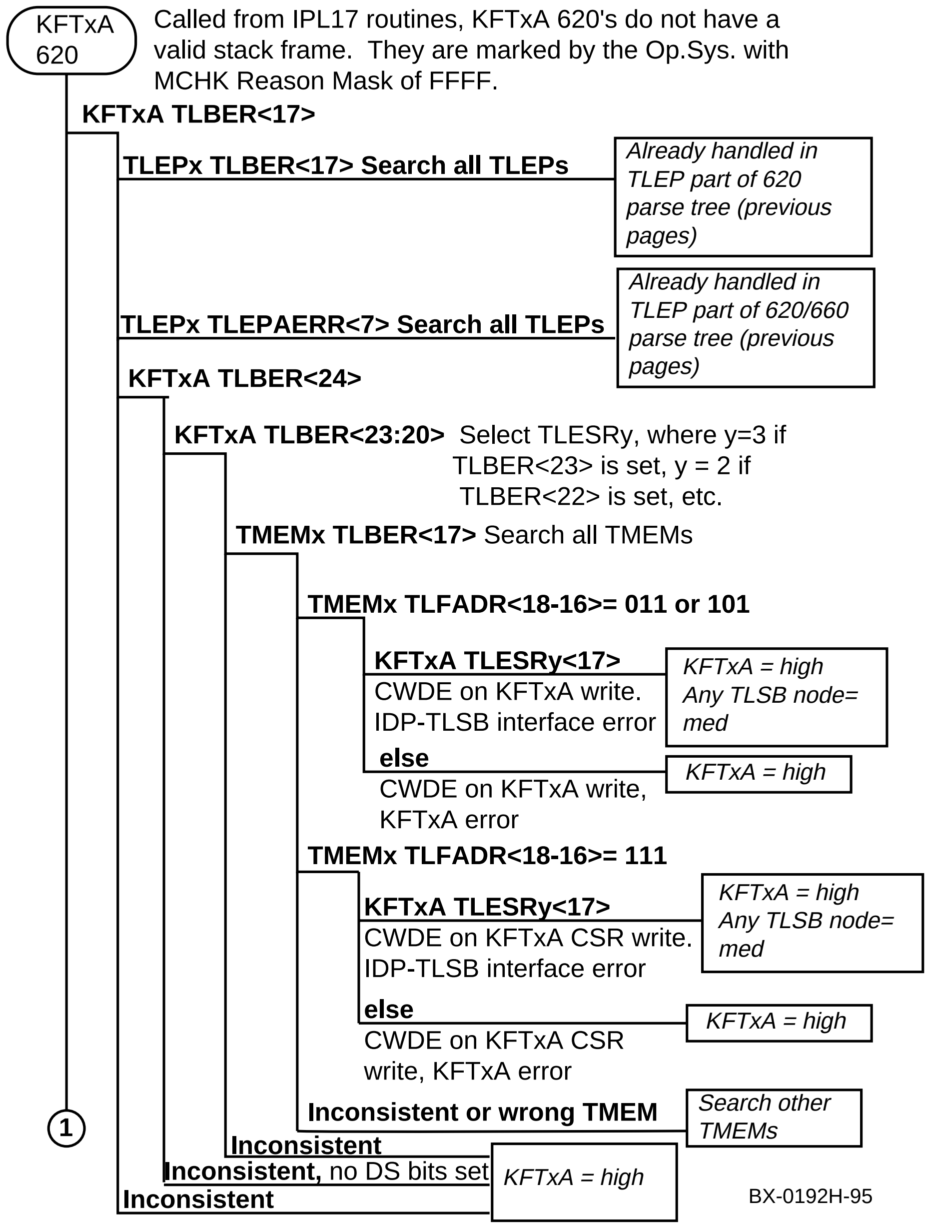
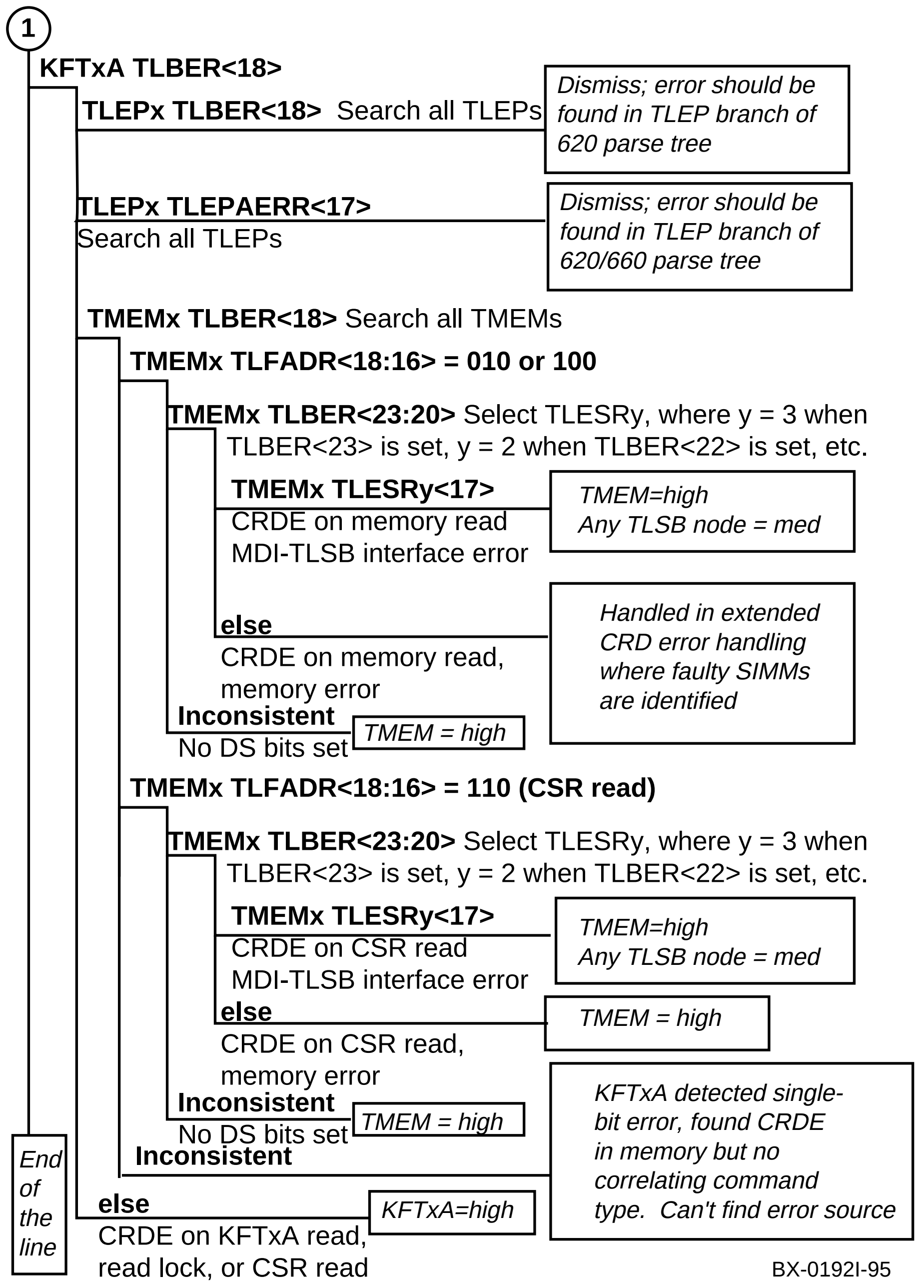


Figure 4–4 Machine Check 620 Error (Continued)



BX-0192I-95

4.6.5 Adapter Parse Trees

I/O bus adapters have their own error registers and corresponding parse trees.

Figure 4–5 KFTxA Error Parse Tree

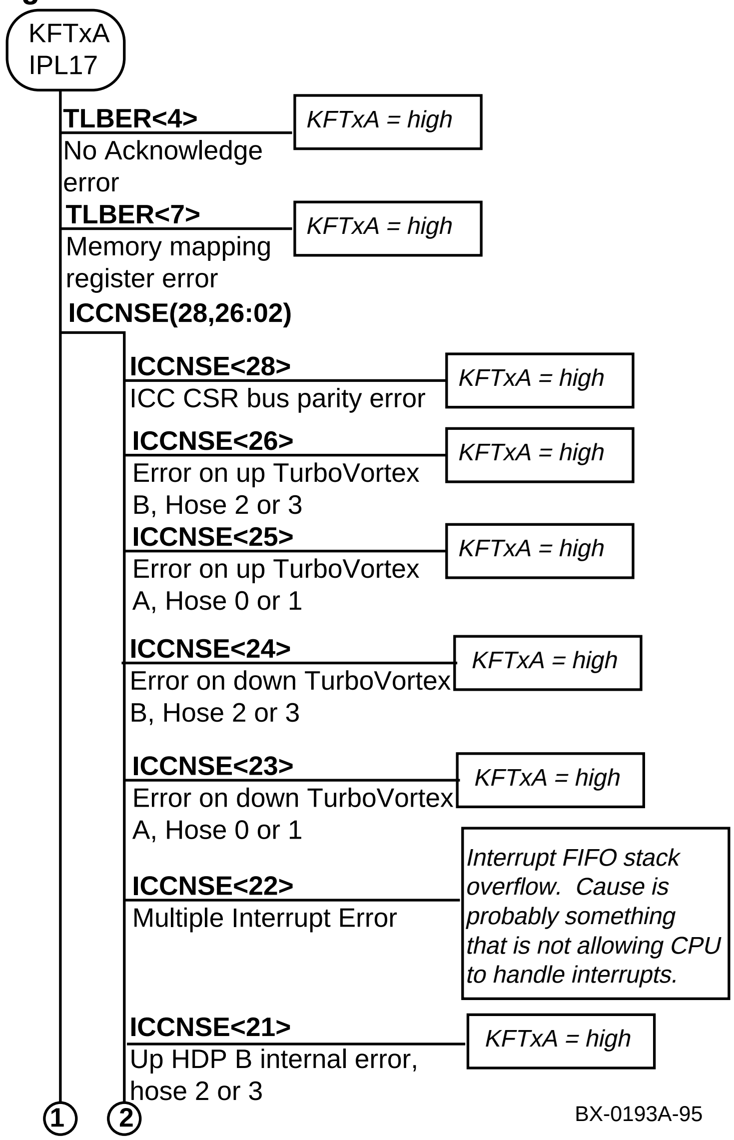


Figure 4–5 KFTxA Error Parse Tree (Continued)

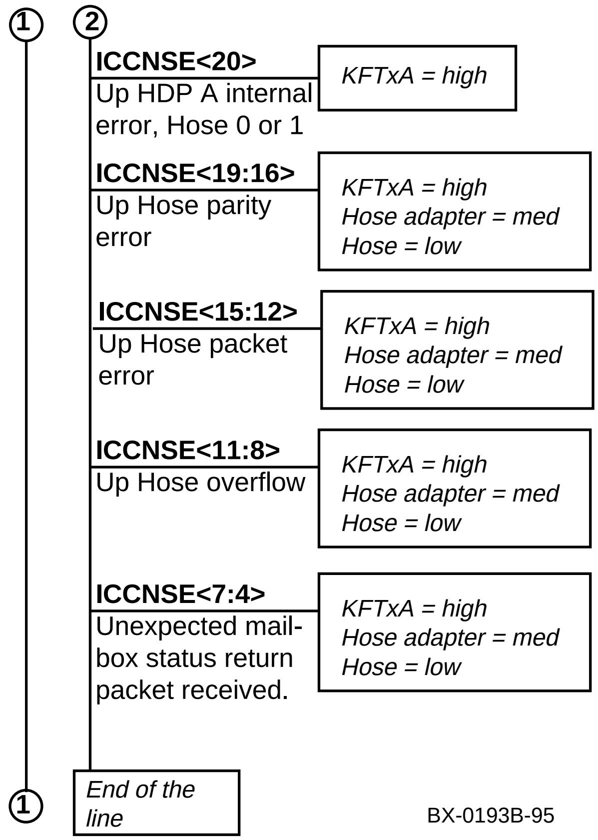


Figure 4–5 KFTxA Error Parse Tree (Continued)

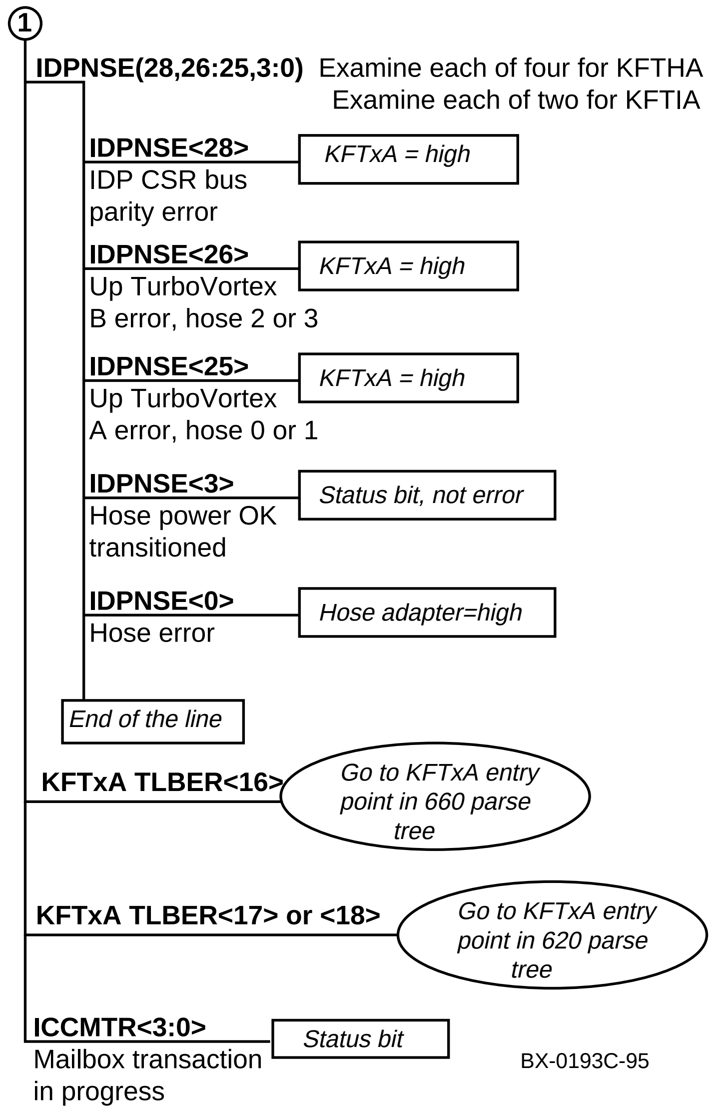


Figure 4–6 DWLPA Error Parse Tree

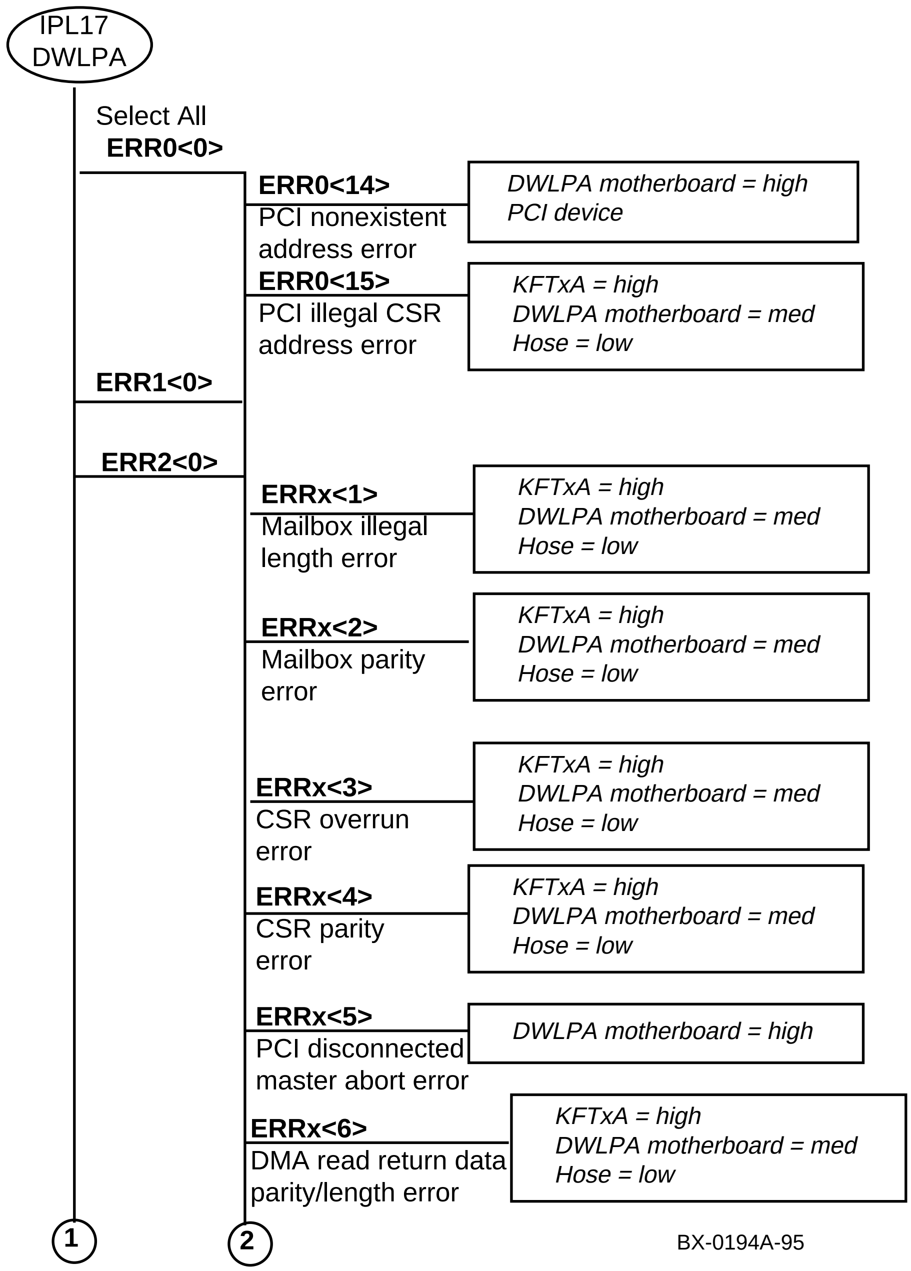


Figure 4–6 DWLPA Error Parse Trees (Continued)

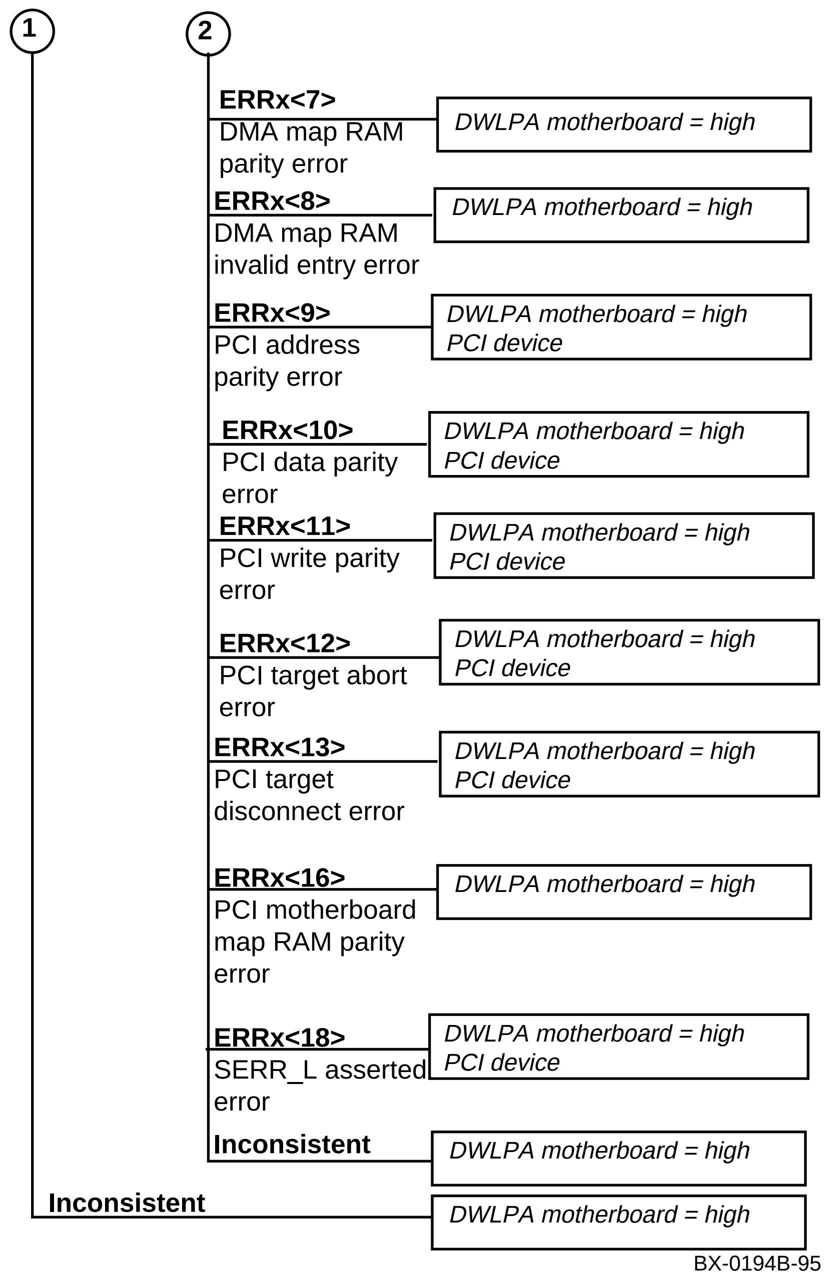


Figure 4–6 DWLPA Error Parse Tree (Continued)

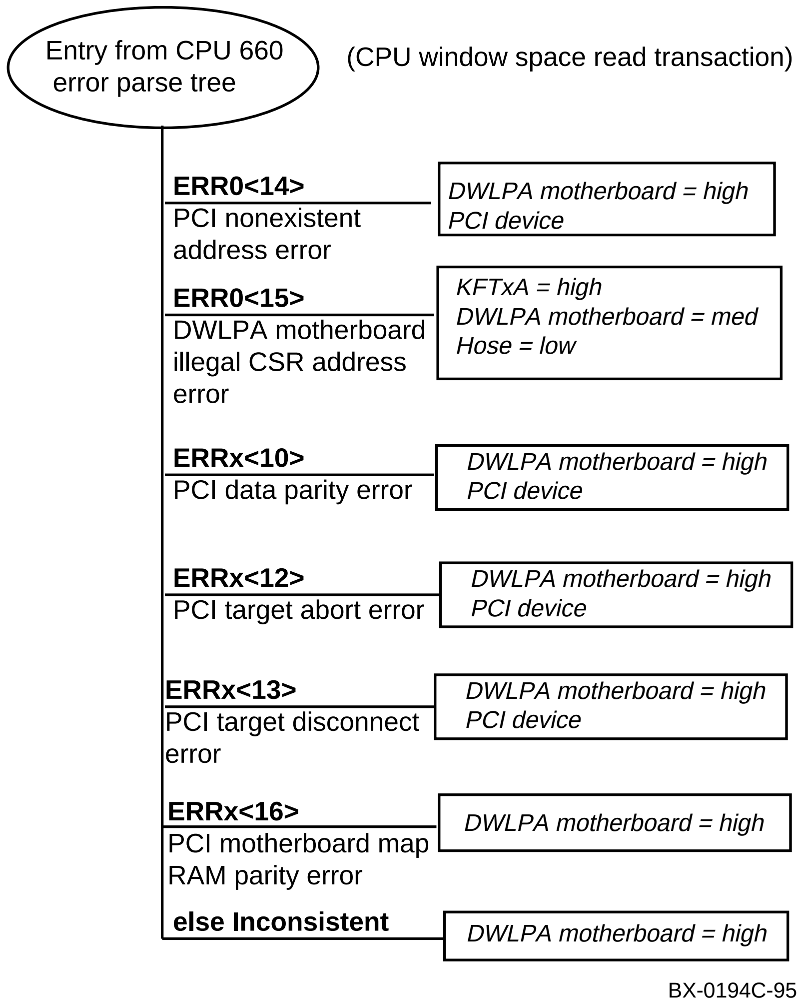


Figure 4–7 DWLMA Error Parse Tree

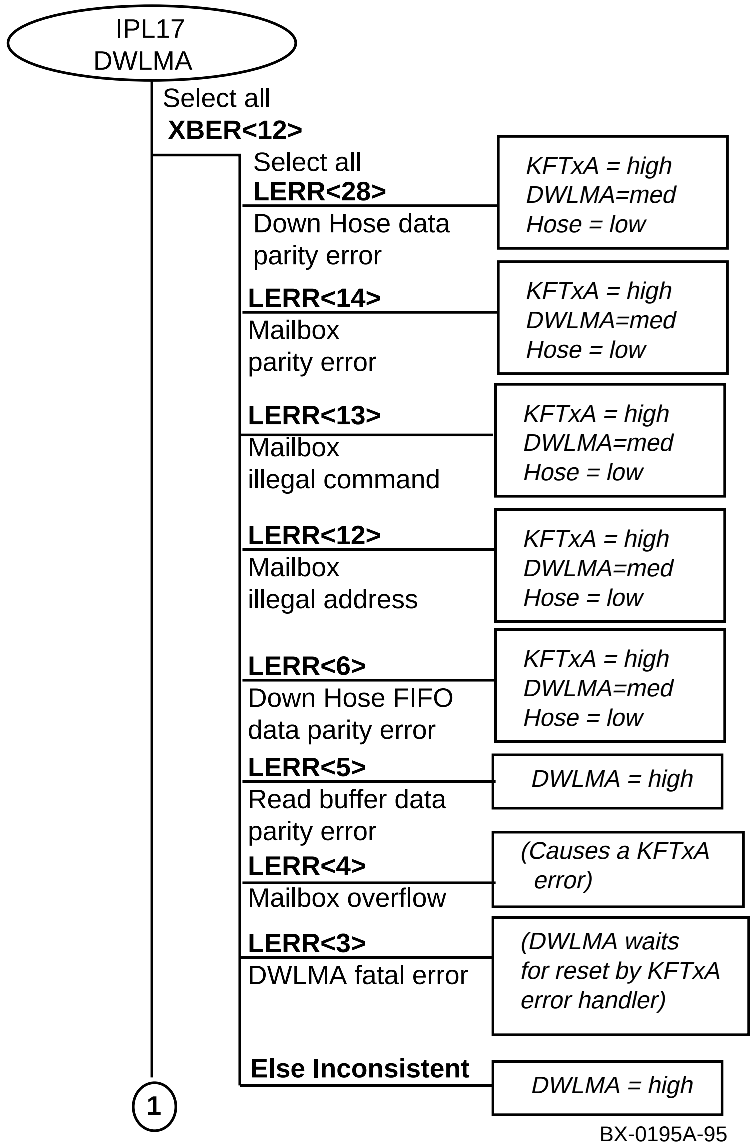


Figure 4–7 DWLMA Error Parse Tree (Continued)

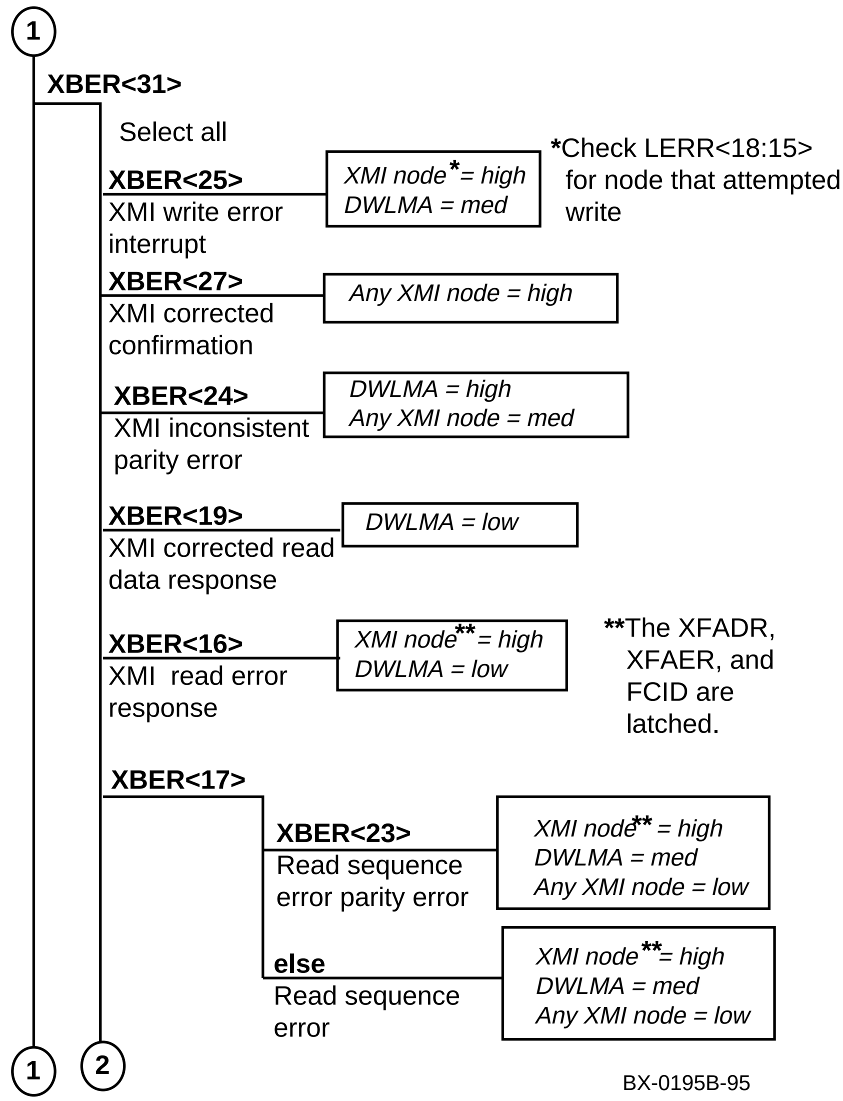


Figure 4–7 DWLMA Error Parse Tree (Continued)

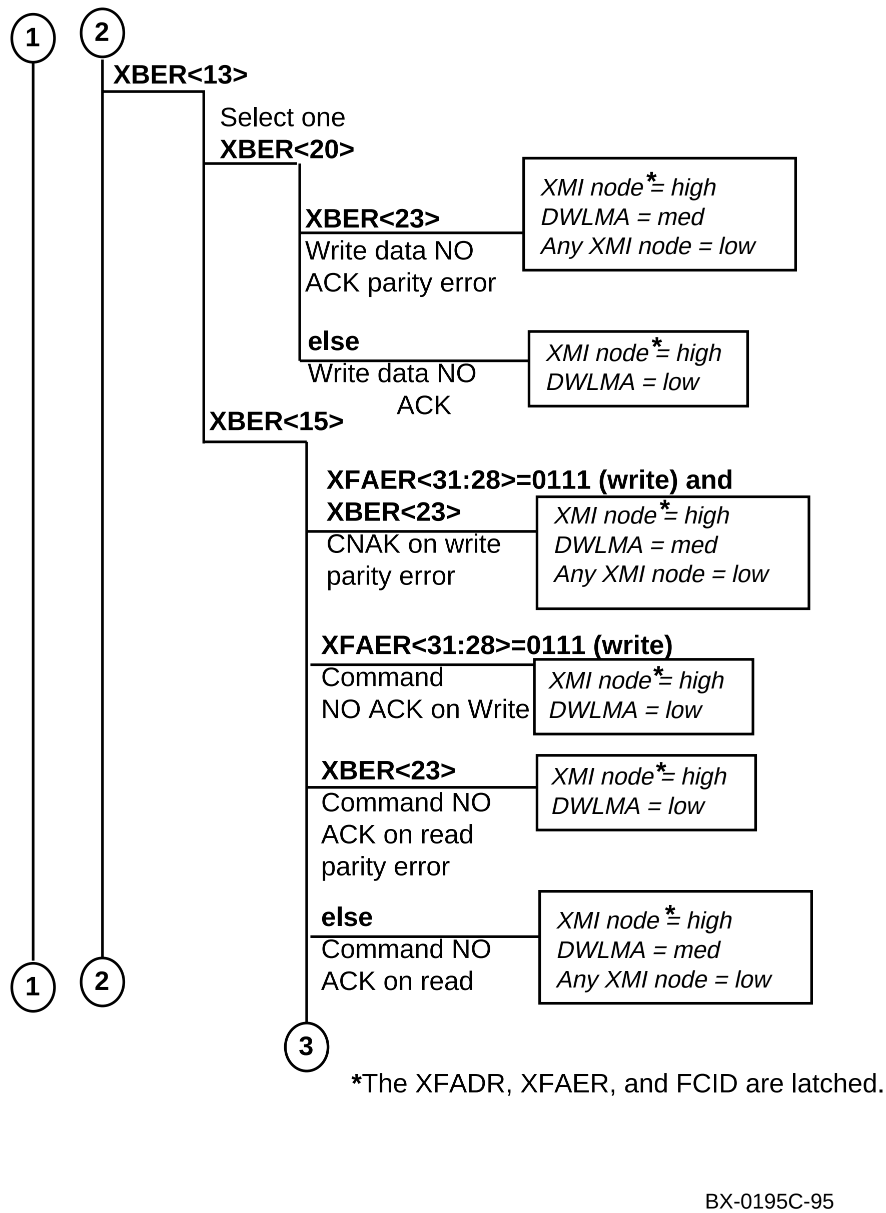
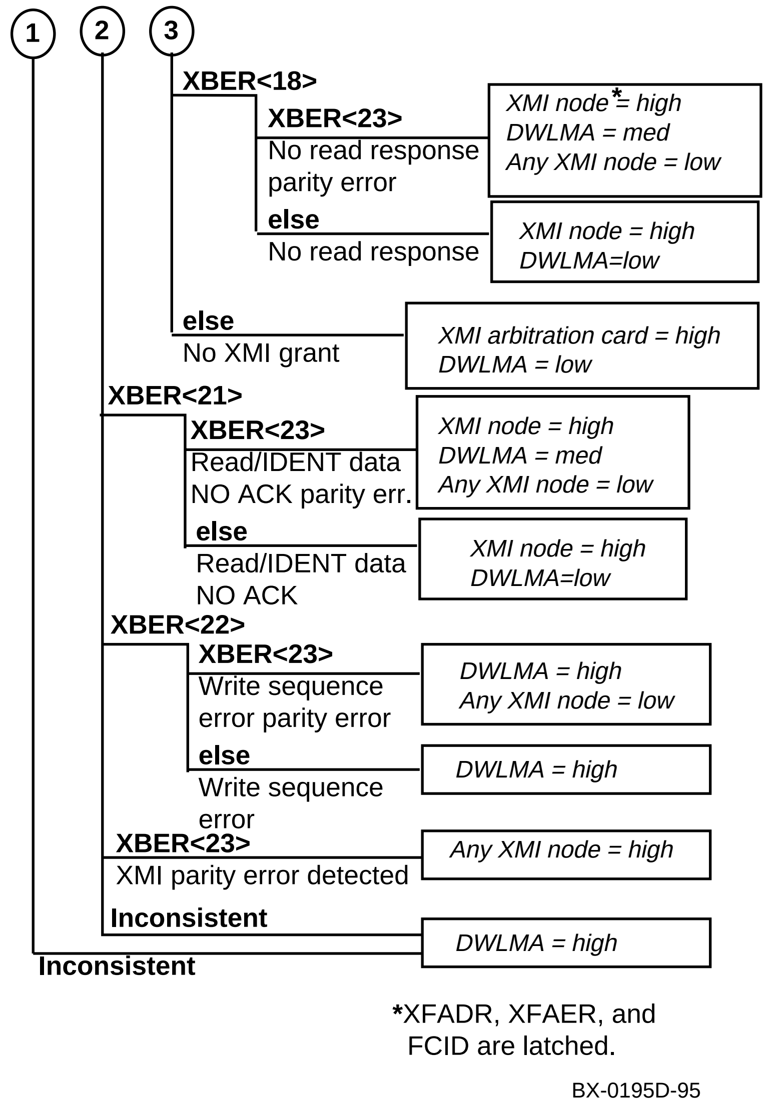


Figure 4–7 DWLMA Error Parse Tree (Continued)



Part 2

TLSB Modules

Chapter 5

TLSB Modules

This chapter contains removal and replacement procedures for modules in the TLSB card cage. These procedures apply to both systems, AlphaServer 8200 and AlphaServer 8400. This chapter includes the following sections:

- How to Replace the Only Processor
- How to Replace the Boot Processor
- How to Add a New Processor or Replace a Secondary Processor
- Processor, Memory, or Terminator Module Removal and Replacement
- SIMM Removal and Replacement
- I/O Cable and KFTHA Module Removal and Replacement
- KFTIA Module Removal and Replacement
- FDDI Daughter Card Removal and Replacement
- NVRAM Daughter Card Removal and Replacement
- NVRAM Battery Removal and Replacement

5.1 How to Replace the Only Processor

First, update console firmware and any customized environment variables or boot paths.

Example 5–1 Replacing the Only Processor Module

```
P00>>> show *                                    ❶
       [list of environment variables appears]
P00>>> boot dka500 -fl 0,a0                      ❸
       [LFU boots]
UPD> update kn7cc*                               ❸
Confirm update on:
kn7cc-ab0
[Y/(N)]y
WARNING: updates may take several minutes to complete for each device.
                          DO NOT ABORT!
kn7cc-ab0       Updating to 3.2-32...  Verifying 3.2-32...  PASSED.
UPD> exit                                        ❹
Initializing...
       [self-test display appears]
P00>>> build -e kn7cc-ab0                        ❺
Build EEPROM on kn7cc-ab0 ? [Y/N]> y
       EEPROM built on kn7cc-ab0
P00>>> set bootdef_dev dua1.0.0.11.0
P00>>> init                                      ❻
Initializing...
       [self-test display appears]
P00>>> set eeprom field                          ❽
LARS> 01234567
Message>
P00>>> boot
```

1. List the system’s environment variables to determine if any have been customized (see ❶ in Example 5–1). You will set these in step 7.
2. Power down the system and remove and replace the module. See Section 5.4.
3. Power up the system. Boot LFU and issue the **update** command to ensure that the module has the latest version of console firmware (see ❸).
4. Exit LFU (see ❹).
5. Build the EEPROM (see ❺). The format of data often changes between versions of console firmware. This command reformats the data.
6. Initialize the system (see ❻).
7. Set any customized environment variables with the **set <envar>** command. See Appendix A.
8. Enter into the EEPROM the 8-digit LARS number and a short message (68 characters maximum) stating the date and reason for service (see ❽).
9. Boot the operating system.

5.2 How to Replace the Boot Processor

Check the console firmware version in the existing and replacement modules, and, if they differ, use the LFU update command to bring the replacement module to the current version. Build the EEPROM on the replacement module.

Example 5–2 Replacing the Boot Processor

```
F   E   D   C   B   A   9   8   7   6   5   4   3   2   1   0   NODE #
                            A   M   M   .   .   .   M   P   .   TYP
                            o   +   +   .   .   .   +   ++  .   ST1
                            .   .   .   .   .   .   .   EB  .   BPD
                            o   +   +   .   .   .   +   ++  .   ST2
                            .   .   .   .   .   .   .   EB  .   BPD
                            +   +   +   .   .   .   +   ++  .   ST3
                            .   .   .   .   .   .   .   EB  .   BPD

    +   .   .   +   .   .   +   .   .   .   .   +   .   +       C0 XMI +
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C1
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C2
                .   +   .   +   +   .   .   .   .   .   .   +   C3 PCI +
                            .   .   .   .   +   .   +   .          EISA+

                            .  B1  B0   .   .   .  A0   .   .   ILV
                            . 128 128   .   .   . 256   .   .   512MB
AlphaServer 8400 Console V1.0❷, SROM V1.0, Apr  1 1995 16:17:26
P00>>> boot dka500 -fl 0,a0  ❺
       [LFU boots]
UPD> update kn7cc*           ❺

Confirm update on:
kn7cc-ab0
[Y/(N)]y
WARNING: updates may take several minutes to complete for each device.

                          DO NOT ABORT!
```

1. Remove the failing module (see Section 5.4). In this example, the primary processor is the failing module, and it is in slot 0.
2. Power up the system and make note of the version of console firmware in the remaining modules. See ❷ in Example 5–2.
3. Power down the system and remove all processor modules. See Section 5.4.
4. Insert the replacement processor module. See Section 5.4.
5. Power up the system and determine the version of console firmware in the replacement module. If it is different from the other modules, boot LFU and update the firmware using the **update** command. See ❺.

Continued on next page

Example 5–2 Replacing the Boot Processor (Continued)

```
kn7cc-ab0       Updating to 1.0-66...  Verifying 1.0-66...  PASSED.

UPD> exit
Initializing...
       [self-test display appears]
P00>>> build -e kn7cc-ab0    ❻
Build EEPROM on kn7cc-ab0 ? [Y/N]> y

       EEPROM built on kn7cc-ab0
P00>>>
F   E   D   C   B   A   9   8   7   6   5   4   3   2   1   0   NODE #
                            A   M   M   .   .   .   M   P   P   TYP
                            o   +   +   .   .   .   +  ++  ++   ST1
                            .   .   .   .   .   .   .  EE  EB   BPD
                            o   +   +   .   .   .   +  ++  ++   ST2
                            .   .   .   .   .   .   .  EE  EB   BPD
                            +   +   +   .   .   .   +  ++  ++   ST3
                            .   .   .   .   .   .   .  EE  EB   BPD

    +   .   .   +   .   .   +   .   .   .   .   +   .   +       C0 XMI +
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C1
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C2
                .   +   .   +   +   .   .   .   .   .   .   +   C3 PCI +
                            .   .   .   .   +   .   +   .          EISA+

                            .  B1  B0   .   .   .  A0   .   .   ILV
                            . 128 128   .   .   . 256   .   .   512MB
AlphaServer 8400 Console V1.0, SROM V1.0, Apr  1 1995 16:17:26
P00>>> set cpu 2            ❽
P02>>> build -c kn7cc*
P02>>> set cpu 0            ❾
P00>>> set eeprom field
LARS> 01234567
Message>
P00>>> boot
```

6. Build the EEPROM. See ❻.
7. Power down the system, replace the other processor modules (see Section 5.4), and power up the system.
8. Copy the EEPROM environment variables from a secondary processor to the new primary processor. To do this, set a different module as primary and copy the environment variables using the **build -c** command. See ❽.
9. Set processor 0 as the primary processor. Then enter into the EEPROM the 8-digit LARS number and a short message (68 characters maximum) stating the date and reason for service. See ❾.
10. Boot the operating system.

5.3 How to Add a New Processor or Replace a Secondary Processor

---

Check the console firmware version in the existing modules and the new or replacement module, and, if they differ, use the LFU update command to bring the new module to the current version. Build the EEPROM on the new module.

Example 5–3 Adding or Replacing a Secondary Processor

```
F   E   D   C   B   A   9   8   7   6   5   4   3   2   1   0   NODE #
                            A   M   M   .   .   .   M   .   P   TYP
                            o   +   +   .   .   .   +   .  ++   ST1
                            .   .   .   .   .   .   .   .  EB   BPD
                            o   +   +   .   .   .   +   .  ++   ST2
                            .   .   .   .   .   .   .   .  EB   BPD
                            +   +   +   .   .   .   +   .  ++   ST3
                            .   .   .   .   .   .   .   .  EB   BPD

    +   .   .   +   .   .   +   .   .   .   .   +   .   +       C0 XMI +
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C1
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C2
                .   +   .   +   +   .   .   .   .   .   .   +   C3 PCI +
                            .   .   .   .   +   .   +   .          EISA+

                            .  B1  B0   .   .   .  A0   .   .   ILV
                            . 128 128   .   .   . 256   .   .   512MB
AlphaServer 8400 Console V1.0❷, SROM V1.0, Apr  1 1995 16:17:26
P02>>> boot dka500 -fl 0,a0  ❺
       [LFU boots]
UPD> update kn7cc*           ❺

Confirm update on:
kn7cc-ab0
[Y/(N)]y
```

In this example, the primary processor is in slot 0 and a secondary processor is being replaced in slot 1.

1. If you are replacing a secondary processor, remove the module from the system. See Section 5.4.
2. Power up the system and make note of the version of console firmware in the processor modules. See ❷ in Example 5–3.
3. Power down the system and remove all processor modules. See Section 5.4.
4. Insert the new processor module. See Section 5.4.
5. Power up the system and determine the version of console firmware in the replacement module. If it is different from the other modules, boot LFU and update the firmware using the **update** command. See ❺.

Continued on next page

Example 5–3 Adding or Replacing a Secondary Processor (Continued)

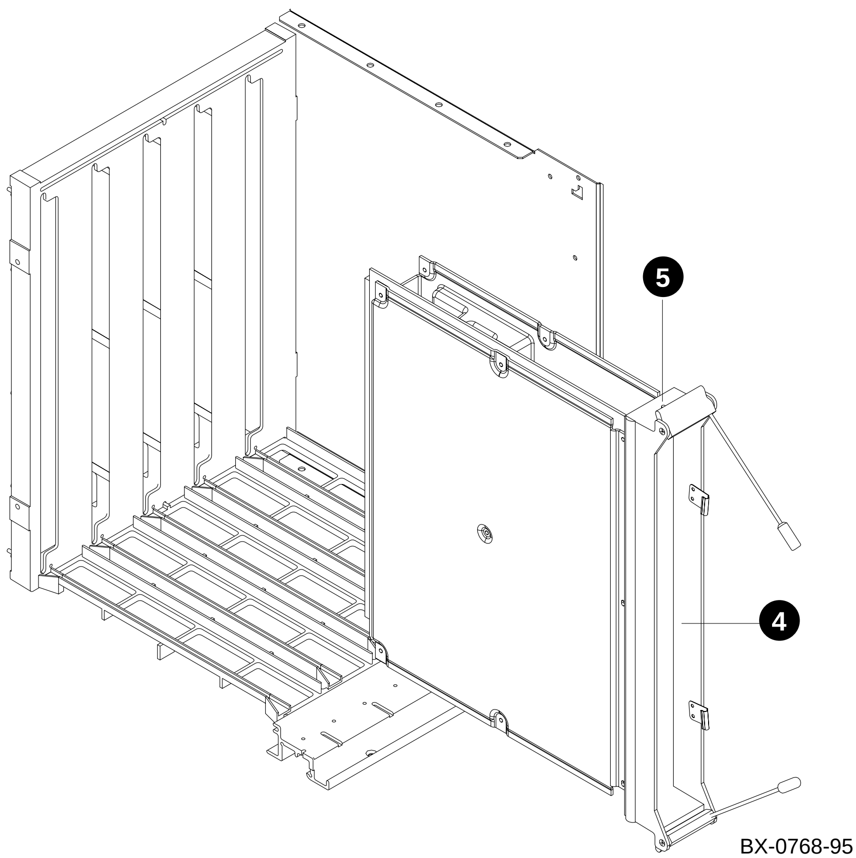
```
WARNING: updates may take several minutes to complete for each device.

                          DO NOT ABORT!

kn7cc-ab0       Updating to 1.0-66...  Verifying 1.0-66...  PASSED.

UPD> exit
Initializing...
       [self-test display appears]
P02>>> build -e kn7cc*          ❻
Build EEPROM on kn7cc-ab0 ? [Y/N]> y

       EEPROM built on kn7cc-ab0
P02>>> i
Initializing...
F   E   D   C   B   A   9   8   7   6   5   4   3   2   1   0   NODE #
                            A   M   M   .   .   .   M   P   P   TYP
                            o   +   +   .   .   .   +  ++  ++   ST1
                            .   .   .   .   .   .   .  EE  EB   BPD
                            o   +   +   .   .   .   +  ++  ++   ST2
                            .   .   .   .   .   .   .  EE  EB   BPD
                            +   +   +   .   .   .   +  ++  ++   ST3
                            .   .   .   .   .   .   .  EE  EB   BPD

    +   .   .   +   .   .   +   .   .   .   .   +   .   +       C0 XMI +
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C1
.   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   C2
                .   +   .   +   +   .   .   .   .   .   .   +   C3 PCI +
                            .   .   .   .   +   .   +   .          EISA+

                            .  B1  B0   .   .   .  A0   .   .   ILV
                            . 128 128   .   .   . 256   .   .   512MB
AlphaServer 8400 Console V1.0, SROM V1.0, Apr  1 1995 16:17:26
P00>>> build -c kn7cc*          ❽
P00>>> set eeprom field         ❾
LARS> 01234567
Message>
P00>>> boot
```

6. Build the EEPROM. See ❻.
7. Power down the system and replace the other processor modules. See Section 5.4.
8. Power up the system. Copy the EEPROM environment variables to the new processor using the **build -c** command. See ❽.
9. Enter into the EEPROM the 8-digit LARS number and a short message (68 characters maximum) stating the date and reason for service. See ❾.
10. Boot the operating system.

5.4 Processor, Memory, or Terminator Module Removal and Replacement

Wear an antistatic wrist strap. Release the handles and slide the module out of the card cage. To replace, line up the module and cover with the guide and rail in the card cage, be sure the projections on the top and bottom of the end plate align with the slots in the card cage, and slide the module into the cage. Push the handles in to connect at the centerplane, and let them spring into the stops.

Figure 5–1 Processor, Memory, or Terminator Module



NOTE: If you are replacing or adding a processor module, see Section 5.1, 5.2, or 5.3 before using this procedure.

Removal

1. Shut down the operating system and power down the system.

   CAUTION: You must wear a wrist strap when you handle any modules.

2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Push the handles of the module to be removed in toward the module end plate and to the left, releasing them from the stops.
4. Grasp the end plate and slide the module out of the card cage. See ❹ in Figure 5–1.
5. Place the module on an ESD pad. If it is being replaced, slide the module into the antistatic bag from the replacement module and pack it in the box.

Replacement

CAUTION: You must wear a wrist strap when you handle any modules.

1. Ground yourself to the cabinet frame with an antistatic wrist strap.

   CAUTION: To avoid damaging an EMI gasket, insert modules from left to right. These gaskets can easily break, and a broken piece of gasket can damage a module or the centerplane.

2. Remove the module from its packaging and release the spring-loaded handles from the stops. To do this, push both handles toward the module end plate and away from the stops.
3. Hold the module assembly by the end plate. Align the module with the card guide and the cover with the rail (see Figure 5–1).
4. Slide the module assembly into the card cage as far as it will easily go.
5. When the module stops, check that the projections on the top and bottom of the end plate are aligned with the slots in the card cage (see ❺ in Figure 5–1). If they are not, remove the module and realign it.
6. Push the handles to the module end plate. You will feel the module make contact with the connectors at the centerplane. Release the handles so they spring back into the stops.

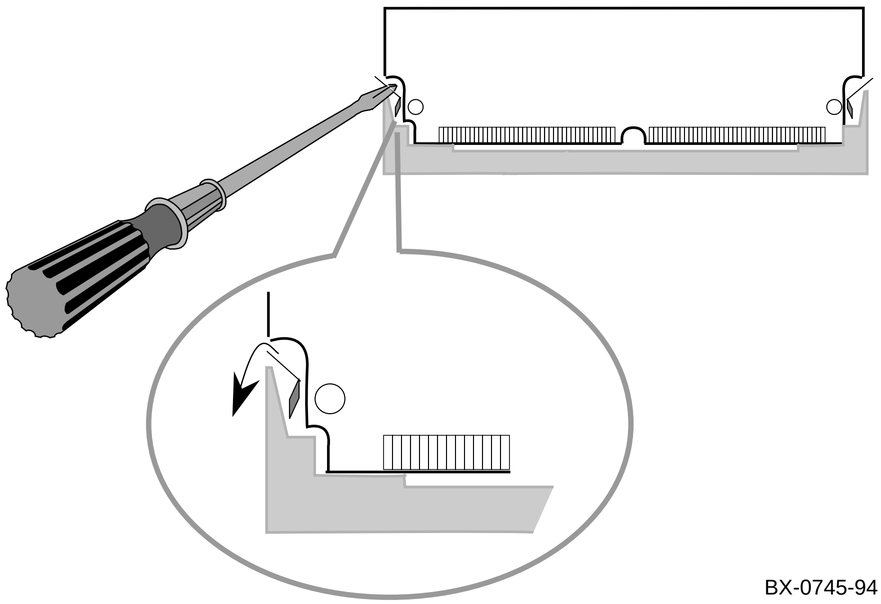
Verification

Check that terminator modules are installed in all unused slots. Power up the system and check that the self-test display is correct. Enter the **show configuration** command. If you replaced a memory module, enter the **show simm** command.

5.5 SIMM Removal and Replacement

Remove both covers from the memory module. Remove the standoff at the end of the row with the failing SIMM. Remove all SIMMs in the row up to and including the failing SIMM. Release the latches on both ends of the SIMM by gently inserting a small Phillips screwdriver.

Figure 5–2 Removing a SIMM



Removal

1. Remove the appropriate memory module from the card cage.
2. Place the module on an ESD pad on a level surface. Remove both module covers by removing the nine screws from each. (The screws that attach to the end plate of the module are larger than those that attach to the standoffs.)
3. Use an adjustable wrench to remove the standoff at the end of the row with the failing SIMM. See ❸ in Figure 5–3 or 5–4.
4. Beginning with J2, J12, or J24 on the E2035 module or with J2, J14, or J28 on the E2036 module, remove each SIMM up to and including the failing SIMM. To remove a SIMM, release the latch on each end of the connector by inserting a Phillips screwdriver into the slot and pressing down. See Figure 5–2. (See Figures 5–3 and 5–4 for SIMM connector numbers.)

Replacement

1. Insert the replacement SIMM into the connector at a 45 degree angle. As you rotate it to an upright position, the latches will snap into place. (The SIMM is keyed on the sides and in the center so that the correct side faces front.)
2. Insert the other SIMMs in their connectors.
3. Replace the standoff. The square standoff goes on side 1 (the component side) and the hexagonal standoff on side 2. Torque the standoffs to 12 inch-pounds (15 inch-pounds maximum).
4. Replace the module covers.
5. Replace the memory module.

Verification

```
P00>>> set simm_callout on
P00>>> init
        [self-test display appears]
P00>>> show simm
        [test message appears]
P00>>> set simm_callout off
```

Look for a “no error” message.

Figure 5–3 SIMM Connector Numbers — E2035 Module

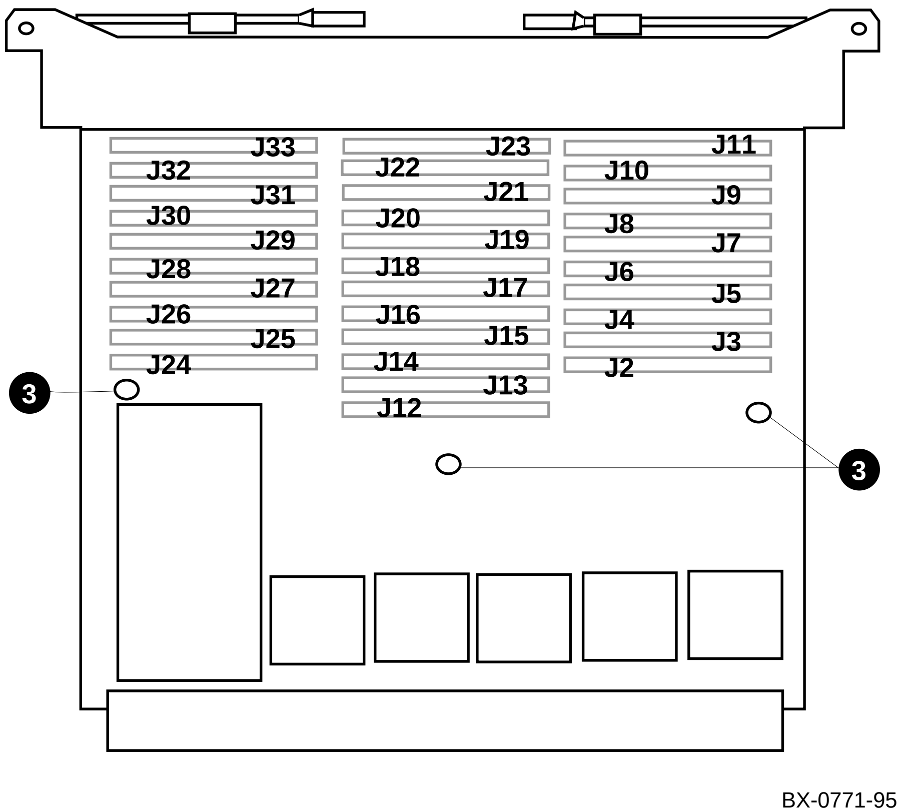
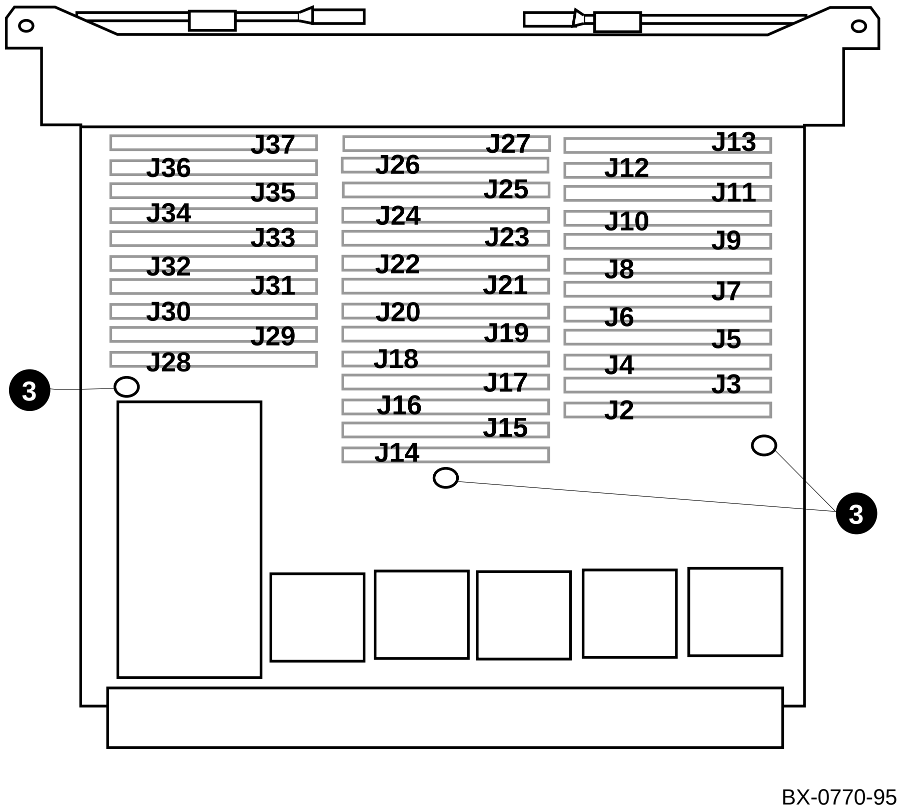


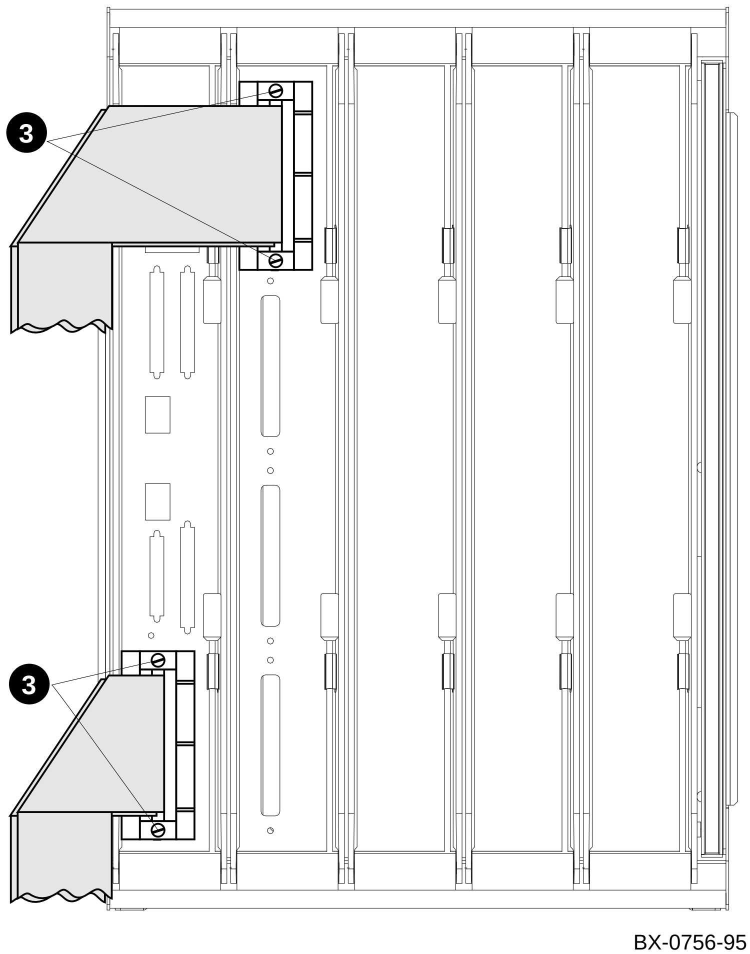
Figure 5–4 SIMM Connector Numbers — E2036 (2-Gbyte) Module



5.6 I/O Cable and KFTHA Module Removal and Replacement

The I/O hose cable connects the KFTHA or KFTIA module to an I/O bus. Remove a hose by loosening the captive screws on the connector. After disconnecting all cables, removal of the module is the same as other modules.

Figure 5–5 I/O Hose Cable



I/O Hose Cable Removal

1. Shut down the operating system and power down the system.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Loosen the captive screws (slotted) to remove the cable connectors at both ends of the I/O cable to be replaced. See ❸ in Figure 5–5.

I/O Hose Cable Replacement

1. Attach the TLSB end with pin 50 on top. Torque the screws to 6 inch-pounds.
2. Route the replacement I/O cable through the same path as the original one was routed.
3. Attach the I/O bus end. The connector is asymmetrical to ensure proper orientation.

Verification

Power up the system and check that the console display includes the I/O bus connected to this cable.

KFTHA Module Removal

1. Remove the I/O hose cables from the module. See procedure above.
2. Remove the module. See Section 5.4.

KFTHA Module Replacement

1. Replace the module (Section 5.4).
2. Replace the I/O hose cables (see above).

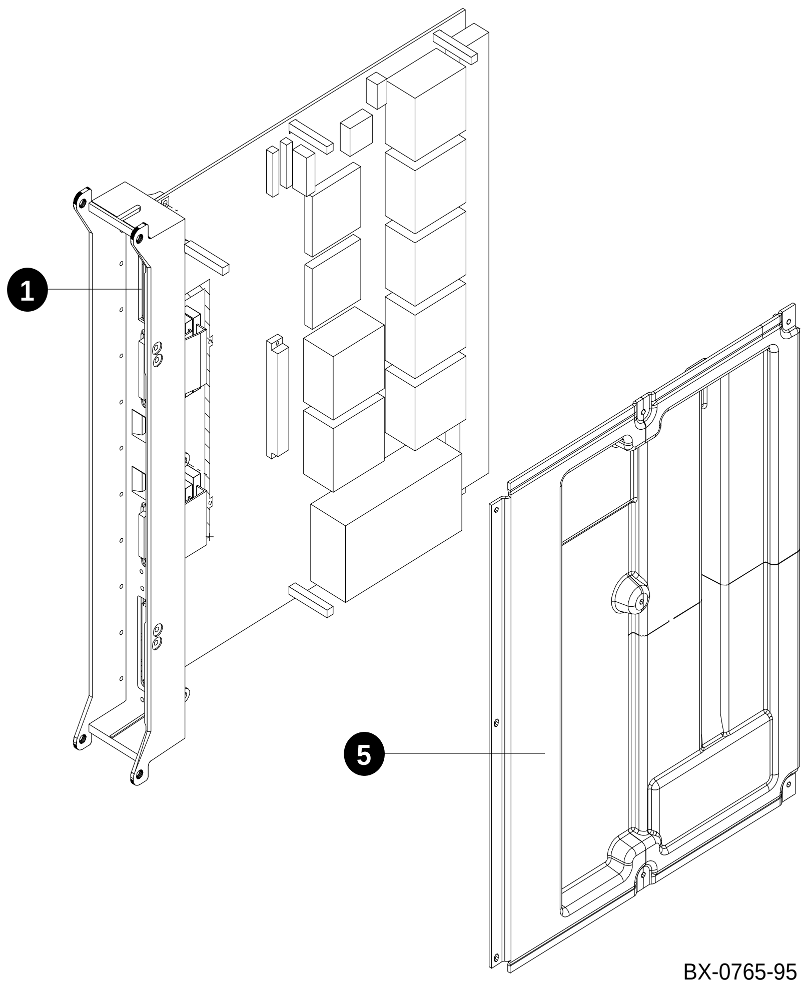
Verification

Power up the system and check that the green LED near the top connector lights.

5.7 KFTIA Module Removal and Replacement

Disconnect and label all cables. Remove the side 1 cover and any daughter cards. If present, remove and save the FDDI bulkhead connector.

Figure 5–6 KFTIA Module



Removal

1. Shut down the operating system and power down the system.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Disconnect all cables from the KFTIA bulkhead and label the cables. It is possible to have one I/O hose cable, four SCSI cables, two Ethernet cables, and one FDDI cable.
4. Remove the module from the card cage. See Section 5.4.
5. Place the module on an ESD pad on a level surface. Remove the side 1 cover (see ❺ in Figure 5–6) from the module by removing the eight screws. Note that the three screws attaching the cover to the bulkhead are larger than the five attaching it to the standoffs.
6. Remove any daughter cards from the module. See Section 5.8 for the FDDI daughter card and Section 5.9 for the NVRAM daughter card.
7. If the module has an FDDI daughter card, remove the FDDI bulkhead connector from the KFTIA by removing the screw from the top of the connector. Save the connector and screw.

Replacement

1. If the KFTIA module being replaced had any daughter cards on it, do the following:
   a. Place the new module on an ESD pad on a level surface. Remove the side 1 cover.
   b. If the KFTIA module had an FDDI daughter card, on the replacement module remove the blank from the FDDI bulkhead connector position (see ❶ in Figure 5–6). To do this, remove the screw at the top and replace it with the connector saved in step 7 above.
   c. Install the daughter card or cards on the replacement module. See Section 5.8 for the FDDI card and Section 5.9 for the NVRAM card.
   d. Replace the side 1 cover on the KFTIA module.
2. Insert the KFTIA module in the card cage. See Section 5.4.
3. Connect all bulkhead cables.

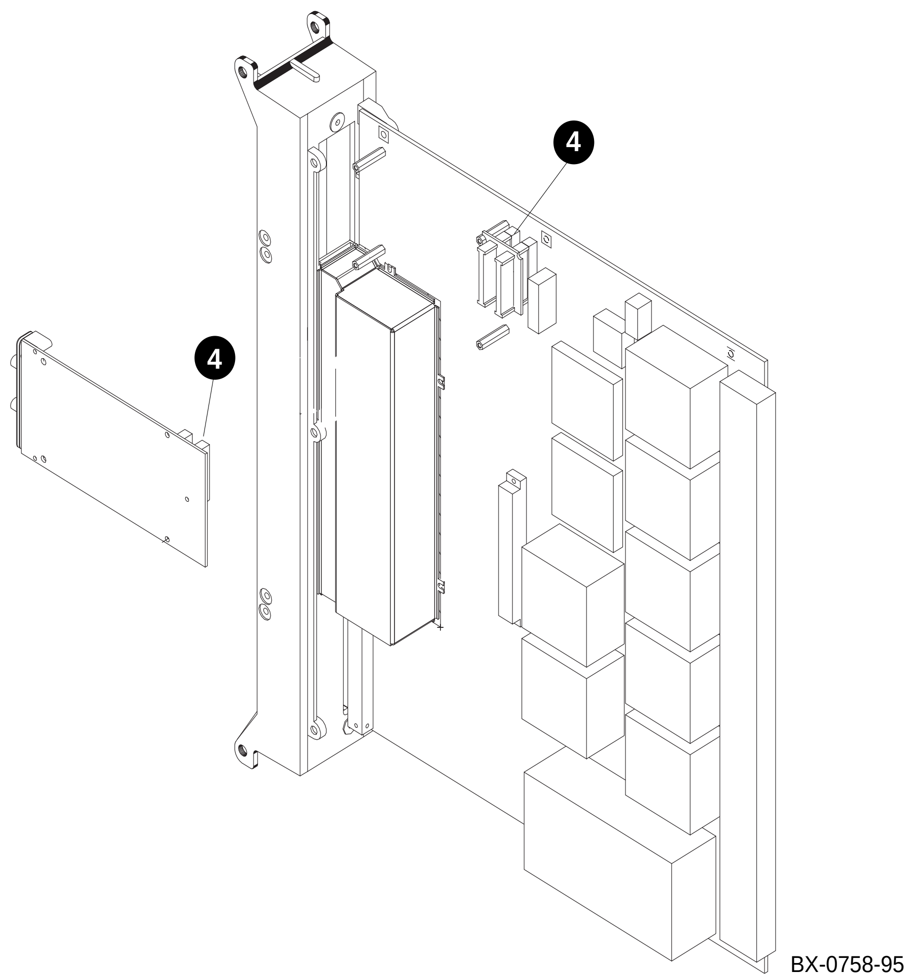
Verification

Power up the system and check that the green self-test LED under the single-ended SCSI connector on the KFTIA module lights. Check the self-test display for plus signs on the internal PCI line. If any minus signs print, run the **show config** command and check the internal PCI bus section.

5.8 FDDI Daughter Card Removal and Replacement

Remove the KFTIA module from the system. Remove the side 1 cover and the two screws that attach the FDDI daughter card to the module. Lift the module off the extender.

Figure 5–7 FDDI Daughter Card



Removal

1. Remove the KFTIA module. See Section 5.7 for instructions. Place the module on an ESD pad on a level surface.
2. Remove the side 1 cover from the KFTIA module by removing the eight screws. Note that the three screws attaching the cover to the bulkhead are larger than the five attaching it to the standoffs.
3. Remove and save the two screws that attach the FDDI daughter card to the KFTIA module. Leave the standoffs on the module.
4. Lift the FDDI daughter card off the extender (see ❹). Leave the extender on the module.

Replacement

1. Connect the replacement daughter card to the extender.
2. Attach the daughter card to the module with the screws saved in step 3 above.
3. Replace the side 1 cover on the KFTIA module.
4. Replace the KFTIA module. See Section 5.7 for instructions.

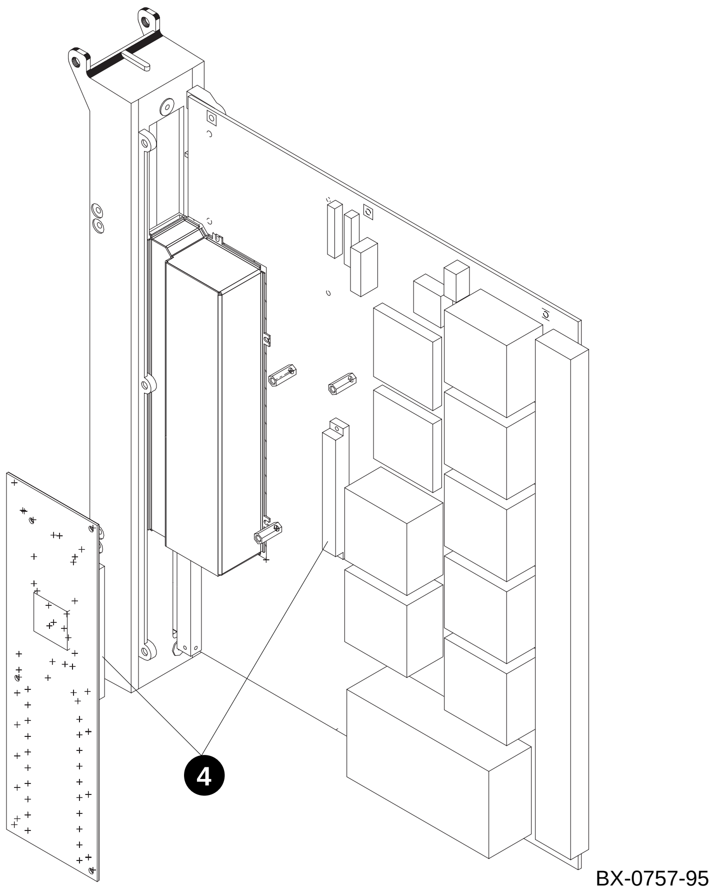
Verification

Power up the system and check that all modules appear in the self-test display. Enter the **show configuration**, **show device**, and **test** commands.

5.9 NVRAM Daughter Card Removal and Replacement

Remove the KFTIA module from the system. Remove the side 1 cover and the four screws that attach the NVRAM daughter card to the module. Lift the module off the connector.

Figure 5–8 NVRAM Daughter Card



Removal

1. Remove the KFTIA module. See Section 5.7 for instructions. Place the module on an ESD pad on a level surface.
2. Remove the side 1 cover from the KFTIA module by removing the eight screws. Note that the three screws attaching the cover to the bulkhead are larger than the five attaching it to the standoffs.
3. Remove and save the four screws that attach the NVRAM daughter card to the KFTIA module. Leave the standoffs on the module.
4. Lift the NVRAM daughter card off the connector (see ❹ in Figure 5–8). Grasp the card near the connector and lift it off the connector.

Replacement

1. Remove the insulator tape from under the battery clip on the replacement NVRAM daughter card. (For battery location, see Figure 5–9.)
2. Attach the replacement daughter card to the connector.
3. Attach the daughter card to the module with the screws saved in step 3 above.
4. Replace the side 1 cover on the KFTIA module.
5. Replace the KFTIA module. See Section 5.7 for instructions.

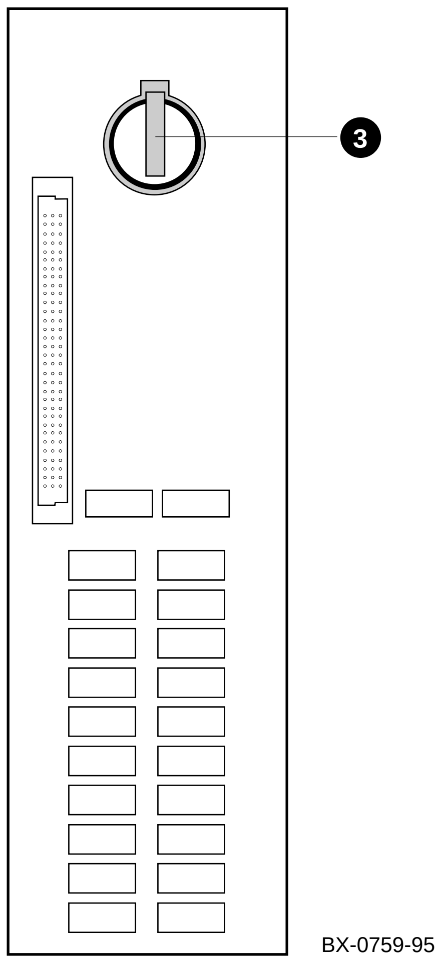
Verification

Power up the system and check that all modules appear in the self-test display. Enter the **show configuration**, **show device**, and **test** commands.

5.10 NVRAM Battery Removal and Replacement

Remove the NVRAM daughter card. Slide the battery out of the holder. Observe all notes and cautions on the next page.

Figure 5–9 NVRAM Battery



Removal

1. Remove the daughter card (see Section 5.9).
2. Place the daughter card on an ESD pad on a level surface, battery side up.
3. Lift the clip slightly and slide the battery out of the holder. See ❸ in Figure 5–9.

REPLACEMENT OF BATTERIES: When batteries are replaced, use only batteries that are compatible with the product's electrical requirements and recharging circuitry, if applicable. Consult your local Digital Service Center for information and proper servicing.

*CAUTION: **There is a danger of explosion if the battery is incorrectly replaced**. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to local regulations, or consult your Digital Service Center.*

CAUTION: Keep small batteries away from children.

Replacement

1. Slide the replacement battery into the holder so that the flat side of the battery is up. The battery holder is made to accept the battery only if the flat side is up.
2. Check that the clip is holding the battery firmly. If not, remove the battery, press the clip down gently, and replace the battery.

BATTERY DISPOSAL: Recycle or dispose of batteries contained in this product properly, in accordance with local regulations for the battery type as marked on the battery. Prior to disposal or recycling, protect batteries against accidental short circuiting by affixing non-conductive tape across battery terminals or conductive surfaces. If the battery is not marked, or if you require other information regarding batteries, consult your nearest Digital Service Center.

Chapter 6

Updating Firmware

Use the Loadable Firmware Update (LFU) utility to update system firmware. LFU runs without any operating system and can update the firmware on any system module. LFU handles modules on the TLSB bus (for example, the CPU) as well as modules on the I/O buses (for example, a CI controller on the XMI bus). You are not required to specify any hardware path information, and the update process is highly automated.

Both the LFU program and the firmware microcode images it writes are supplied on a CD-ROM. You start LFU on AlphaServer systems with the **boot** command.

A typical update procedure is:

1. Boot the LFU CD-ROM.
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. Exit.

Sections in this chapter are:

- Booting LFU
- List
- Update
- Exit
- Display and Verify Commands
- How to Update Corrupted Firmware
- How to Modify Device Attributes

6.1 Booting LFU

LFU is supplied on the Alpha CD-ROM (Part Number AG–PTMW*–BE, where * is the letter that denotes the disk revision). Make sure this CD-ROM is mounted in the in-cabinet CD drive. Boot LFU from the CD-ROM.

Example 6–1 Booting LFU from CD-ROM

```
P00>>> sho dev                                ❶
polling for units on isp0, slot 0, bus0, hose0...
dka400.4.0.0.0     DKA400                  RZ26L  440C
polling for units on isp1, slot 1, bus0, hose0...
polling for units on isp2, slot 4, bus0, hose0...
polling for units on isp3, slot 5, bus0, hose0...
dkd400.4.0.5.0     DKD400                  RRD44  0000
dkd500.5.0.5.0     DKD500                  RZ26L  440C
P00>>> boot dkd400 -fl 0,a0                    ❷
Building FRU table............
(boot dkd400.4.0.5.0 -flags 0,a0)
SRM boot identifier: scsi 4 0 5 0 400 ef00 81011
boot adapter: isp3 rev 0 in bus slot 5 off of kftia0 in TLSB slot 8
block 0 of dkd400.4.0.5.0 is a valid boot block
reading 1018 blocks from dkd400.4.0.5.0
bootstrap code read in
base = 200000, image_start = 0, image_bytes = 7f400
initializing HWRPB at 2000
initializing page table at 1f2000
initializing machine state
setting affinity to the primary CPU
jumping to bootstrap code
Bootfile: [alpha8400]as8000_v01.exe   ❸
```

```
             ***** Loadable Firmware Update Utility *****
------------------------------------------------------------------------
Function  Description
------------------------------------------------------------------------

Display     Displays the system's configuration table.
Exit        Return to loadable offline operating environment.
List        Lists the device types and firmware revisions supported by
            this revision of LFU.
Modify      Modifies port parameters and device attributes.
Show        Displays device mnemonic, hardware and firmware revisions.
Update      Replaces current firmware with loadable data image.
Verify      Compares loadable and device images.
? or Help   Scrolls the function table.
------------------------------------------------------------------------

UPD>
```

❶ Use the **show device** command to find the name of the RRDCD drive.

❷ Enter the **boot** command to boot LFU from the RRDCD drive. This drive has the device name dkd400.

❸ Enter the directory and file name of the utility. The directory name depends on the system model: [alpha8200] for the AlphaServer 8200 or [alpha8400] for the AlphaServer 8400. The file name of the utility is as8000_v01.exe, regardless of the directory.

LFU starts, displays a summary of its commands, and issues its prompt (UPD>).

6.2 List

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

Example 6–2 List Command

```
UPD> list

Device          Current Revision    Filename            Update Revision

cixcd0              3               cixcd_fw                4

demna0              8.3             demna_fw                8.3

kcm440              3.0             kcm44_fw                3.1

kn7cc-ab0           1.0-x           kn7cc_fw                1.0-x

kzpsa0          A02_1               kzpsa_fw              A06

UPD>
```

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 that is recommended for updating that firmware
- Update revision — The revision of the firmware update

6.3 Update

The update command writes new firmware from the CD-ROM 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 CD-ROM image.

Example 6–3 Update Command

```
UPD> update kn7cc-ab0                               ❶

Confirm update on:                                  ❷
kn7cc-ab0
[Y/(N)]y
WARNING: updates may take several minutes to complete for each device.

                          DO NOT ABORT!

kn7cc-ab0       update rev 2.0-1543 is less than current rev 2.0-1545.
Continue [Y/(N)] y

kn7cc-ab0       Updating to 2.0-1543... Verifying 2.0-1543... PASSED. ❸

UPD> update kzpsa0                                  ❹

Confirm update on:
kzpsa0
[Y/(N)]y
WARNING: updates may take several minutes to complete for each device.

                          DO NOT ABORT!

kzpsa0          Updating to A06...  FAILED.  ❺

UPD> exit

Errors occurred during update with the following devices:
kzpsa0

Do you want to continue to exit?
Continue [Y/(N)]y
Initializing...
       [self-test display appears]
```

❶ This command requests a firmware update for a specific module. If you want 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.

❷ LFU requires you to confirm the update. The default is no.

❸ Status message reports update and verification progress.

❹ This is a second example.

❺ The update failed. This could indicate a bad device.

Continued on next page

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

Example 6–3 Update Command (Continued)

```
UPD> update                                    ❻

confirm update on:                             ❼
cixcd0
demna0
unknown2
kdm700
[Y/(N)]n

UPD> update cixcd0 -path kdm70_fw              ❽

Confirm update on:
cixdc0
[Y/(N)]y
WARNING: updates may take several minutes to complete for each device.

                          DO NOT ABORT!

cixdc0            firmware filename 'kdm70_fw' is bad

UPD>
```

❻ When you do not specify a device name, LFU tries to update all devices.

❼ LFU lists the selected devices to update and prompts before devices are updated.

❽ In this next example, the **-path** option is used to update a device with different firmware from the LFU default. A network location for the firmware file can be specified with the **-path** option. In this example the firmware filename is not a valid file for the device specified.

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

6.4 Exit

The exit command terminates the LFU program, causes system initialization and self-test, and returns the system to console mode.

Example 6–4 Exit Command

```
UPD> exit                                                      ❶
Initializing...
       [self-test display appears]
P00>>>                                                         ❷

UPD> update kzpsa0

Confirm update on:
kzpsa0
[Y/(N)]y
WARNING: updates may take several minutes to complete for each device.

                          DO NOT ABORT!

kzpsa0          Updating to A06...  FAILED.

UPD> exit

Errors occurred during update with the following devices:    ❸
kzpsa0

Do you want to continue to exit?                               ❹
Continue [Y/(N)]y                                              ❺
Initializing...
       [self-test display appears]
P00>>>
```

❶ At the UPD> prompt, **exit** causes the system to be initialized.

❷ The console prompt appears.

❸ Errors occurred during an update.

❹ Because of the errors, confirmation of the exit is required.

❺ Typing **y** causes the system to be initialized and the console prompt to appear.

6.5 Display and Verify Commands

Display and verify commands are used in special situations. Display shows the physical configuration. Verify repeats the verification process performed by the update command.

Example 6–5 Display and Verify Commands

```
UPD> display             ❶

      Name                  Type   Rev  Mnemonic
   TLSB
   2-+   KN7CC-AB              8014  0000  kn7cc-ab0
   3+    MS7CC                 5000  0000  ms7cc0
   5+    MS7CC                 5000  0000  ms7cc1
   7+    KFTHA                 2000  0036  kftha0
   8+    KFTIA                 2020  0000  kftia0

   C0 Internal PCI connected to kftia0     pci0
   0+    ISP1020           10201077  0001  isp0
   1+    ISP1020           10201077  0001  isp1
   2+    DECchip 21040-AA     21011  0023  tulip0
   4+    ISP1020           10201077  0001  isp2
   5+    ISP1020           10201077  0001  isp3
   6+    DECchip 21040-AA     21011  0023  tulip1
   7+    PCI NVRAM            71011  0000  pci_nvram0

   C4 XMI connected to kftha0              xmi0
   2+    DEMNA                  C03  0803  demna0
   4+    CIXCD                  C2F  0311  cixcd0
   8+    DWLMA                 102A  0105  dwlma0
   A+    KCM44                  C22  5E50  kcm440

   C7 PCI connected to kftha0              pci1
   6+    DECchip 21040-AA     21011  0023  tulip2
   A+    KZPSA                81011  0000  kzpsa0

UPD> verify kzpsa0        ❷
kzpsa0          Verifying A06...  PASSED.

UPD>
```

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

❷ **Verify** reads the firmware from the module into memory and compares it with the update firmware on the CD-ROM. If a module already verified successfully when you updated it, but later failed self-test, you can use **verify** to tell whether the firmware has become corrupted.

6.6 How to Update Corrupted Firmware

If LFU identifies a device as unknown, either the firmware on the module is corrupted or the console does not support or does not recognize the device.

Example 6–6 Updating an "Unknown" Device

```
UPD> display            ❶

      Name          Type   Rev  Mnemonic
  TLSB
  0+    KN7CC-AA      8011  0000  kn7cc-aa0
  4+    MS7CC         5000  0000  ms7cc0
  6+    MS7CC         5000  0000  ms7cc1
  8+    KFTHA         2000  0000  kftha0

  C0 XMI                          xmi0
  2+    ?????          810  A4A6  unknown0 ❷
  8+    DWLMA         102A  0003  dwlma0
  C+    KDM70          C22  2B01  kdm700
  E+    DEMNA          C03  0803  demna0

  C3 XMI                          xmi1
  1+    DEMFA          823  9120  demfa0
  2+    ?????          810  A4A6  unknown1 ❷
  8+    DWLMA         102A  0104  dwlma1
  A+    KCM44          C22  69F1  kcm440
  C-    ?????         FDFF  FFFF  unknown2 ❷
  E+    CIXCD          C2F  0211  cixcd0

UPD> update unknown*        ❸

Confirm update on:
unknown2
[Y/(N)]y
WARNING: updates may take several minutes to complete for each device.

                          DO NOT ABORT!
```

❶ Issue the **display** command. The display indicates an unknown device — LFU is unable to recognize the device type. You can identify the unknown device by looking at the physical configuration.

❷ **Display** shows that the unknown devices are in slot 2 of the first XMI bus and slots 2 and 12 of the second XMI.

❸ Issue the command **update unknown***.

Continued on next page

Example 6–6 Updating an “Unknown” Device (Continued)

```
unknown2          Updating to 2...  Verifying 2...  PASSED.  ❹

UPD> exit        ❺
Initializing...

       [self-test display appears]
P00>>> sho config

        Name           Type   Rev  Mnemonic
  TLSB
  0+    KN7CC-AA       8011  0000  kn7cc-aa0
  4+    MS7CC          5000  0000  ms7cc0
  6+    MS7CC          5000  0000  ms7cc1
  8+    KFTHA          2000  0000  kftha0

  C0 XMI                           xmi0
  2+    ?????           810  A4A6  unknown0 ❻
  8+    DWLMA          102A  0003  dwlma0
  C+    KDM70           C22  2B01  kdm700
  E+    DEMNA           C03  0803  demna0

  C3 XMI                           xmi1
  1+    DEMFA           823  9120  demfa0
  2+    ?????           810  A4A6  unknown1 ❻
  8+    DWLMA          102A  0104  dwlma1
  A+    KCM44           C22  69F1  kcm440
  C+    CIXCD           C2F  0211  cixcd0   ❼
  E+    CIXCD           C2F  0211  cixcd1

UPD>
```

❹ Status message indicates that the update succeeded.

❺ To make the device known, initialize the system by exiting LFU.

❻ The modules in slot 2 of the first XMI and slot 2 of the second are still unknown. The console either does not support or does not recognize these devices. (The device may be new and not supported by the console installed. Check the current list of supported devices and upgrade the console revision if necessary. For information on finding the current list, see Appendix B.)

❼ Initialization has made the device known to the system. The previously unknown device is now assigned device mnemonic cixcd0 by the system. The previous cixcd0 is now cixcd1.

6.7 How to Modify Device Attributes

The modify command can change parameters stored in EEPROM on the following devices: KZMSA, DEC LANcontroller 400 (DEMNA), KCM44, and KFMSB. The attributes are specific to each device.

Example 6–7 Modify Command

```
UPD> modify kzmsa0                            ❶

kzmsa0

        Local Console:                   ENABLED

        Local Console:                   ENABLED
        Log Selftest Errors:             ENABLED
        Log NRC 53C710 RBD Errors:       ENABLED
        Log XMI RBD Errors:              ENABLED
        Log XZA RBD Errors:              ENABLED
        RBD Error Logging:               DISABLED
        RBD Error Frame Overflow:        ENABLED         Read Only
        Hard Error Frame Overflow:       ENABLED         Read Only
        Soft Error Frame Overflow:       DISABLED        Read Only
        FW Update Error Frame Overflow:  DISABLED        Read Only
        Disable Reset Channel 0:         DISABLED
        Disable Reset Channel 1:         DISABLED
        Chnl 0 Fast SCSI:                DISABLED
        Chnl 1 Fast SCSI:                DISABLED

        Channel_0 ID:                    07
        Channel_1 ID:                    07

        Module Serial Number:            abcdefghi

Do you wish to modify any of these parameters? [y/(n)] y   ❷
```

❶ When you modify the KZMSA, LFU first displays all the parameters.

❷ LFU asks if you want to modify any parameter values. The default response is **no**.

Continued on next page

Example 6–7 Modify Command (Continued)

```
    Local Console:                   ENABLED         Change? [y/(n)]
    Log Selftest Errors:             ENABLED         Change? [y/(n)]
    Log NRC 53C710 RBD Errors:       ENABLED         Change? [y/(n)] y❸
    Log XMI RBD Errors:              ENABLED         Change? [y/(n)]
    Log XZA RBD Errors:              ENABLED         Change? [y/(n)]
    RBD Error Logging:               DISABLED        Change? [y/(n)]
    Disable Reset Channel 0:         DISABLED        Change? [y/(n)]
    Disable Reset Channel 1:         DISABLED        Change? [y/(n)]
    Chnl 0 Fast SCSI:                DISABLED        Change? [y/(n)]
    Chnl 1 Fast SCSI:                DISABLED        Change? [y/(n)]

    Channel_0 ID:                    07         Change? [y/(n)]
    Channel_1 ID:                    07         Change? [y/(n)]

    Module Serial Number:            abcdefghi   X   Change? [y/(n)]


    Local Console:                   ENABLED    ❹

    Local Console:                   ENABLED
    Log Selftest Errors:             ENABLED
    Log NRC 53C710 RBD Errors:       DISABLED
    Log XMI RBD Errors:              ENABLED
    Log XZA RBD Errors:              ENABLED
    RBD Error Logging:               DISABLED
    RBD Error Frame Overflow:        ENABLED         Read Only
    Hard Error Frame Overflow:       ENABLED         Read Only
    Soft Error Frame Overflow:       DISABLED        Read Only
    FW Update Error Frame Overflow:  DISABLED        Read Only
    Disable Reset Channel 0:         DISABLED
    Disable Reset Channel 1:         DISABLED
    Chnl 0 Fast SCSI:                DISABLED
    Chnl 1 Fast SCSI:                DISABLED

    Channel_0 ID:                    07
    Channel_1 ID:                    07

    Module Serial Number:            abcdefghi


Modify kzmsa0 with these parameter values? [y/(n)] y ❺

UPD>
```

❸ LFU prompts for parameters to modify. This example modifies one parameter on the KZMSA0; logging of ROM-based diagnostic errors is now enabled.

❹ LFU displays the list of parameters with modifications.

❺ If these modified values are acceptable, type **y**.

Part 3

AlphaServer 8200

Chapter 7

Field-Replaceable Units

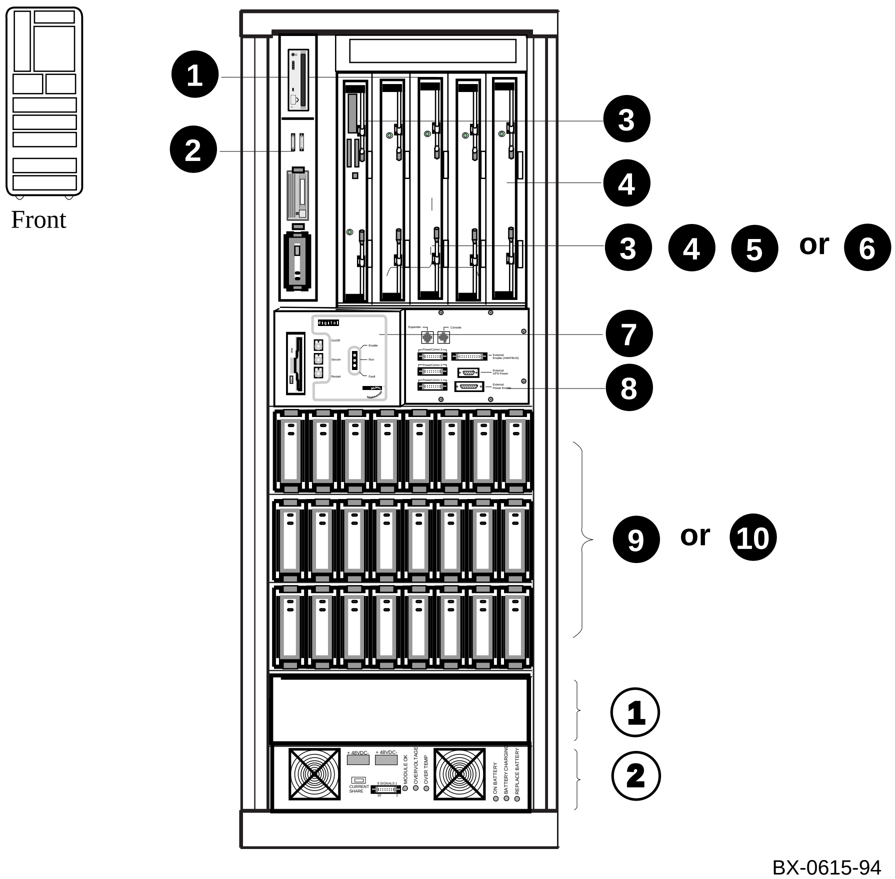
This chapter shows the location of all field-replaceable units (FRUs). A part number is called out for each FRU. Sections in this chapter include:

- FRUs Accessible from the Front of the Cabinet
- FRUs Accessible from the Rear of the Cabinet
- FRUs in the Processor System Unit
- FRUs in the PCI Shelf
- FRUs in the StorageWorks Shelf
- FRUs in the Power Regulator
- Cables

7.1 FRUs Accessible from the Front of the Cabinet

Figure 7-1 shows the location of field-replaceable units (FRUs) that can be accessed from the front of the AlphaServer 8200 cabinet.

Figure 7–1 AlphaServer 8200 Cabinet (Front) FRU Locations



❶	70–31086–01	5-slot card cage and TLSB backplane
❷	70–31087–01	Storage drawer
❸	KFTIA	E2054–AA I/O module

FRUs that may be included with the KFTIA module are:

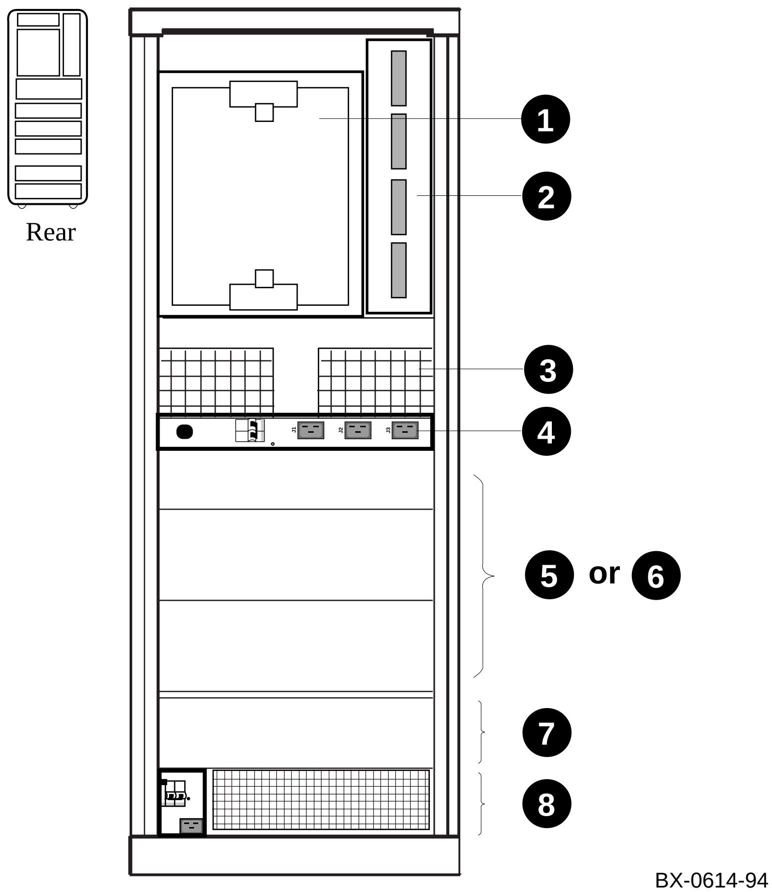
DJ–ML300–BA	NVRAM daughter card option
DEFPZ–AA	FDDI (multimode fiber card) option
DEFPZ–UA	FDDI (twisted-pair copper card) option
BN20W–0B	Y cable for FWD SCSI connection (CK–KFTIA–AA is cable with one terminator)

❹	KN7CC–AA or KN7CC–AB	E2056–CA single-processor module E2056–DA dual-processor module
❺	MS7CC–BA or	E2035–BA memory module 128 Mbytes (includes 16 54–21724–01 SIMMs)
	MS7CC–CA or	E2035–CA memory module 256 Mbytes (includes 32 54–21724–01 SIMMs)
	MS7CC–DA or	E2035–DA memory module 512 Mbytes (includes 16 54–21726–01 SIMMs)
	MS7CC–EA or	E2035–EA memory module 1 Gbytes (includes 32 54–21726–01 SIMMs)
	MS7CC–FA	E2036–AA memory module 2 Gbytes (includes 36 54–21718–01 SIMMs)
❻	KFTHA–AA	E2052–AA I/O module
❼	54–23459–01	Control panel
❽	54–23461–01	CCL module
❾	DWLPA–CA	PCI shelf
❿	BA350–JB	StorageWorks shelf
①	H7266–AA	Space for optional power regulator
②	H7266–AA	Power regulator

7.2 FRUs Accessible from the Rear

Figure 7-2 shows the location of field-replaceable units (FRUs) that can be accessed from the rear of the AlphaServer 8200 cabinet.

Figure 7–2 AlphaServer 8200 Cabinet (Rear) FRU Locations

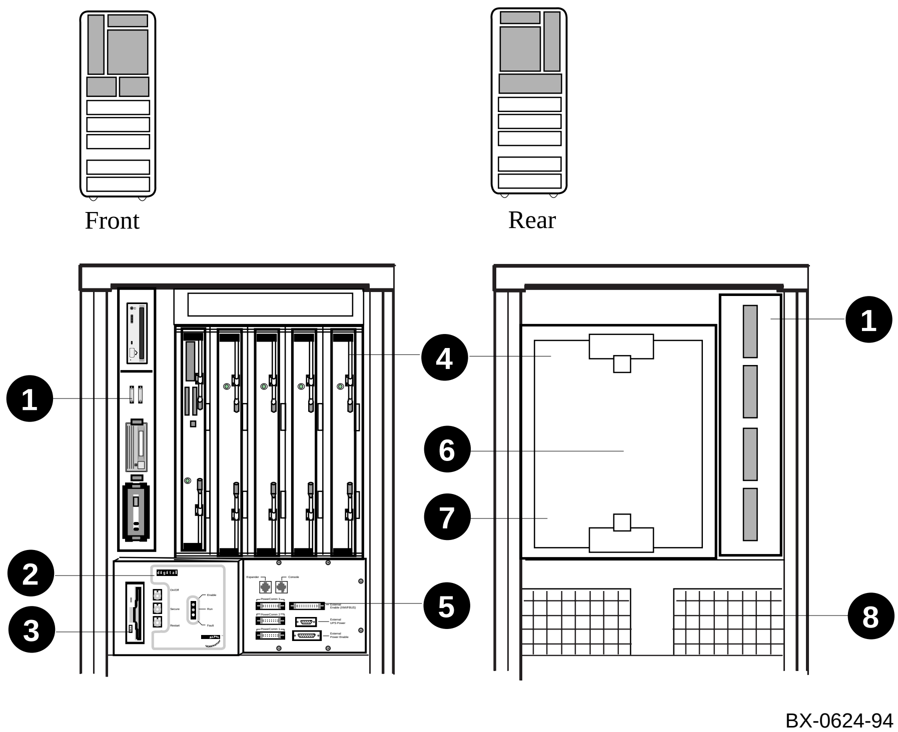


❶	70–31086–01	5-slot card cage and TLSB backplane
❷	70–31087–01	Storage drawer
❸	12–41009–01	Blower
❹	30–42075–01 30–42075–02	Power strip (US/AP) Power strip (Eur) (A power strip is included only in dual power regulator systems.)
❺	DWLPA–CA	PCI shelf
❻	BA350–JB	StorageWorks shelf
❼	H7266–AA	Space for optional power regulator
❽	H7266–AA	Power regulator

7.3 FRUs in the Processor System Unit

Figure 7-3 shows the field-replaceable units (FRUs) in the processor system unit.

Figure 7–3 Processor System Unit FRU Locations

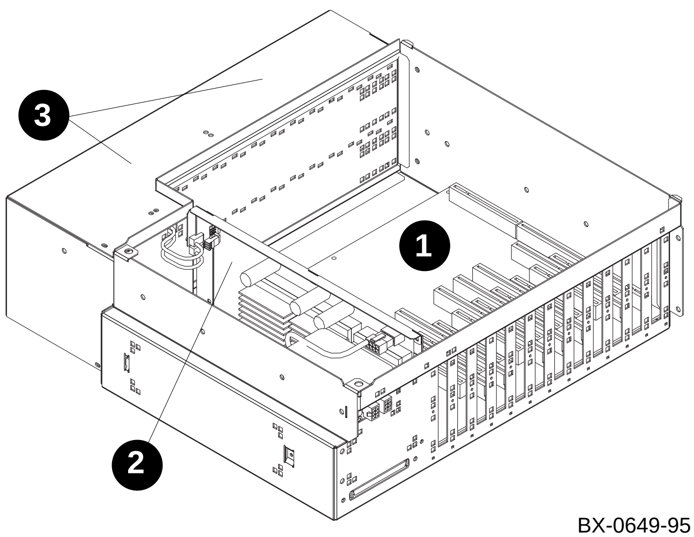


❶	70–31087–01	BA656 Storage drawer – CD-ROM drive – StorageWorks disks – StorageWorks power supply
❷	54–23459–01	Control panel
❸	RX26–AA	Floppy drive
❹	70–31086–01	5-slot TLSB backplane assembly
❺	54–23461–01	CCL module
❻	E2034–AA	Terminator module
❼	54–21728–01	Clock module
❽	12–41009–01	Blower

7.4 FRUs in the PCI Shelf

Figure 7-4 shows the field-replaceable units (FRUs) in the DWLPA PCI shelf. For information on finding a list of PCI options, see Appendix B.

Figure 7–4 PCI Shelf FRU Locations

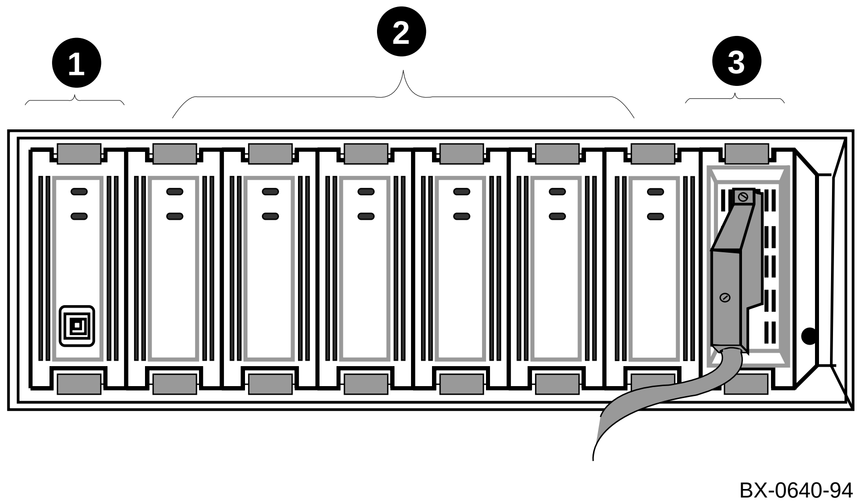


❶	54–23468–01	DWLPA motherboard
❷	54–23470–01	Power board
❸	12–23609–19	Fan (2)

7.5 FRUs in the StorageWorks Shelf

Figure 7-5 shows the field-replaceable units (FRUs) in the StorageWorks shelf. For information on finding a list of StorageWorks options, see Appendix B.

Figure 7–5 StorageWorks Shelf FRU Locations

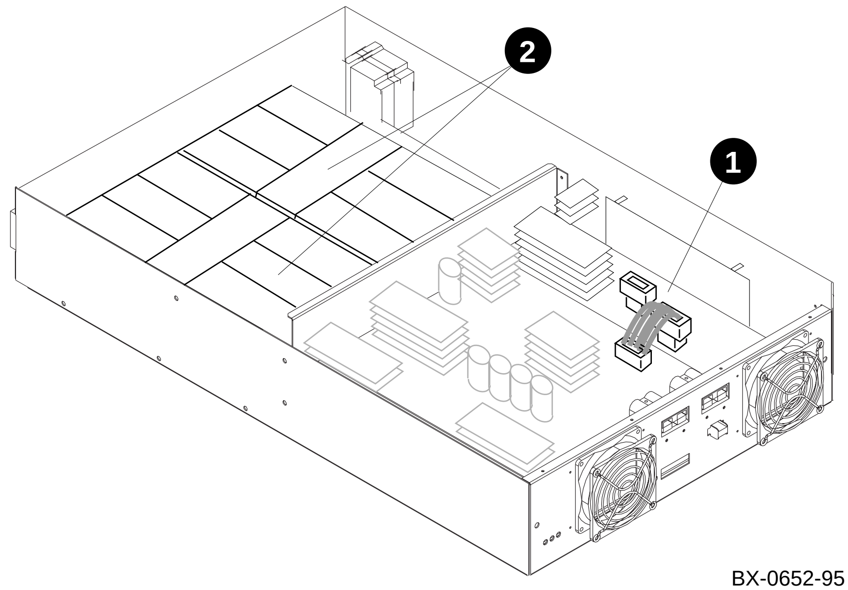


❶	BA35X–HB	Power supply
❷		StorageWorks disks (see Appendix B for information on finding part numbers)
❸	DWZZA–VA	Controller

7.6 FRUs in the Power Regulator

Figure 7-6 shows the field-replaceable units (FRUs) in the power regulator.

Figure 7–6 Power Regulator FRU Locations



❶	30–42756–01	Charger board
❷	30–42856–01	Battery pack (2)

7.7 Cables

Table 7-1 lists the cables in the AlphaServer 8200 cabinet.

Table 7–1 Cables

Cable	From	To
17–03122–01	TLSB P2	TLSB P1
17–03511–01	CCL	Expander cabinet
17–04018–01	Power regulator	PCI options, storage options, and CCL
17–04036–01	Power regulator	PSU bulkhead
17–04044–02	PCI power jumper (front)	PCI power jumper (rear)
17–04045–01	Power regulator	CCL
17–04046–01	Control panel	CCL
17–04048–01	CCL	TLSB card cage and PSU bulkhead
17–04049–01	BA656 storage drawer	PSU internal bulkhead
17–04050–01	CCL	Blower
17–04051–01	CCL	PSU internal bulkhead
17–04054–01	TLSB card cage	PSU internal bulkhead
17–04100–01	RX26 drive	KFE70 internal bulkhead
17–04101–01	RX26 drive	KFE70 internal bulkhead
17–04102–01	PCI option	KFE70 option
17–04103–01	CCL	PSU internal bulkhead
17–04178–01	PCI option	KFE70 option

Chapter 8

Configuration Rules

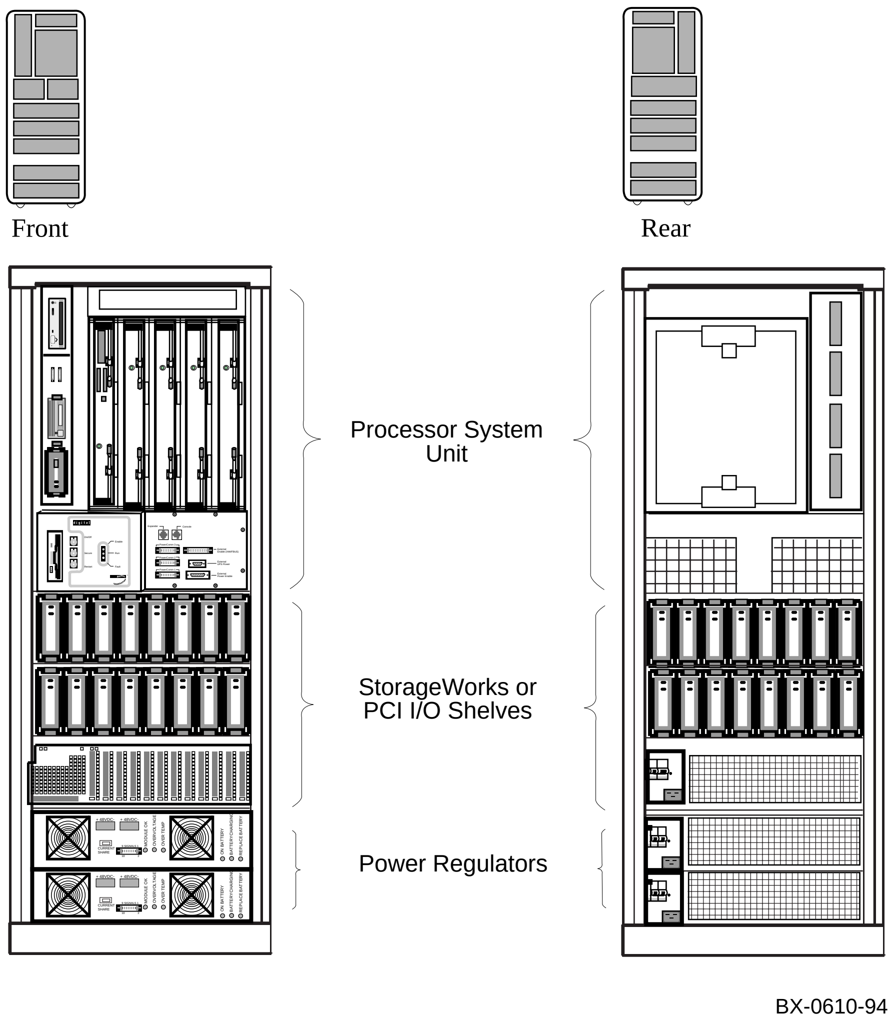
This chapter provides configuration information for the following system components:

- Main Cabinet
- Expander Cabinet
- Power System
- TLSB Card Cage and Storage Drawer
- I/O Interface
- Shelves
  - PCI Shelf
  - StorageWorks Shelf

8.1 Main Cabinet

Figure 8-1 shows the components of the main cabinet.

Figure 8–1 Main Cabinet



About the Main Cabinet

The main cabinet, H9A10–EA, contains the following components:

- Processor system unit (PSU)
- Space for PCI I/O shelves or StorageWorks shelves
- Power regulators

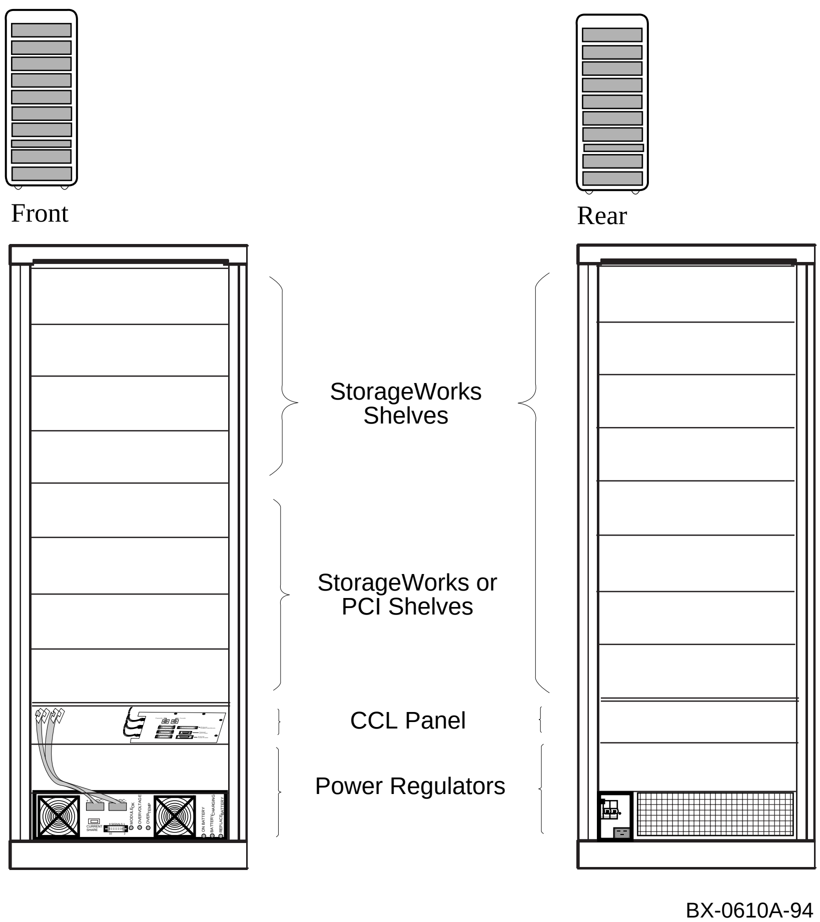
A CD-ROM drive is mounted in the PSU storage drawer at the front of the cabinet. This option connects to the single-ended SCSI port on the KFTIA module.

If the system includes a PCI shelf with a standard I/O module (PCI-to-EISA bridge), a floppy drive is mounted next to the control panel.

8.2 Expander Cabinet

The expander cabinet looks like the main cabinet, but without the processor system unit or a control panel. StorageWorks shelves or PCI I/O shelves may be installed in the space that would be occupied by the processor system unit.

Figure 8–2 Expander Cabinet



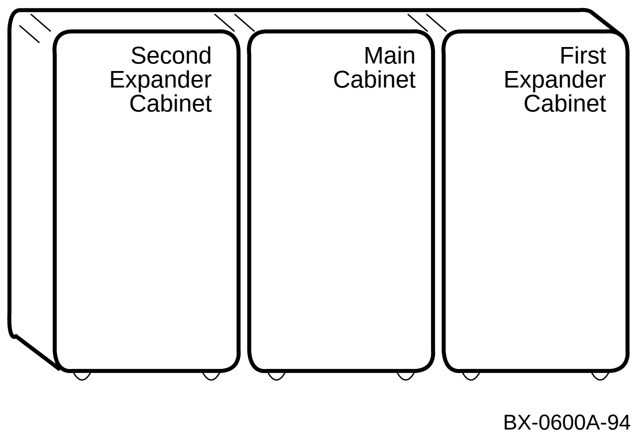
About the Expander Cabinet

The expander cabinet, H9B10-EA, is similar to the main cabinet; the contents, however, differ. The expander cabinet does not have a processor system unit, but it does have a cabinet control panel mounted just above the power regulator. The upper half of the cabinet can be filled with PCI or StorageWorks shelves.

Expander Cabinet Configuration Rules

- Each system can have up to two expander cabinets. The first expander cabinet is placed to the right of the main cabinet and the second to the left. See Figure 8-3.
- PCI shelves are installed in the space above the cabinet control panel. StorageWorks shelves are installed above PCI shelves.

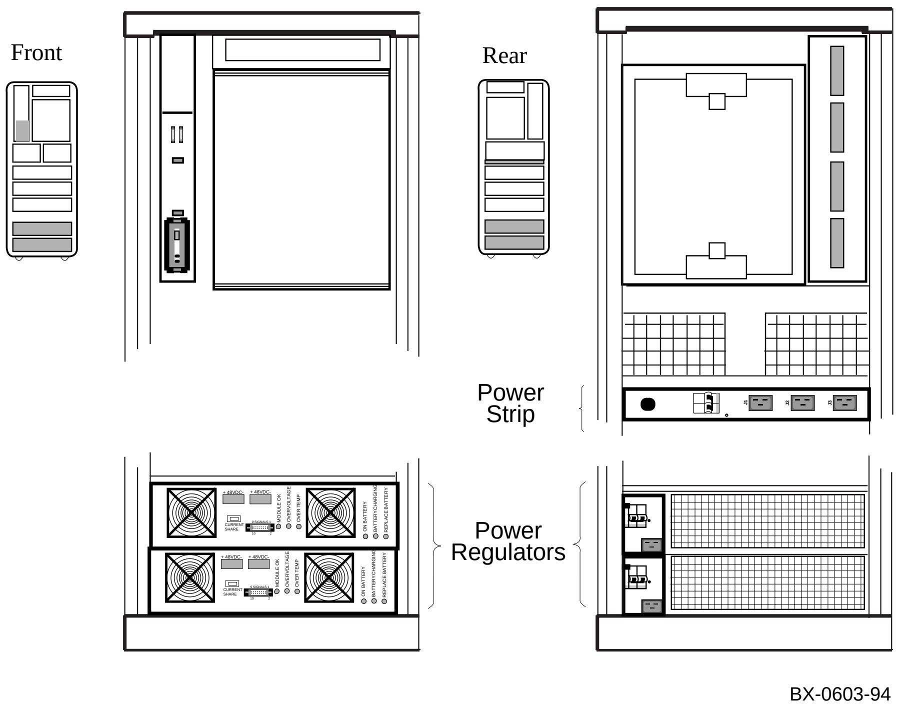
Figure 8–3 System with Two Expander Cabinets (Front View)



8.3 Power System

The power system consists of a power regulator (with optional battery backup), distribution cables, and the cabinet control logic (CCL) module. Each PCI shelf and StorageWorks shelf has its own power supply that generates DC voltages from the 48VDC cabinet power.

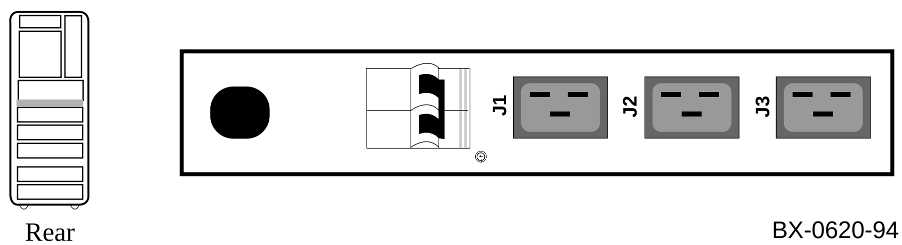
Figure 8–4 Power System



About the Power System

- The power system consists of one or two power regulators. The second power regulator is for optional redundant power.
- In a single power regulator system, the AC power cord plugs directly into the power regulator. The system circuit breaker is located on the rear of the power regulator.
- In a dual power regulator system, a power strip is mounted at the rear of the cabinet (see Figure 8-5). The power strip provides one AC power connection and the system circuit breaker.
- The battery backup option is contained in the power regulator.
- Power regulators cannot be warm swapped.
- Each PCI shelf and StorageWorks shelf has its own power supply that generates the required DC voltages.

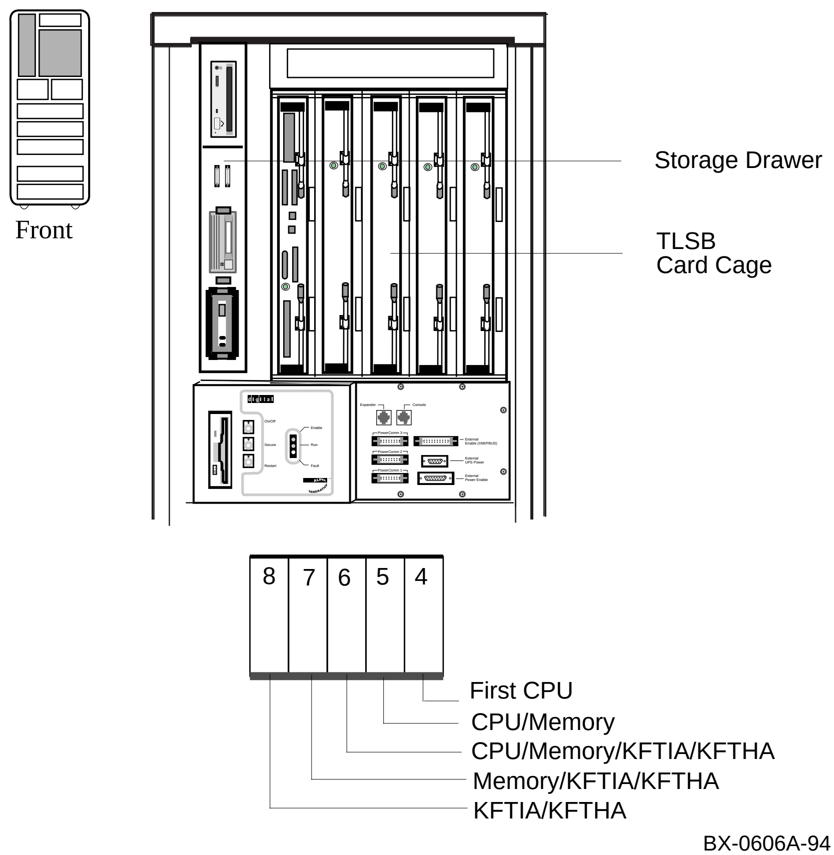
Figure 8–5 Power Strip



8.4 TLSB Card Cage and Storage Drawer

Both the TLSB card cage and the storage drawer are housed in the processor system unit (PSU). The TLSB card cage has five module slots. The storage drawer has space for six storage units.

Figure 8–6 TLSB Card Card Cage and Storage Drawer



About the TLSB Card Cage

- The TLSB card cage has slots for five modules (see Figure 8-6). These modules are a combination of processor (KN7CC), memory (MS7CC), and the I/O modules.
- The maximum number of processor modules is three.
- Uni- or dual-CPU modules are allowed in the following combinations: 1 CPU (uni-CPU module only), 2 CPUs (dual-CPU module only), 4 CPUs (two dual-CPU modules), 6 CPUs (three dual-CPU modules). All CPUs must have the same speed and cache size.
- The maximum number of memory modules is three. Memory modules may reside in slots 5 through 7 only.
- Each system must have one I/O module, which must be in slot 8.
- The minimum configuration is one processor module, one memory module, and one I/O module. In this configuration the processor module must be in slot 4, the memory module in slot 7, and the I/O module in slot 8.
- A terminator module must be placed in any open slot in the TLSB card cage.

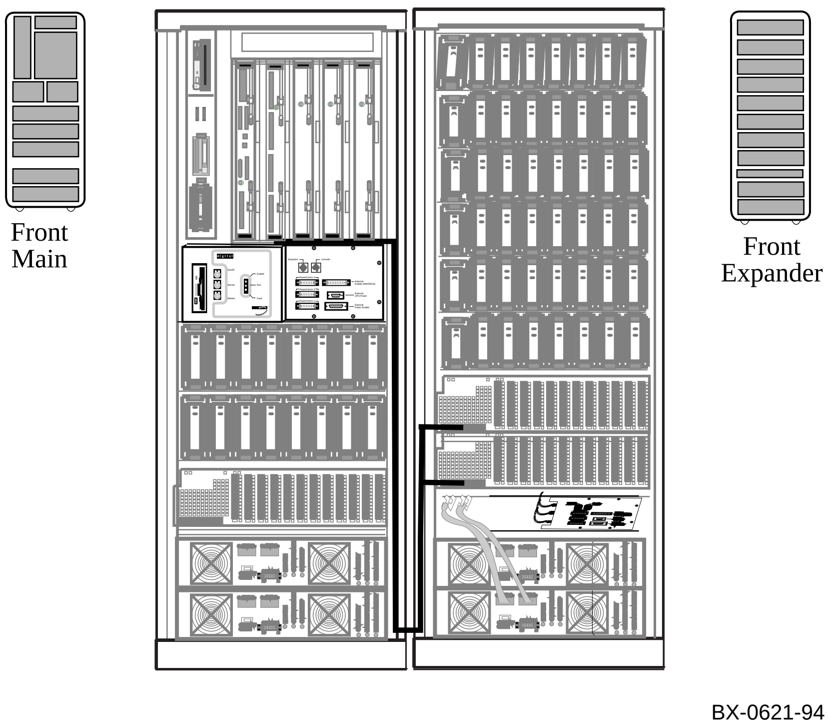
About the Storage Drawer

- The storage drawer contains one 5.25" slot, five 3.5" slots, and a power supply slot.
- The 5.25" slot and one 3.5" slot are accessible from the front of the cabinet. The remaining four 3.5" slots are accessible from the rear of the cabinet.
- The CD-ROM drive is installed in the 5.25" slot.
- A StorageWorks disk or tape option is installed in the 3.5" slot that is accessible from the front of the cabinet.
- Up to four 3.5" hard disk drives can be installed in the four slots accessible from the rear of the cabinet.

8.5 I/O Interface

The I/O interface consists of an I/O module in the TLSB card cage and the I/O cable that connects the module to the I/O bus.

Figure 8–7 I/O Interface



About the I/O Interface

The I/O interface consists of an I/O module (KFTIA) in slot 8 of the TLSB card cage and cabling for the I/O channels.

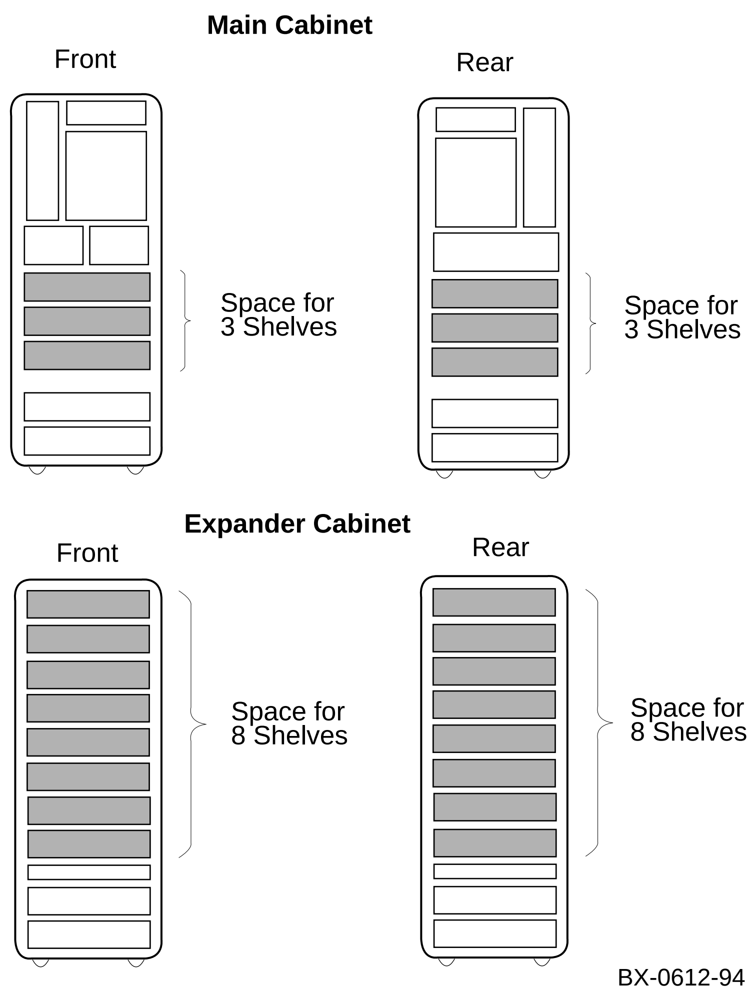
I/O Interface Configuration

- The KFTIA can accommodate one I/O channel; the KFTHA can accommodate up to four I/O channels.
- Each I/O bus is housed in an I/O shelf.
- An I/O cable connects the I/O module to an I/O shelf; each I/O cable consists of two separate unidirectional interconnects.
- The maximum length of each I/O cable is 3 meters (10 ft.).

8.6 Shelves

PCI shelves and StorageWorks shelves are located in the main and expander cabinets as shown in Figure 8-8. Both cabinets have space for shelves in the bottom. The expander cabinet also has space in the top.

Figure 8–8 Location of Shelf Space



About Shelves

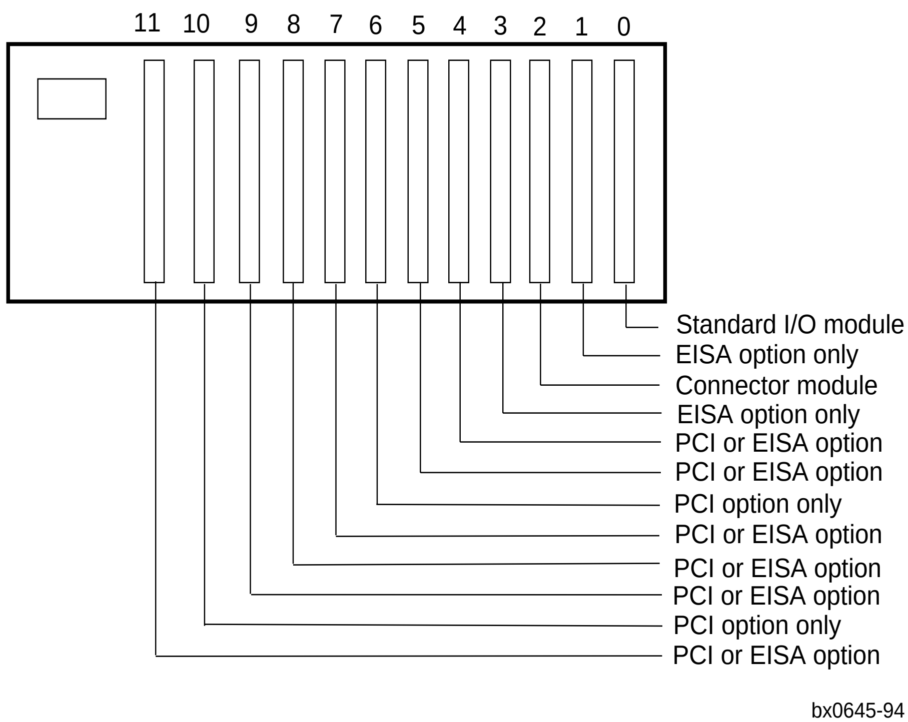
- Shelves house options in the main and expander cabinets. The options are:
  - PCI I/O devices
  - StorageWorks disk drives
- Shelf space is located in the lower half of the main cabinet and in both halves of the expander cabinet.
- Two StorageWorks shelves can occupy one shelf space; one shelf is installed from the front of the cabinet, the other shelf is installed from the rear of the cabinet.
- One PCI shelf occupies one shelf space.

Configuration rules for each of these options are discussed in the following sections.

8.6.1 PCI Shelf

The PCI shelf houses a PCI card cage and power regulator. The PCI shelf is in the bottom half of the main cabinet or expander cabinet. Each shelf may contain PCI options only, or PCI and EISA options. Only one PCI/EISA shelf is allowed in a system. Figure 5-9 shows the PCI/EISA slot configuration rules.

Figure 8–9 PCI Shelf and Slot Assignments



About the PCI Shelf

- The maximum number of PCI shelves in the main cabinet is 3**.**
- The maximum number of PCI shelves in an expander cabinet is 4.
- The maximum number of PCI shelves in a system is 11.

PCI Shelf Configuration Rules

- Each PCI shelf occupies one front-to-rear shelf space.

PCI Configuration Rules

- In a PCI configuration (no KFE70 and no EISA options), all 12 slots are available for PCI options.
- In a PCI/EISA configuration, a maximum of 10 slots are available for PCI or EISA options. Slots 0 and 2 are reserved for the standard I/O module and the connector module, respectively. Table 8–1 lists the rules for each slot in a PCI/EISA configuration.

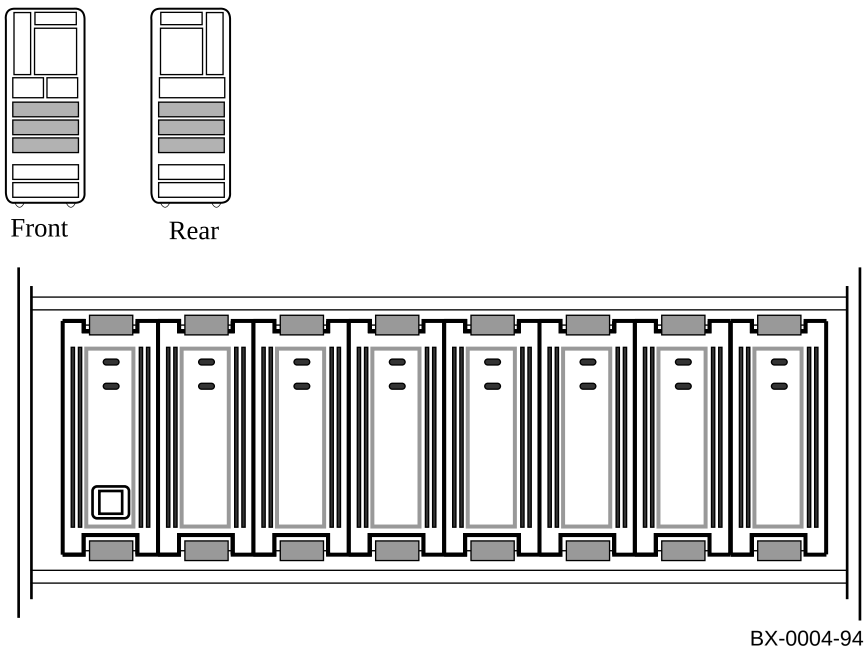
Table 8–1 PCI/EISA Configuration Rules (KFE70 Installed)

Slot	Usage
0	Standard I/O module (PCI-to-EISA bridge)
1	EISA option only
2	Connector module (floppy, keyboard, and mouse)
3	EISA option only
4	PCI or EISA option
5	PCI or EISA option
6	PCI option only
7	PCI or EISA option
8	PCI or EISA option
9	PCI or EISA option
10	PCI option only
11	PCI or EISA option

8.6.2 StorageWorks Shelf

The StorageWorks shelf houses disk drives and a power regulator. StorageWorks shelves can be located in the bottom half of the main cabinet and in any shelf space available in the expander cabinet.

Figure 8–10 StorageWorks Shelf



About the StorageWorks Shelf

- The maximum number of StorageWorks shelves in the main cabinet is six.
- The maximum number of StorageWorks shelves in an expander cabinet is sixteen.
- Each shelf contains seven storage slots and one slot for the power regulator.

StorageWorks Shelf Configuration Rules

Two StorageWorks shelves can be installed in one shelf space. One shelf is installed at the front of the cabinet; the other is installed at the rear of the cabinet.

Chapter 9

Cabinet Control System

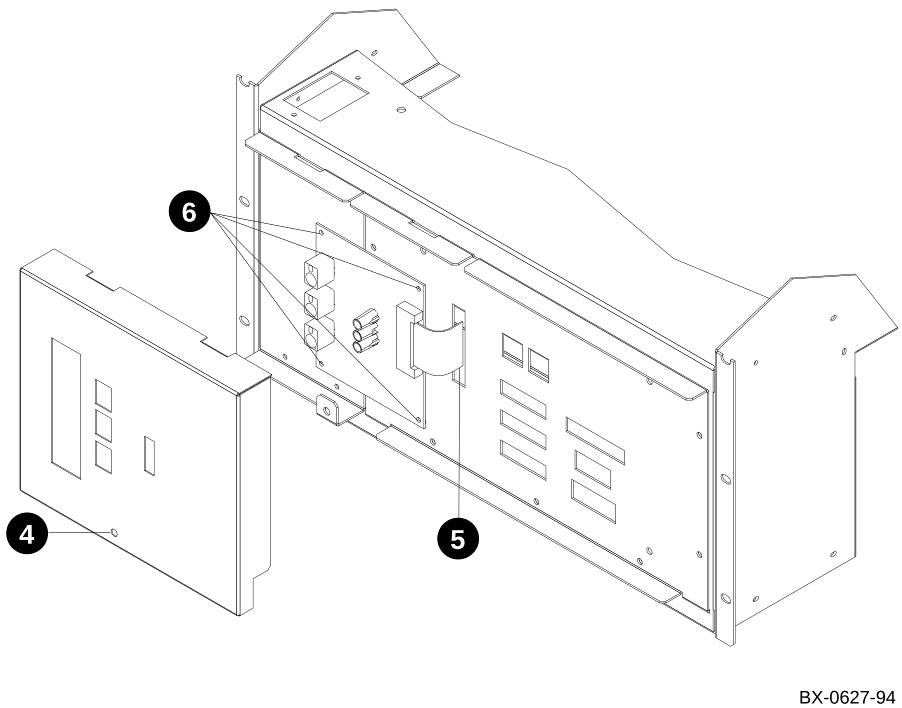
This chapter contains the following sections:

- Control Panel Removal and Replacement
- Cabinet Control Logic Module Removal and Replacement

9.1 Control Panel Removal and Replacement

The control panel bezel attaches to the cabinet with a black plunger located at the bottom center of the bezel. The circuit board attaches to the cabinet with four small screws. Access is from the front of the cabinet.

Figure 9–1 Control Panel



Removal

1. Open the front cabinet door.
2. Push the control panel On/Off button to Off.
3. At the rear of the cabinet, shut the circuit breaker off by pushing down the handle.
4. Pull the black plunger (see ❹) and remove the control panel bezel.
5. Disconnect the 17–04046–01 cable from J9 on the CCL panel (see ❺).
6. Remove the four screws that attach the control panel circuit board to the cabinet (see ❻).
7. Remove the control panel circuit board.

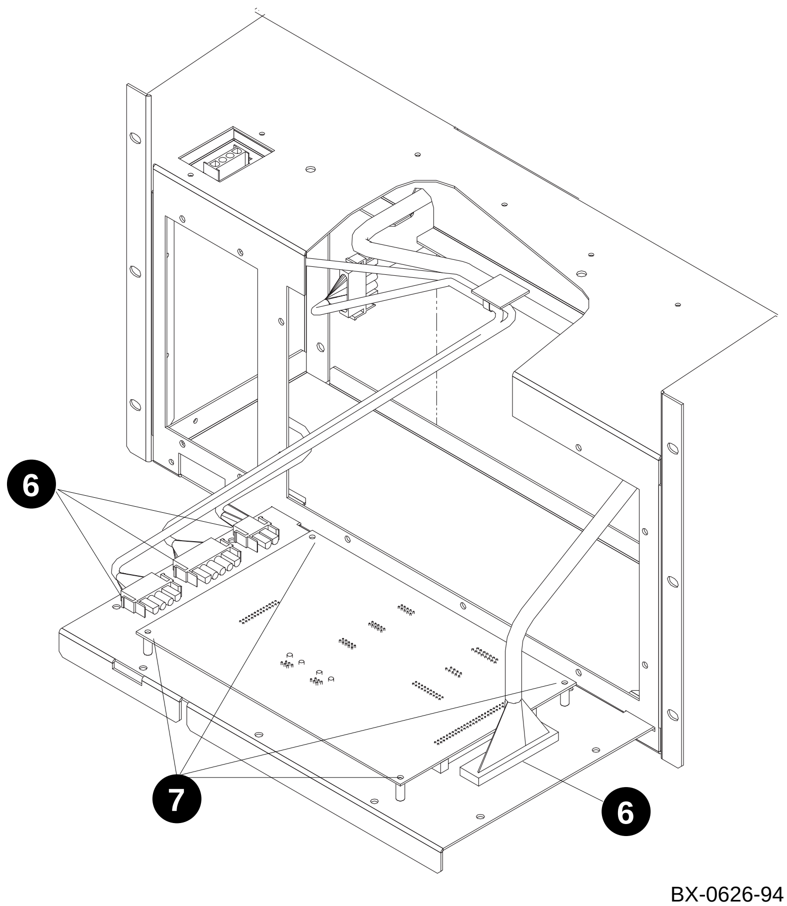
Replacement

Reverse steps in the Removal procedure.

9.2 Cabinet Control Logic Module Removal and Replacement

The cabinet control logic (CCL) module is mounted behind the CCL panel. The CCL module is held in place by four Phillips screws. Access is from the front of the cabinet.

Figure 9–2 Cabinet Control Logic Module



Removal

1. Open the front cabinet door.
2. Push the control panel On/Off button to Off.
3. At the rear of the cabinet, shut the circuit breaker off by pushing down the handle.
4. Remove the control panel (see Section 9.1).
5. Disconnect these cables from the CCL module:
   a. 17–04018–01 from J2 (EXTERNAL POWER ENABLE)
   b. 17–04045–01 from J3 (POWER COMM 1)
   c. 17–04045–01 from J4 (POWER COMM 2), in dual-power regulator systems
6. Remove the ten Phillips screws that hold the CCL panel and module in place. The panel hinges downward. Disconnect these cables from the CCL module:
   a. 17–04103–02 from J11
   b. 17–04051–01 from J10
   c. 17–04050–01 from J6
   d. 17–04048–01 from J1
7. Remove the four Phillips screws that hold the CCL module to the CCL panel.
8. Lift the CCL module off.

Replacement

Reverse steps in the Removal procedure.

NOTE: After connecting all the cables to the CCL module, be careful not to damage the cables when you reattach the module to the cabinet.

Chapter 10

Power System

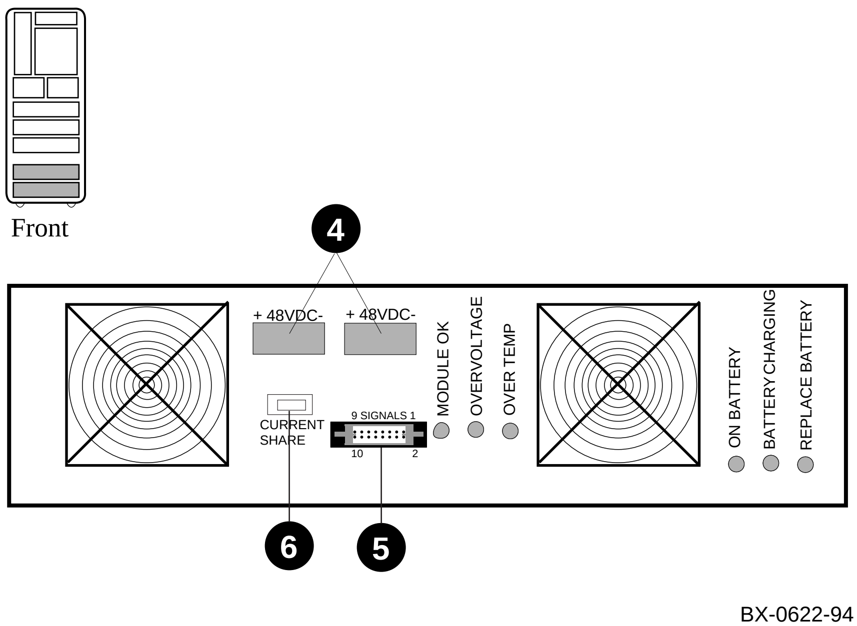
This chapter contains the following sections:

- Power Regulator Removal and Replacement
- BBU Option Removal and Replacement
  - Battery Pack Removal and Replacement
  - Charger Board Removal and Replacement
- Power Strip Removal and Replacement
- Blower Removal and Replacement

10.1 Power Regulator Removal and Replacement

The power regulator is very heavy. Two people are required to remove the power regulator from the cabinet.

Figure 10–1 Power Regulator



Removal

1. Open the front cabinet door and remove the rear door.
2. Push the control panel On/Off button to Off.
3. Shut the power regulator circuit breaker off by pushing down on the handle and disconnect the AC power cord.

   NOTE: In a dual power regulator system, shut the power strip circuit breaker off, and then shut off each circuit breaker on the two power regulators.
4. At the front of the cabinet, disconnect the two 48 VDC cables from the power regulator (see ❹).
5. Disconnect the 17–04045–01 signal cable from the power regulator (see ❺).
6. In a dual power regulator system, disconnect the CURRENT SHARE cable (see ❻) and the two 48 VDC cables.
7. Remove the two Phillips screws that attach the power regulator to the cabinet brackets.
8. Clip the tie-wraps that secure the cables to the front of the power regulator.
9. At the rear of the cabinet, disconnect the power cord.
10. Carefully slide the power regulator out from the rear of the cabinet.

Replacement

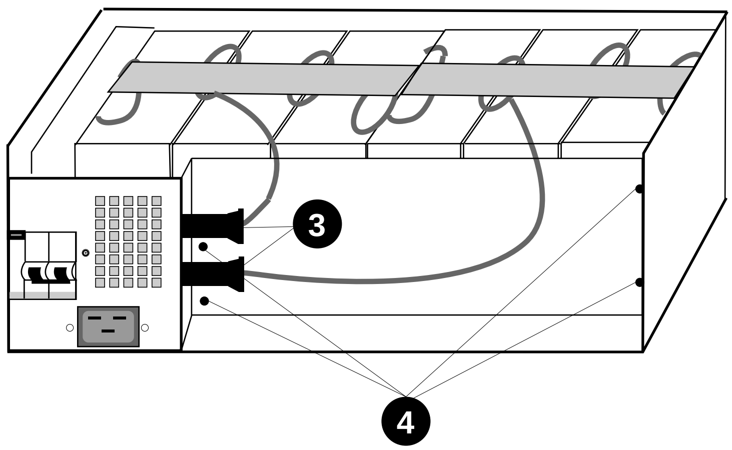
- Reverse the steps in the Removal procedure.

10.2 BBU Option Removal and Replacement

10.2.1 Battery Pack Removal and Replacement

You must replace the BBU option battery packs every two years. Be careful when removing the battery packs; they are very heavy.

Figure 10–2 Accessing the BBU Option Battery Packs



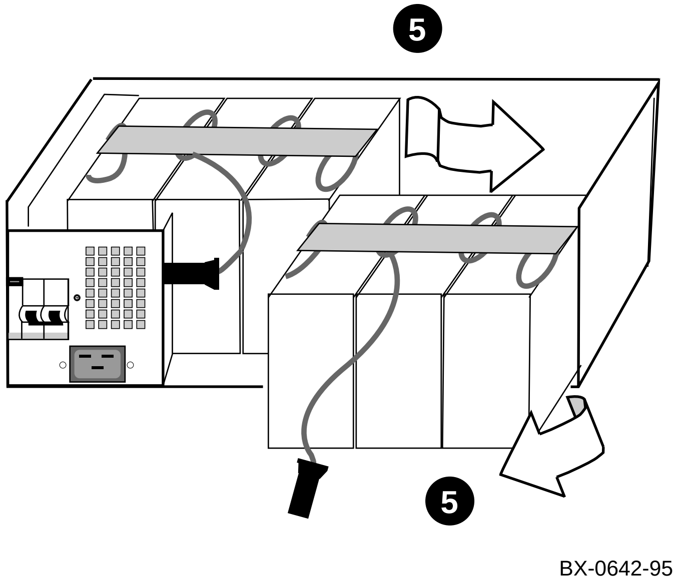
Removal

1. Remove the power regulator (see Section 10.1).
2. Remove the power regulator air outlet screen (two flathead screws from the side of the unit and 2 pan head screws from the rear of the unit).

   CAUTION: Each battery pack provides 72 volts of potential, even with the main power cable disconnected.
3. Unplug the battery cables (see ❸).
4. Remove the battery baffle by removing 2 flathead screws from the side of the unit and 2 nuts from the internal rear panel (see ❹).

   CAUTION: The battery packs are very heavy. Handle with extreme caution.
5. Remove the battery packs from the chassis by removing the pack on the right first and then sliding the left battery pack into the empty space to remove it (see Figure 10–3).

Figure 10–3 Removing the BBU Option Battery Packs



Replacement

- Reverse the steps in the Removal procedure.

Verification

- Check the power regulator LEDs. The BATTERY CHARGING LED should be on or flashing; the REPLACE BATTERY LED should be off.

REPLACEMENT OF BATTERIES: When batteries are replaced, use only batteries that are compatible with the product's electrical requirements and recharging circuitry, if applicable. Consult your local Digital Service Center for information and proper servicing. Lithium batteries, if contained in this product, are subject to special precautions.

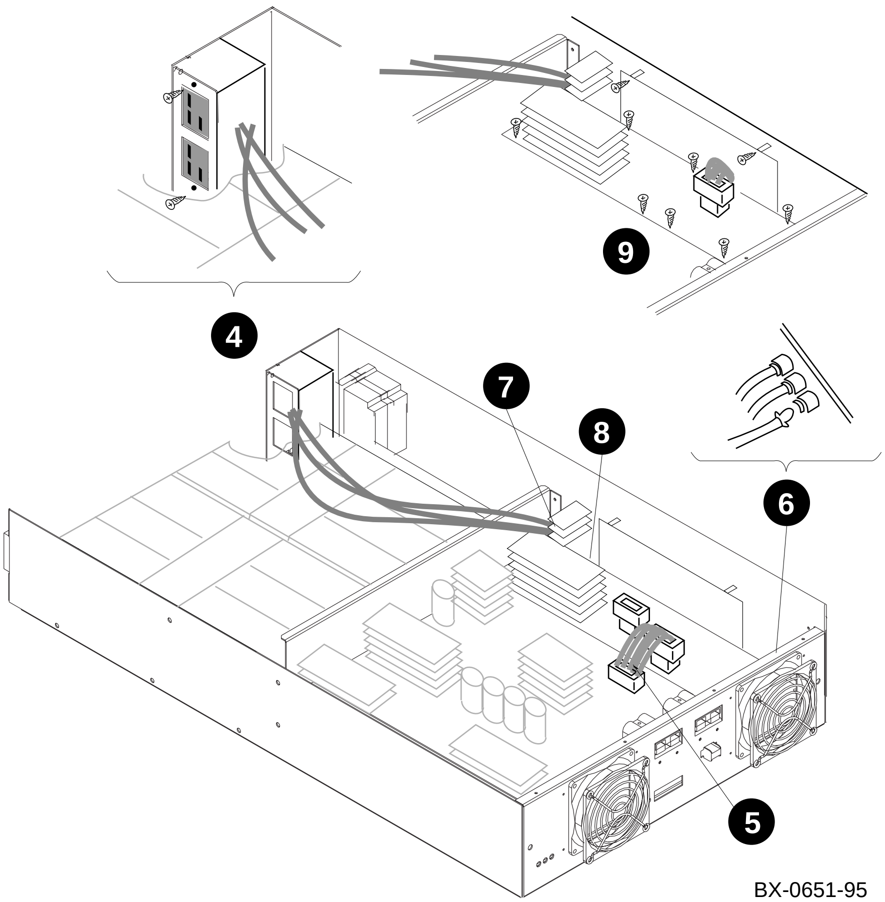
CAUTION: ***There is a danger of explosion if battery is incorrectly replaced.*** *Replace only with same or equivalent type recommended by the manufacturer. Dispose of used batteries according to local regulations, or consult your Digital Service Center.*

BATTERY DISPOSAL: Recycle or dispose of batteries contained in this product properly, in accordance with local regulations for the battery type as marked on the battery. Prior to disposal or recycling, protect batteries against accidental short circuiting by affixing non-conductive tape across battery terminals or conductive surfaces. If the battery is not marked, or if you require other information regarding batteries, consult your nearest Digital Service Center.

10.2.2 Charger Board Removal and Replacement

The charger board is located at the left rear corner of the power regulator. You must also remove the daughter card, which is attached to the side of the unit.

Figure 10–4 Charger Board Removal



Removal

1. Shut down the operating system and push the control panel On/Off switch to Off.
2. Shut the power regulator circuit breaker off. If the system has two power regulators, shut off both regulator circuit breakers and the power strip circuit breaker. Disconnect the AC power cord.
3. Remove the power regulator (see Section 10.1).
4. Remove the battery power connector plate by removing the two small Phillips screws (see ➍).
5. Disconnect the 16-pin cable connector at J6 on the 2400 watt power supply (see ➎).
6. Disconnect the three LED cables (see ➏).
7. Disconnect the five cables (2 red, 3 black) connected to the AC power filter board (see ➐).
8. Disconnect the 2-pin breaker sensor connector (see ➑).
9. Remove the nine screws that attach the charger board and daughter card to the power regulator chassis (see ➒).
10. Carefully lift the charger board up and toward the rear of the power regulator chassis. Be careful not to scrape the daughter card on the standoffs. Guide the battery power cables away from the other cables during removal.

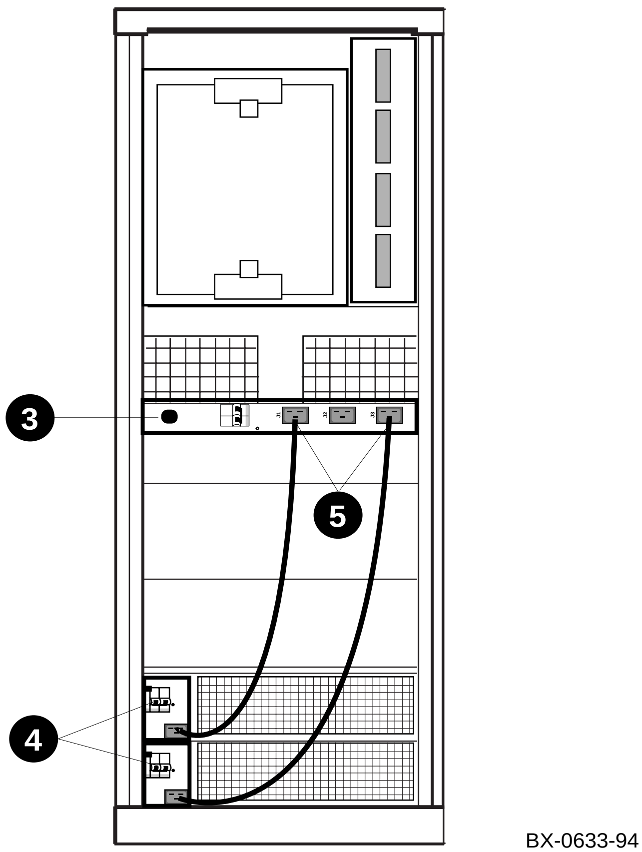
Replacement

- Reverse the steps in the Removal procedure.

10.3 Power Strip Removal and Replacement

The power strip is attached to the rear of the cabinet by four screws. The power strip is installed in dual-power regulator systems only.

Figure 10–5 Power Strip



Removal

1. Push the control panel On/Off button to Off.
2. Remove the rear cabinet door by loosening the two bolts at the bottom of the cabinet and lifting the door off the two brackets.
3. Unplug the power cord from the power strip (see ❸) and shut the circuit breaker off.
4. Shut the power regulator circuit breakers off by pushing down the handles (see ❹).
5. Unplug the power cables from the power strip. See ❺.
6. Remove the four Phillips screws that attach the power strip to the vertical rails.

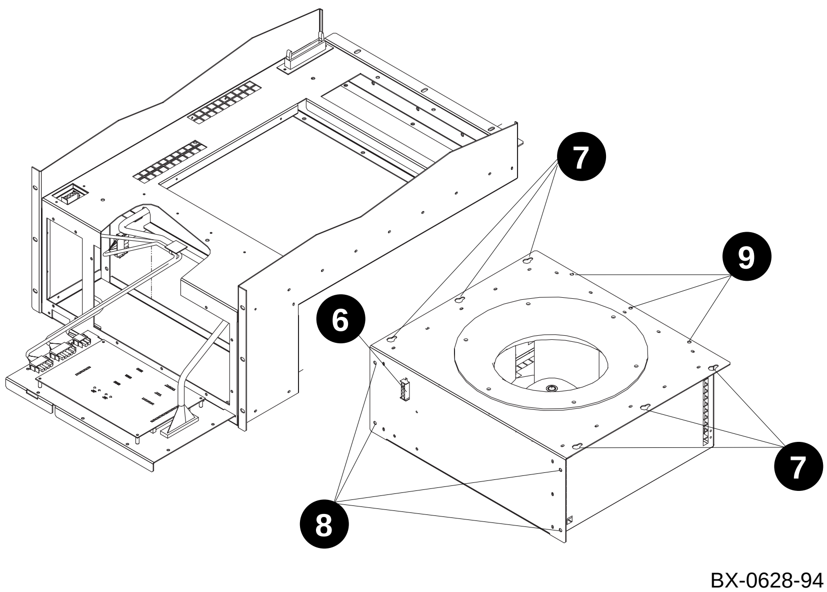
Replacement

- Reverse the steps in the Removal procedure.

10.4 Blower Removal and Replacement

The blower is attached to the PSU by 13 Phillips screws. Access to some of these screws is difficult. You will need a 1/4 inch drive ratchet with a 12 inch extension and a long Phillips screwdriver.

Figure 10–6 Blower



Removal

1. Shut down the operating system and push the control panel On/Off button to Off.
2. Shut the circuit breaker off and disconnect the AC power cord.
3. Open the front door and remove the rear door by loosening the two bolts at the bottom of the cabinet and lifting the door off the two brackets.
4. Remove the control panel (see Section 9.1).
5. Remove the CCL module (see Section 9.2).
6. Disconnect the CCL-to-blower power cable (see ❻).
7. At the rear of the cabinet, loosen the six Phillips screws (three on each side of the blower). These screws attach the blower to the PSU (see ❼).
8. Remove the four Phillips screws (two on each side of the blower) that attach the blower to the plate behind the control panel and CCL module (see ❽).
9. Remove the three Phillips screws located just above the blower (see ❾).
10. Remove the blower from the rear of the cabinet.

Replacement

- Reverse the steps in the Removal procedure.

Chapter 11

Processor System Unit

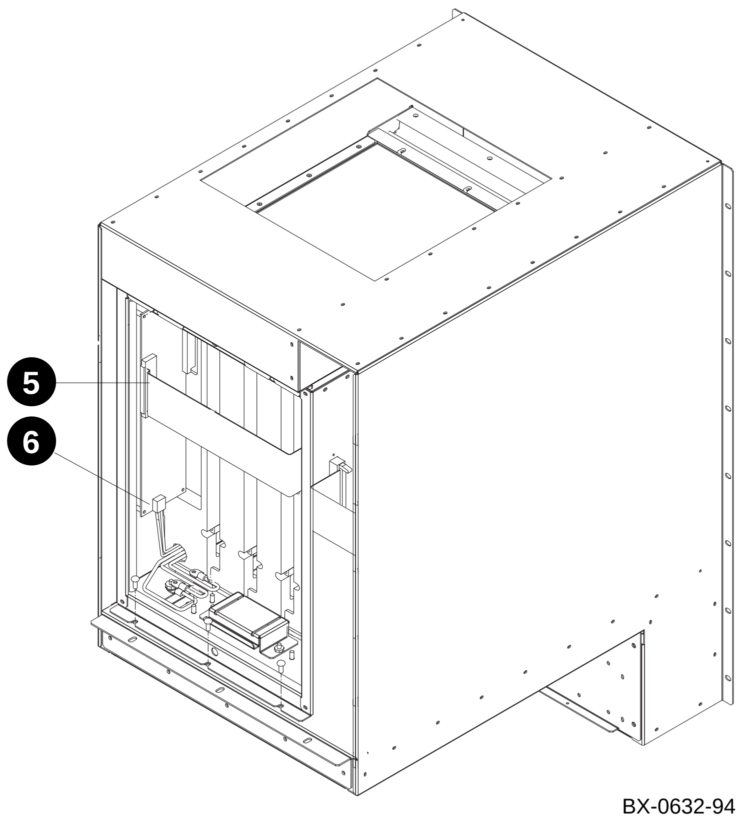
This chapter contains the following sections:

- Clock Module Removal and Replacement
- Terminator Module Removal and Replacement
- TLSB Card Cage Removal and Replacement
- Storage Drawer Removal and Replacement

11.1 Clock Module Removal and Replacement

The clock module is attached to the TLSB card cage by two screws. Access is from the rear of the cabinet.

Figure 11–7 Clock Module



Removal

1. Shut down the operating system and push the control panel On/Off button to Off.
2. Shut the circuit breaker off and disconnect the AC power cord.
3. Remove the rear door by loosening the two bolts at the bottom of the cabinet and lifting the door off the two brackets.
4. Remove the TLSB card cage cover by loosening the two captive screws.
5. Disconnect the 17–03122–01 cable (J3) from the clock module.
6. Disconnect the power cable (J4) from the clock module.
7. Remove the two small Phillips screws that secure the clock module to the card cage.
8. Remove the clock module.

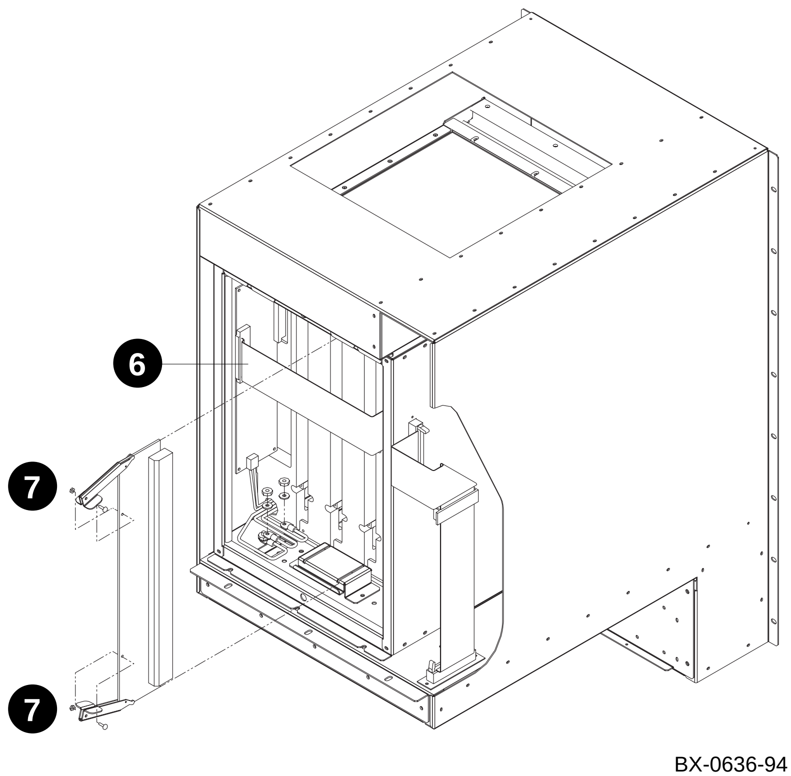
Replacement

- Reverse the steps in the Removal procedure.

11.2 Terminator Module Removal and Replacement

There are two terminator modules located at the rear of the TLSB card cage.

Figure 11–8 Terminator Module



Removal

1. Open the front door.
2. Push the control panel On/Off button to Off.
3. Shut the circuit breaker off by pushing down the handle.
4. Remove the rear door by loosening the two bolts at the bottom of the cabinet and lifting the door off the two brackets.
5. Remove the TLSB card cage cover by loosening the two captive screws.
6. Disconnect the 17–03122–01 cable (J3) from the clock module.
7. Remove the screw that holds each lock-in handle in place.
8. Open the handles and gently pull the terminator module out.

Replacement

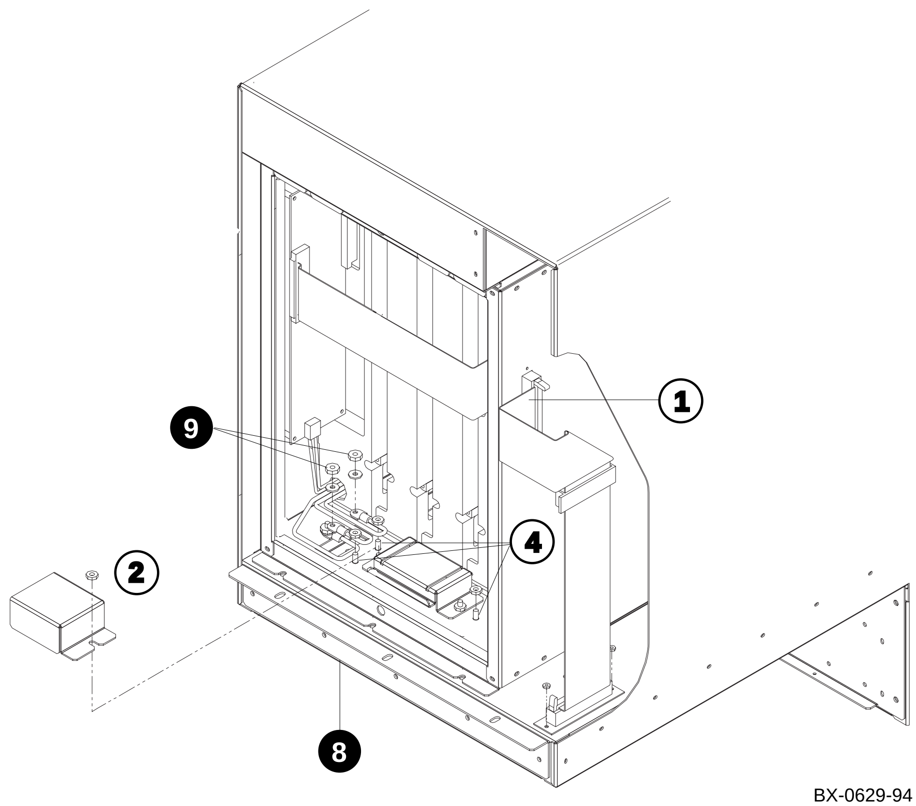
- Reverse the steps in the Removal procedure.

11.3 TLSB Card Cage Removal and Replacement

11.3.1 Prepare the Cabinet and Remove the Line Filter

First, remove the storage drawer. If necessary, remove the StorageWorks shelf and power strip. Then remove the line filter.

Figure 11–9 TLSB Line Filter



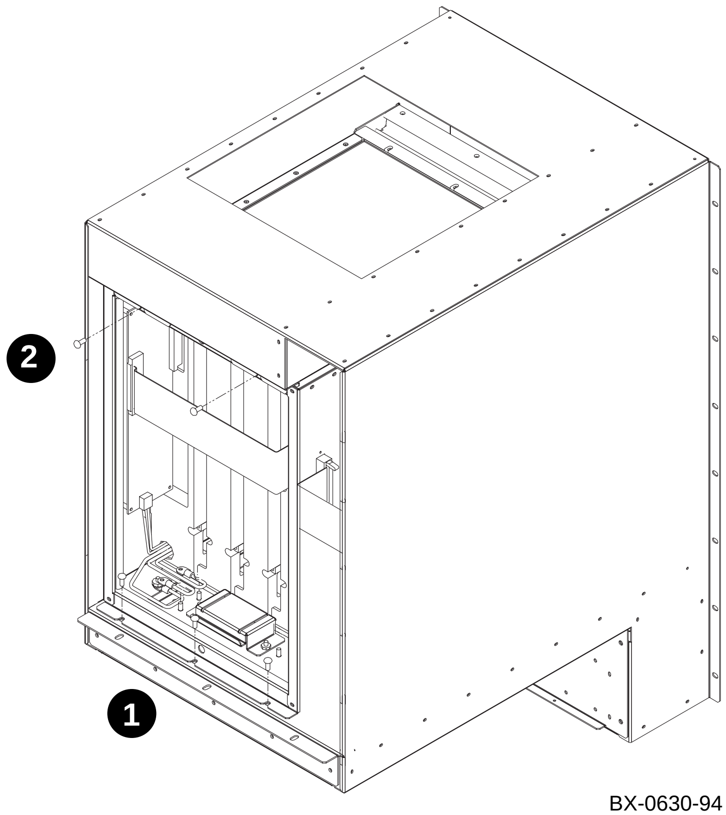
Removal

1. Open the front door and remove the rear door by loosening the two bolts at the bottom of the cabinet and lifting the door off the two brackets.
2. Push the control panel On/Off button to Off.
3. Shut the circuit breaker off and disconnect the AC power cord.
4. Remove the storage drawer (see Section 11.4).
5. If a StorageWorks shelf is located just below the PSU at the front of the cabinet, remove it.
6. If the system has a power strip, remove it.
7. Remove all modules from the TLSB card cage.
8. Remove the line filter cover plate at the bottom of the TLSB card cage by removing eight screws. See ❽.
9. Disconnect the power leads from the input side of the line filter by removing two #6 kepnuts (see ❾).
10. Remove the rear cover plate from the TLSB card cage by loosening the two captive screws.
11. Disconnect the clock module-to-CCL signal cable (17–04054–01). See ①.
12. Remove the safety shield by removing one kepnut. The safety shield covers the power leads. See ②.
13. Disconnect the power leads from the output side of the line filter.
14. Loosen the three kepnuts around the lower terminator module guide. See ④.
15. Grasp the line filter with one hand and then remove the three loosened kepnuts.

11.3.2 Remove the TLSB Card Cage

After preparing the cabinet and removing the line filter, remove the TLSB card cage by loosening or removing eight screws. Access is from the front and rear of the cabinet.

Figure 11–10 TLSB Card Cage (Rear View)



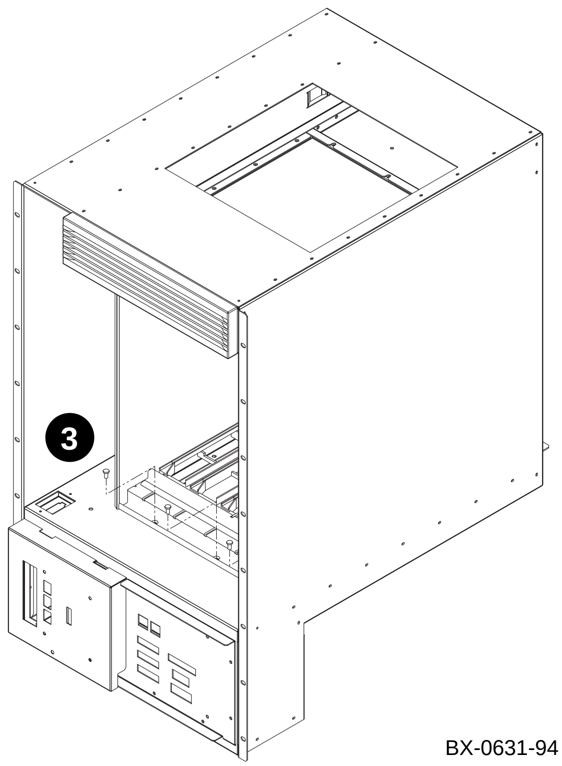
Removal

1. At the rear of the cabinet, loosen the three screws at the bottom of the card cage. See ❶.
2. Remove the two screws at the top of the card cage. See ❷.
3. At the front of the cabinet, remove the three flathead screws at the bottom of the card cage. See ❸.
4. Gently lift the card cage out from the front of the cabinet. The card cage sits in a recessed open area. *Be careful not to damage the gasket around the bottom of the card cage.*

Replacement

- Reverse the steps in the Removal procedure.

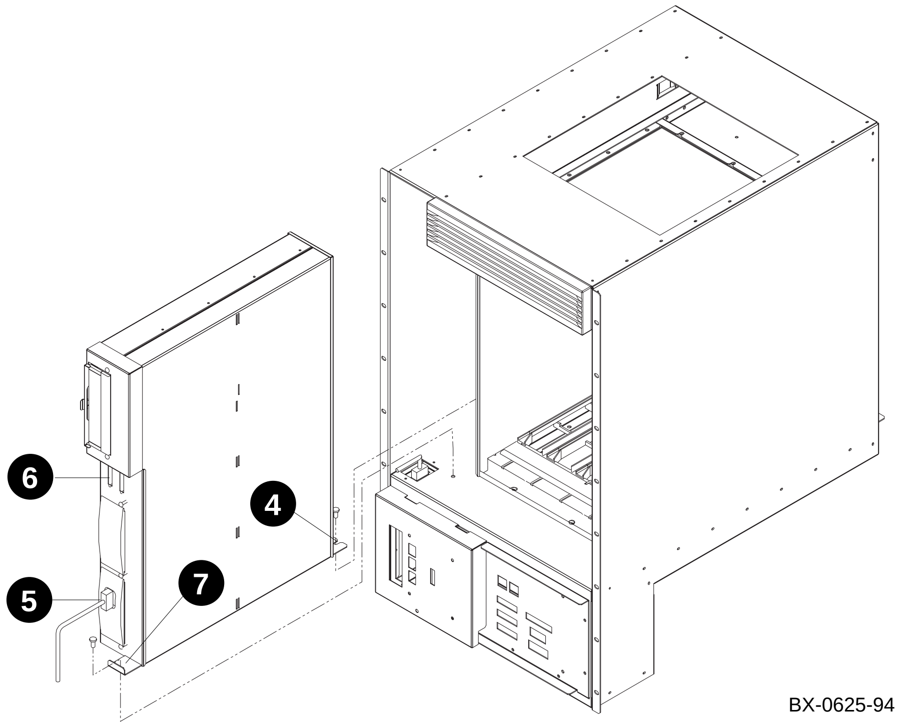
Figure 11–11 TLSB Card Cage (Front View)



11.4 Storage Drawer Removal and Replacement

The storage drawer is attached to the processor system unit by two screws. Remove the storage drawer from the front of the cabinet.

Figure 11–12 Storage Drawer



Removal

1. Shut down the operating system and push the control panel On/Off button to Off.
2. Shut the circuit breaker off and disconnect the AC power cord.
3. Open the front door and remove the rear door by loosening the two bolts at the bottom of the cabinet and lifting the door off the two brackets.
4. At the rear of the cabinet, loosen the screw securing the storage drawer (see ❹).
5. At the front of the cabinet, disconnect and remove the StorageWorks power supply cable (17–04049–01). See ❺.
6. Disconnect the Ethernet cables (see ❻).
7. Remove the screw securing the storage drawer (see ❼).
8. Gently pull the storage drawer out from the front of the cabinet.

Replacement

- Reverse the steps in the Removal procedure.

Chapter 12

PCI Shelves

This chapter contains the following sections:

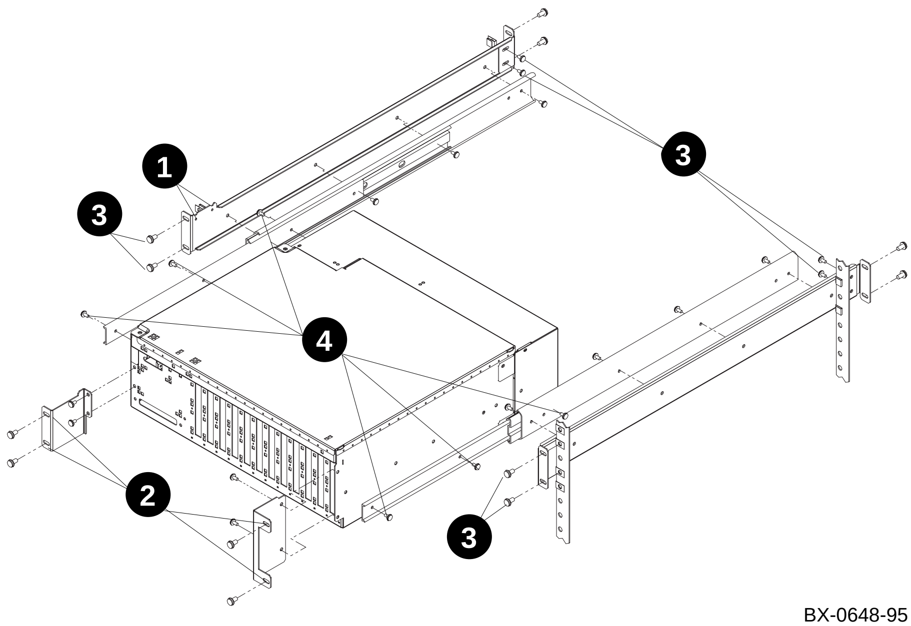
- PCI Shelf Removal and Replacement
- Fan Removal and Replacement

See Chapter 20 for the PCI shelf power board and mother board removal and replacement procedures.

12.1 PCI Shelf Removal and Replacement

To access the fans, you must remove the the PCI shelf from the cabinet. See Section 12.2 for the fan removal and replacement procedure.

Figure 12–1 PCI Shelf



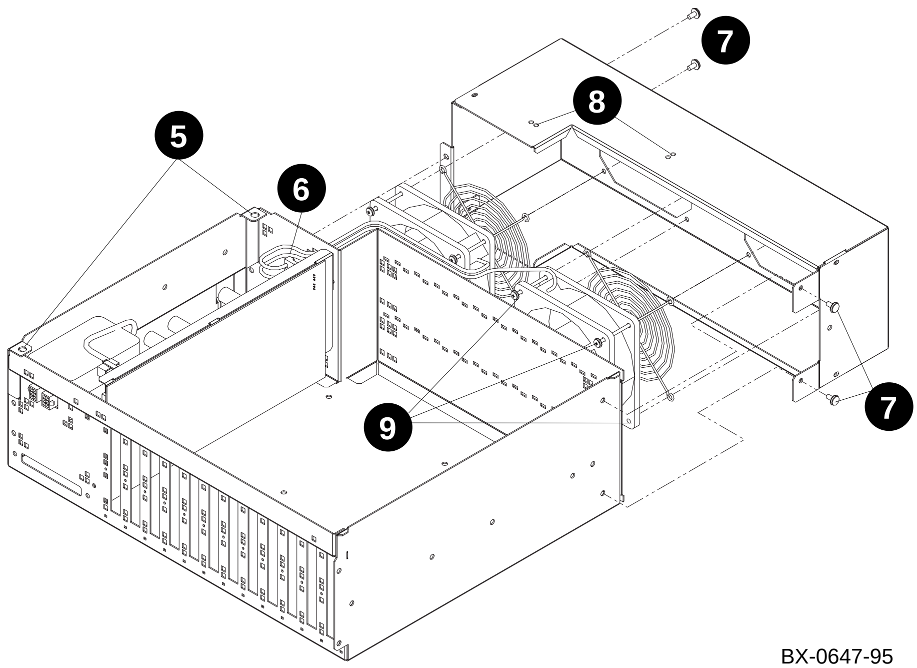
Removal

1. Shut down the system. Disconnect any hose cables or external I/O cables from the PCI shelf. Disconnect the power cable and clip the two tie-wraps that hold the cable to the cabinet rail (see ❶).
2. Remove the four mounting screws (see ❷).
3. Remove the eight bracket screws (see ❸) and gently lift the PCI shelf out of the cabinet.
4. Remove the six screws that connect the PCI shelf to the rail/slide assemblies (see ❹).

12.2 Fan Removal and Replacement

There are two PCI shelf fans. To access the fans, remove the top cover and the fan tray assembly.

Figure 12–2 PCI Fans



Removal

1. To remove the top cover, turn the two quarter-turn fasteners to the left (see ❺).
2. Disconnect the two fan power cable connectors (see ❻).
3. Remove four screws to disconnect the fan tray assembly (see ❼).
4. Clip the two tie-wraps (see ❽).
5. Remove the four screws that secure the fan to the shelf (see ❾).

Replacement

- Reverse the steps in the Removal procedure.

Chapter 13

StorageWorks Shelves

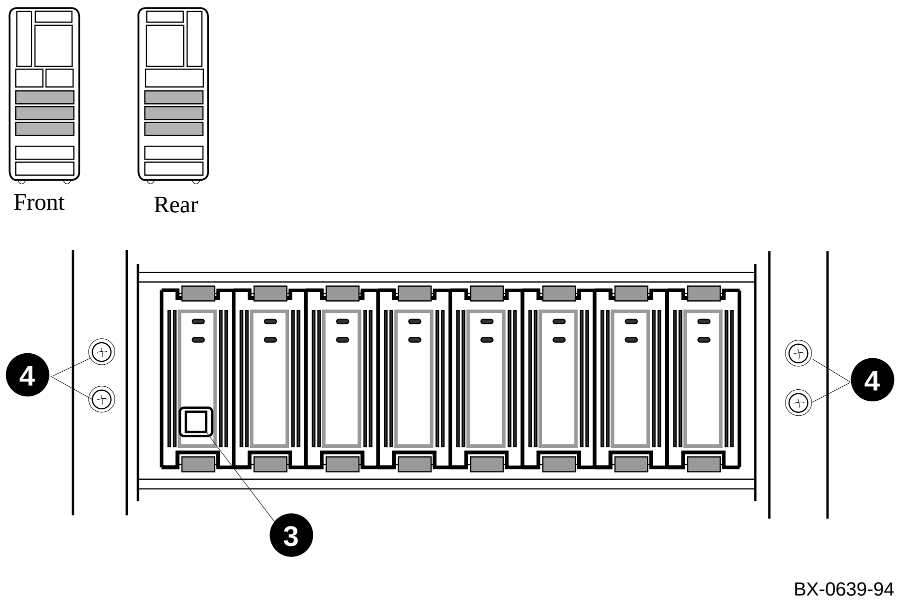
This chapter contains the following sections:

- StorageWorks Shelf Removal and Replacement
- Disk Removal and Replacement
- Power Supply Removal and Replacement

13.1 StorageWorks Shelf Removal and Replacement

The StorageWorks shelf is secured to the cabinet vertical rails by four Phillips screws.

Figure 13–1 StorageWorks Shelf



Removal

1. Open the front door.
2. Push the control panel On/Off button to Off.
3. Disconnect the power cable. See ❸.
4. Remove the four Phillips screws that secure the shelf to the vertical rails. See ❹.
5. Slide the shelf out of the cabinet.

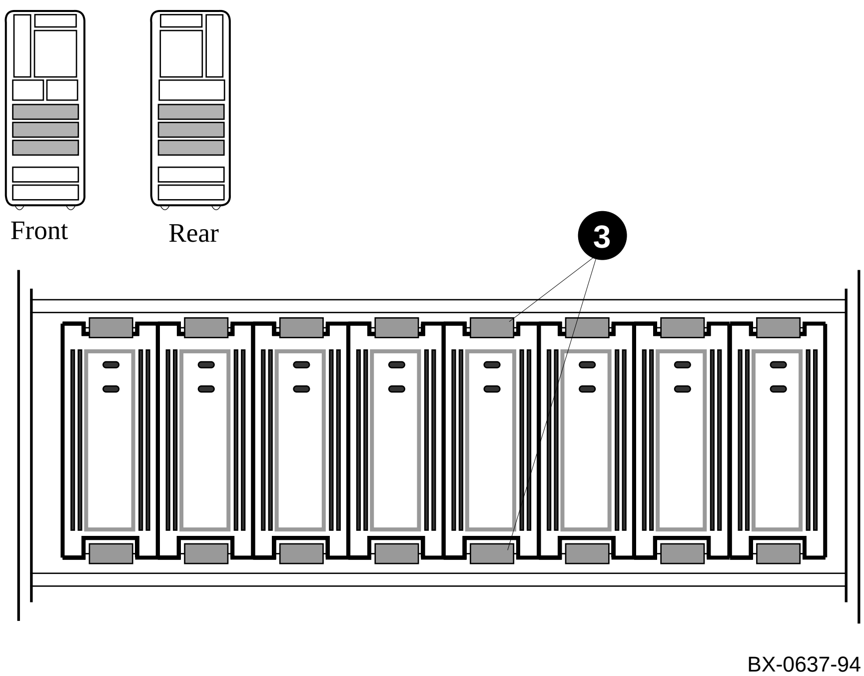
Replacement

- Reverse the steps in the Removal procedure.

13.2 Disk Removal and Replacement

Press both mounting tabs in and slide the disk drive out of the shelf. Use both hands to fully support the weight of the drive.

Figure 13–2 StorageWorks Disk



Removal

1. Open the front door.
2. Push the control panel On/Off button to Off.
3. Press in both mounting tabs on the disk drive (see ❸).
4. Slide the disk drive out of the shelf.

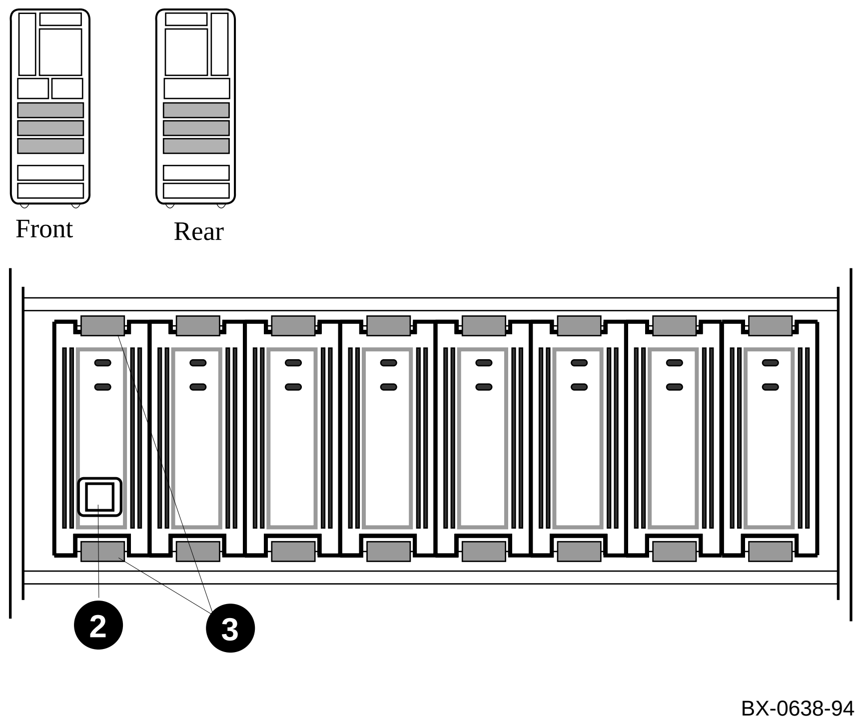
Replacement

1. Insert the disk in the guide slots.
2. Push the drive in until the mounting tabs lock in place.

13.3 Power Supply Removal and Replacement

Disconnect the cable from the power supply. Press the mounting tabs in and slide the power supply out of the shelf. Use both hands to fully support the weight.

Figure 13–3 StorageWorks Power Supply



Removal

1. Push the control panel On/Off button to Off.
2. Disconnect the input power cable from the power supply. See ❷.
3. Press in both mounting tabs on the power supply. See ❸.
4. Using both hands to support the weight, slide the power supply out of the shelf.

Replacement

1. Insert the power supply in the guide slots.
2. Push the power supply in until the mounting tabs lock in place.
3. Connect the input power cable.

Part 4

AlphaServer 8400

Chapter 14

Field-Replaceable Units

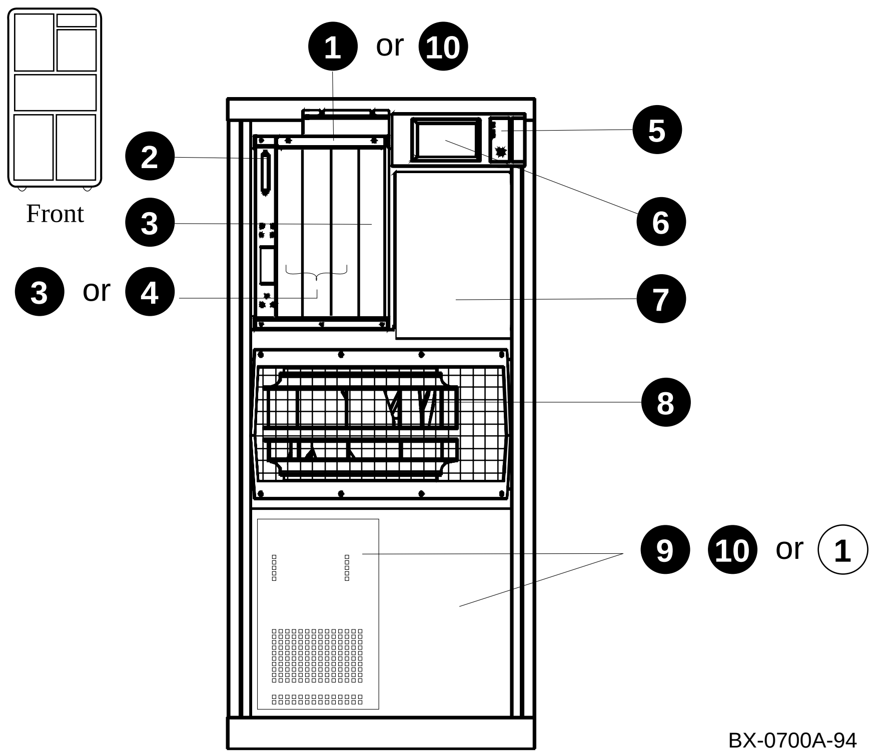
This chapter shows the location of all field-replaceable units (FRUs) in the AlphaServer 8400 system. It contains the following sections:

- FRUs Accessible from the Front of the Cabinet
- FRUs Accessible from the Rear of the Cabinet
- FRUs in the Battery Cabinet
- FRUs in the PCI Plug-In Unit
- FRUs in the XMI Plug-In Unit
- FRUs in the Futurebus+ Plug-In Unit
- FRUs in the SCSI Storage Plug-In Unit
- FRUs in the DSSI Disk Plug-In Unit
- FRUs in the Battery Plug-In Unit
- Cables

14.1 FRUs Accessible from the Front of the Cabinet

FRUs that can be accessed from the front of the cabinet include the TLSB centerplane and card cage, the system clock module, some logic modules, the control panel, the power regulators, the blower, and some plug-in units.

Figure 14–1 Platform Cabinet (Front) Showing FRU Locations



❶	70–29332–01	TLSB centerplane and card cage[1 2]
❷	54–21728–01	System clock module
❸	KN7CC–AA or KN7CC–AB	E2056–CA single-processor module E2056–DA dual-processor module[2]
❹	MS7CC–BA or	E2035–BA memory module 128 Mbytes[2 3] (includes 16 54–21724–01 SIMMs)
	MS7CC–CA or	E2035–CA memory module 256 Mbytes[2 3] (includes 32 54–21724–01 SIMMs)
	MS7CC–DA or	E2035–DA memory module 512 Mbytes[2 3] (includes 16 54–21726–01 SIMMs)
	MS7CC–EA or	E2035–EA memory module 1 Gbytes[2 3] (includes 32 54–21726–01 SIMMs)
	MS7CC–FA	E2036–AA memory module 2 Gbytes[2 3] (includes 36 54–21718–01 SIMMs)
❺	54–20306–01	Control panel[2]
❻	RRDCD–CA	CD-ROM drive[1] (may include a KFE70–AA floppy drive)
❼	30–39348–01 or 30–33796–0x	H7264 power regulator (single phase) H7263 power regulator (three phase)
❽	12–35173–01	Blower[1]
❾	DWLMA–xx[4]	XMI plug-in unit[1]
❿	BA655–AB or BA654–AA	SCSI disk plug-in unit[5] DSSI disk plug-in unit[3 5]
①	H7237–AA	Battery plug-in unit[1] (includes 1 to 3 H7238–AA battery packs)

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1 Access to both the front and the rear of the cabinet is required.

2 This FRU is in the main cabinet only (cannot be located in the expander cabinet).

3 This FRU can be located in either the front or the rear of the cabinet.

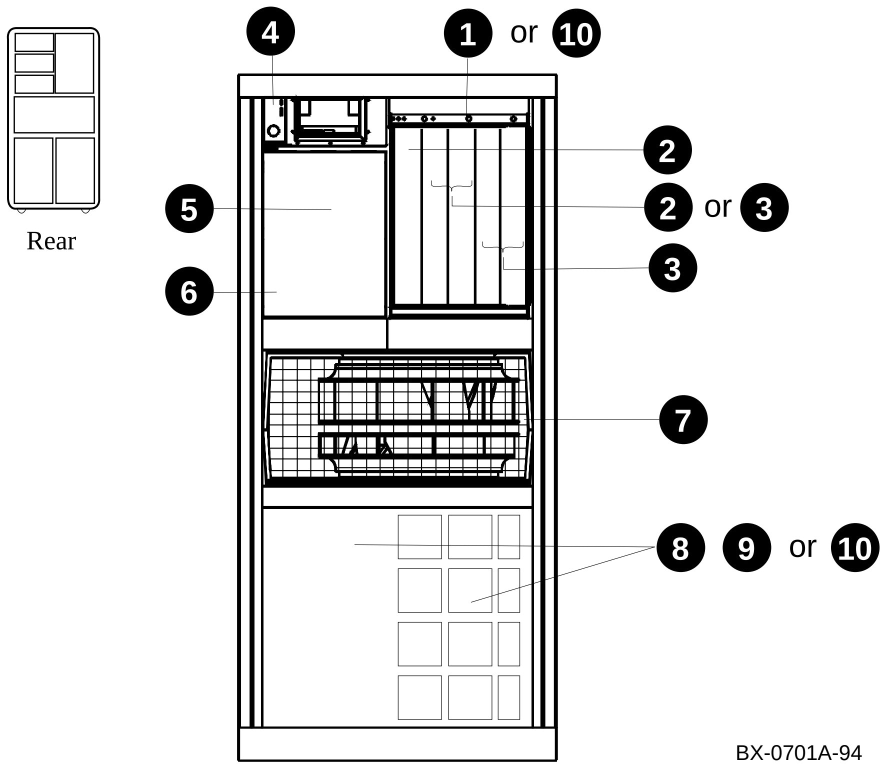
4 Replace -xx with -AA if in the main cabinet or with -BA if in the expander cabinet.

5 Located in the bottom of the main cabinet or in the top or bottom of the expander cabinet.

14.2 FRUs Accessible from the Rear of the Cabinet

FRUs that can be accessed from the rear of the cabinet include the TLSB centerplane and card cage, some logic modules, the removable media device, the DC distribution box, the AC input box, the blower, and some plug-in units.

Figure 14–2 Platform Cabinet (Rear) Showing FRU Locations



❶	70–29332–01	TLSB centerplane and card cage[6] [7]
❷	KFTIA–AA or KFTHA–AA	E2054–AA I/O module[2] E2052–AA I/O module[2]

[6] Access to both the front and the rear of the cabinet is required.

[7] This FRU is in the main cabinet only (cannot be located in the expander cabinet).

FRUs that may be included with the KFTIA module are:

	DEFPZ–AA[8]	Daughter card, SAS multimode fiber FDDI
	DEFPZ–UA	Daughter card, twisted-pair copper FDDI
	DJ–ML300–BA	Daughter card, NVRAM
	BN20W–0B	Y cable for FWD SCSI connection (CK–KFTIA–AA is cable with one terminator)
❸	MS7CC–BA or	E2035–BA memory module 128 Mbytes[2,9] (includes 16 54–21724–01 SIMMs)
	MS7CC–CA or	E2035–CA memory module 256 Mbytes[2,4] (includes 32 54–21724–01 SIMMs)
	MS7CC–DA or	E2035–DA memory module 512 Mbytes[2,4] (includes 16 54–21726–01 SIMMs)
	MS7CC–EA or	E2035–EA memory module 1 Gbyte[2,4] (includes 32 54–21726–01 SIMMs)
	MS7CC–FA	E2036–AA memory module 2 Gbytes[2,4] (includes 36 54–21718–01 SIMMs)
❹	54–20300–01	Cabinet control logic module (CCL)
❺	30–35143–01	DC distribution box[1] and
	12–17199–04	600 V fuse (three-phase only)
❻	30–39579–02 or	AC distribution box (single-phase)
	30–33798–0x	AC input box (three-phase)
❼	12–35173–01	Blower[1]
❽	DWLMA–xx[10] or	XMI plug-in unit[1]
	DWLAA–xx[5] or	Futurebus+ plug-in unit
	DWLPA–xx[11]	PCI plug-in unit
❾	BA655–AB or	SCSI disk plug-in unit[4,12]
	BA654–AA	DSSI disk plug-in unit[4,7]
❿	H7237–AA	Battery plug-in unit[1] (includes 1 to 3 battery packs, H7238–AA)

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[8] Either a DEFPZ–AA or a DEFPZ–UA can be installed at one time.

[9] This FRU can be located in either the front or the rear of the cabinet.

[10] Replace -xx with -AA if in the main cabinet or with -BA if in the expander cabinet.

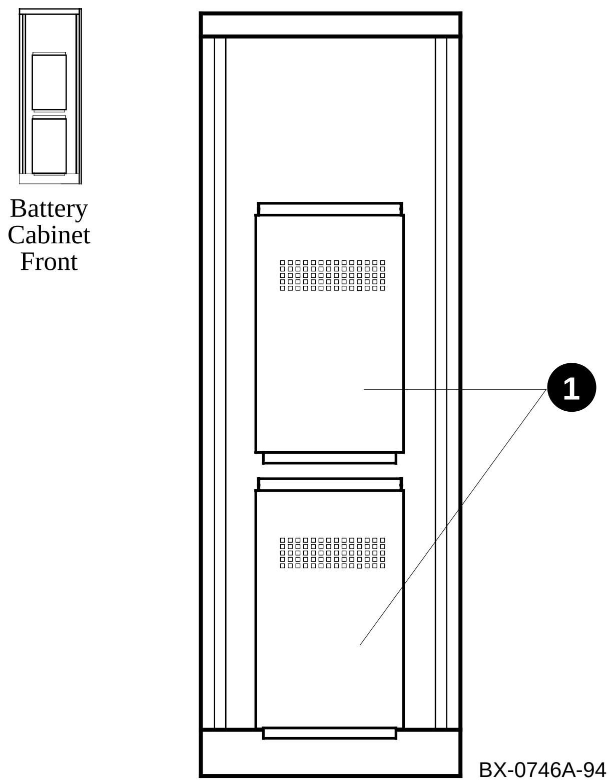
[11] Replace -xx with -AA if in the main cabinet (second shelf is DWLPA-BA) or with -AB if in the expander cabinet (second shelf is DWLPA-BB).

[12] Located in the bottom of the main cabinet or in the top or bottom of the expander cabinet.

14.3 FRUs in the Battery Cabinet

The optional battery cabinet contains two battery plug-in units.

Figure 14–3 Battery Cabinet Showing FRU Locations

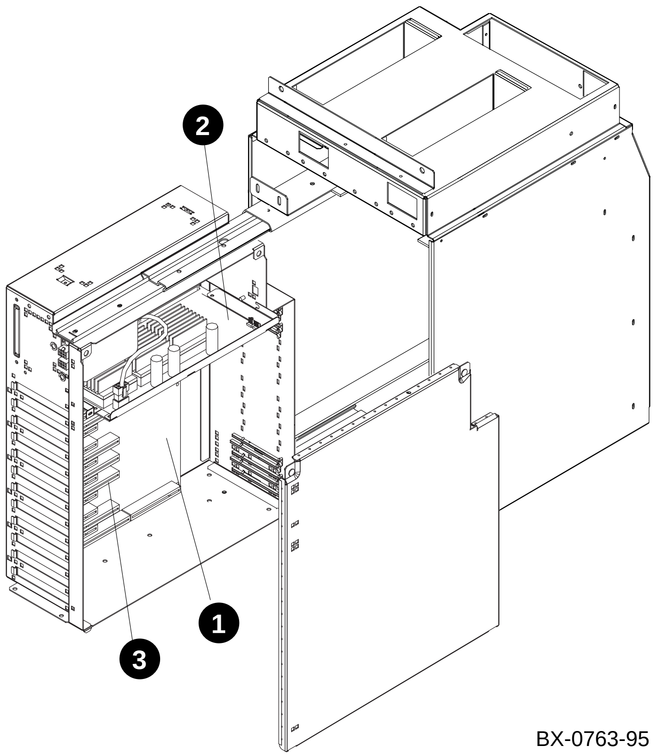


❶	H7237–AA	Battery plug-in unit (includes 1 to 3 battery packs, H7238–AA)

14.4 FRUs in the PCI Plug-In Unit

The PCI plug-in unit contains three kinds of FRUs, including the motherboard, power board, and option boards.

Figure 14–4 PCI Plug-In Unit Showing FRU Locations

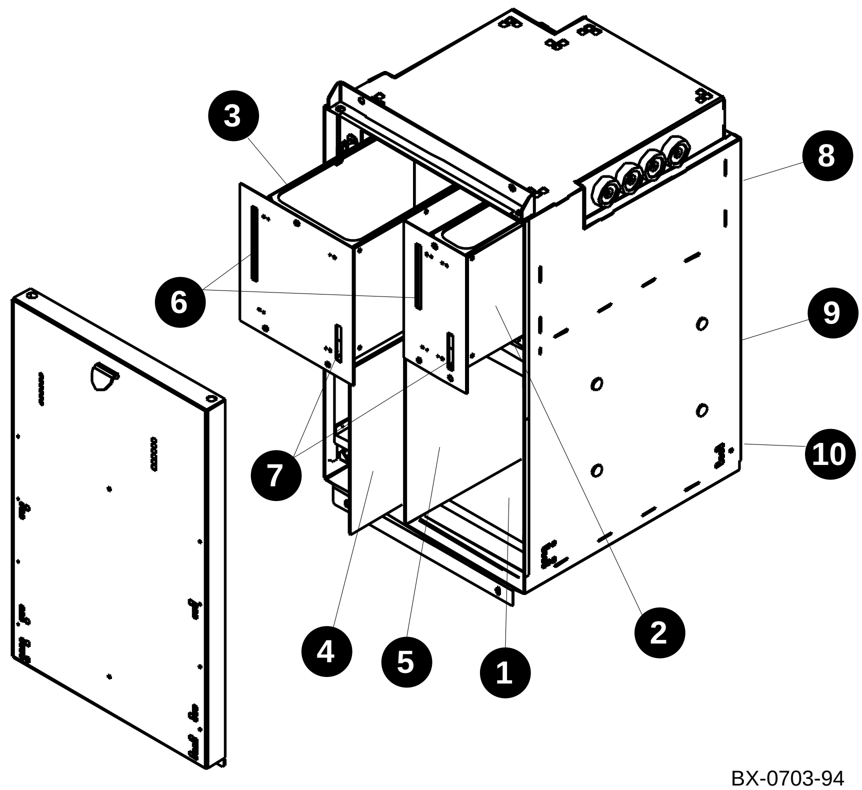


❶	54–23468–01	Motherboard
❷	54–23470–01	Power board
❸	Options	See Appendix B for information on finding a list of supported options. (Connectors only are shown in Figure 14–4.)

14.5 FRUs in the XMI Plug-In Unit

The XMI plug-in unit contains at least 11 FRUs, including the XMI backplane assembly, power regulators, logic modules, and cables.

Figure 14–5 XMI Plug-In Unit (Front) Showing FRU Locations



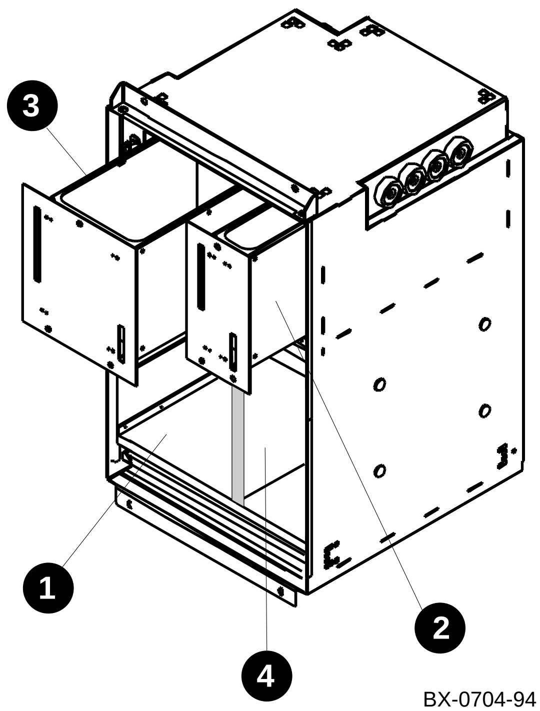
❶	70–30396–01	XMI backplane assembly
❷	30–36010–01	Module A (power regulator)
❸	30–36009–01	Module B (power regulator)
❹	T2028–AA	DWLMA module (TLSB to XMI — slot 8)
❺	T2030–YA	Clock and arbitration module (slot 7)
❻	17–03162–01	Signal cable
❼	17–03163–01	48V power cable
❽	17–03202–01	Power distribution cable (rear of PIU)
❾	17–03416–01	+5VB jumper (rear of PIU)
❿	17–03533–01	Bulkhead to XMI signal (rear of PIU)

NOTE: A module with an XMI corner must be in slot 1 or 14 of the XMI card cage.

14.6 FRUs in the Futurebus+ Plug-In Unit

The Futurebus+ plug-in unit contains four FRUs, including the backplane assembly, power regulators, and logic modules.

Figure 14–6 Futurebus+ Plug-In Unit (Front) Showing FRU Locations

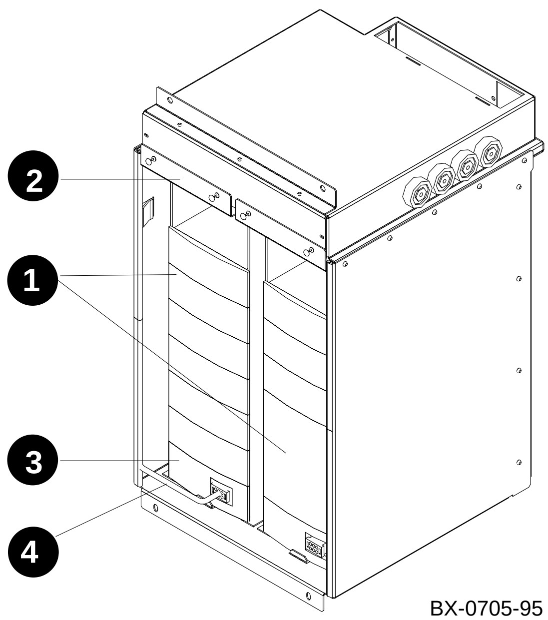


❶	54–21662–01	Futurebus+ backplane assembly
❷	30–36011–01	Module A2 (power regulator)
❸	30–36009–01	Module B (power regulator)
❹	B2003–AA	DWLAA module (TLSB to Futurebus+ — slot 5)

14.7 FRUs in the SCSI Storage Plug-In Unit

The SCSI storage plug-in unit contains four or more FRUs, including drives, one or two shelves, shelf power supply, and cables.

Figure 14–7 SCSI Disk Plug-In Unit (Front) Showing FRU Locations

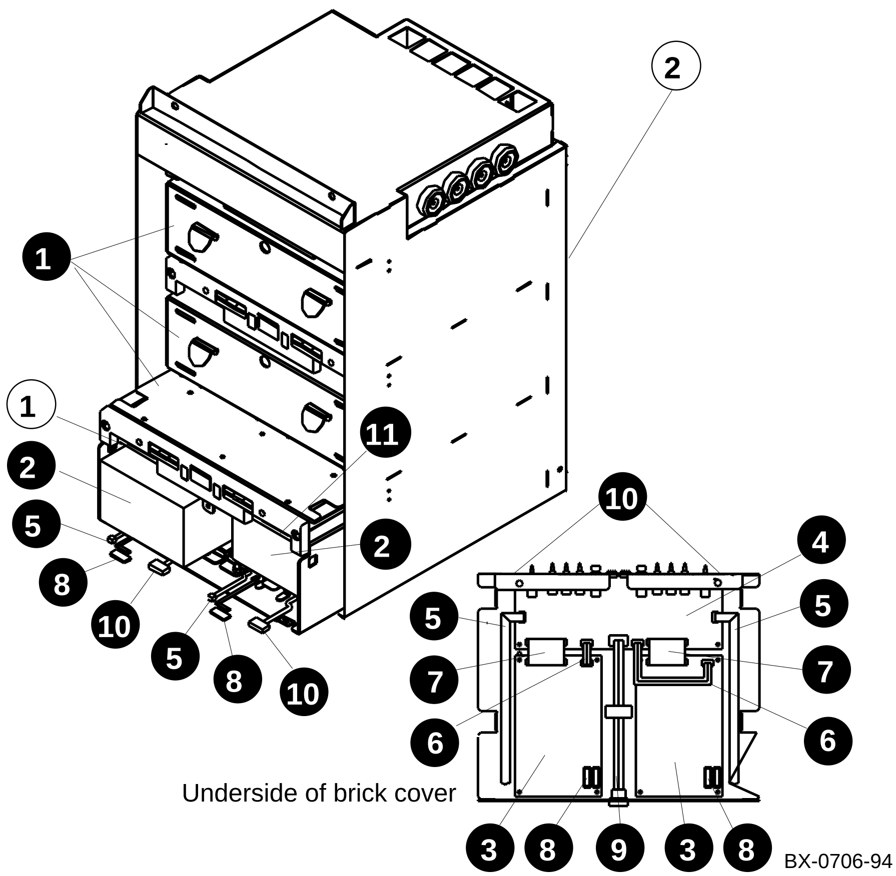


❶	Drive	3.5-inch or 5.25-inch drive (See Appendix B for information on finding a list of supported drives.)
❷	BA350–LA	Shelf
❸	H7430–AA	Shelf power supply
❹	17–03532–01	Power and signal cable

14.8 FRUs in the DSSI Disk Plug-In Unit

The DSSI disk plug-in unit contains 12 FRUs, including one or more disk bricks, disk drives, modules, HDAs, local disk converter, disk control panel, and cables.

Figure 14–8 DSSI Disk Plug-In Unit (Front) Showing FRU Locations



❶	Brick	Disk brick
❷	Drive	Disk drive (See Appendix B for information on finding a list of supported drives.)
❸	54–20868–01	Local disk converter (LDC)
❹	54–21664–01	Disk control panel
❺	17–03417–01	RF73 signal
❻	17–03418–01	LDC power
❼	17–03419–01	LDC signal
❽	17–03420–01	RF73 power
❾	17–03423–01	Disk control panel to bulkhead
❿	17–03424–01	DSSI bus
①	17–02382–0x	DSSI brick jumper cable (BC21Q–xx)
②	17–03422–01	Signal and power

❷ through ❿ are in each brick.

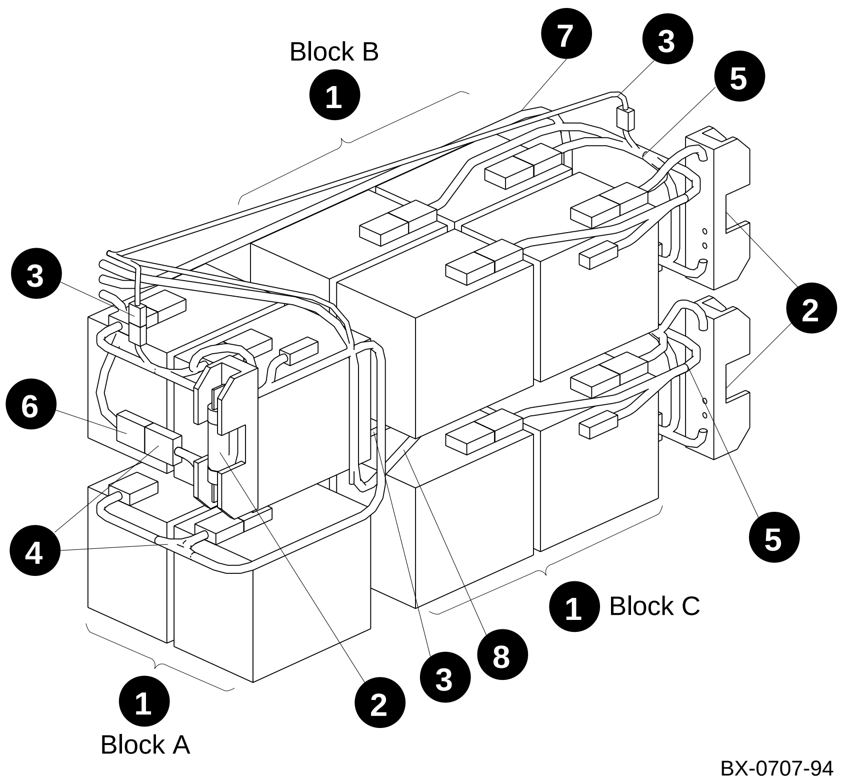
① connects the bricks to each other.

② runs up the center rear of the PIU enclosure.

14.9 FRUs in the Battery Plug-In Unit

The battery plug-in unit contains eight FRUs, including battery blocks, fuses, and cables.

Figure 14–9 Battery Plug-In Unit (Rear) Showing FRU Locations



NOTE: The battery plug-in unit is shown in Figure 14–9 without its enclosure.

❶	H7238–AA	Battery block (contains four 12–36168–02 batteries)
❷	12–39982–01	Fuse (LPN–RK–90)
❸	17–03421–01	Battery sensor cable
❹	17–03492–01	Intermediate cable, battery block A
❺	17–03493–01	Intermediate cable, battery block B or C
❻	17–03494–01	Power regulator A to battery block A
❼	17–03494–02	Power regulator B to battery block B
❽	17–03494–03	Power regulator C to battery block C

14.10 Cables

The system uses up to 36 different cables. Table 14–1 lists these cables and their locations. Note that some systems do not use every cable listed.

Table 14–1 Cables

Cable	Description	From	To
17–02440–01	Signal	LDC	CD-ROM
17–03085–01	I/O hose cable (2.9 m; 9.5 ft)	KFTIA or KFTHA	Plug-in unit in expander cabinet
17–03085–02	I/O hose cable (1.4 m; 4.5 ft)	KFTIA or KFTHA	Plug-in unit in main cabinet
17–03118–01	48V TLSB power	Power filter	DC distribution
17–03119–01*	48V power/signal 4-to-1	DC distribution box	Plug-in units (Q1-Q4) & CCL
17–03120–01	Signal	Control panel	CCL
17–03121–01	Signal	CCL	TLSB bulkhead
17–03122–01	Signal	TLSB bulkhead	TLSB backplane
17–03123–01	Signal	Removable media box LDC	CCL
17–03124–01	Signal (three-phase expander cabinet)	AC input	CCL

* To remove this cable:

1. Remove the right side panel (as viewed from the front of the cabinet).
2. Remove the screws on the strain relief clamps (visible from the side of the cabinet).
3. Remove all ends of the cable. These ends are at the CCL module, the DC distribution box, and the floating connector in each PIU quadrant. You must remove all PIUs to gain access to the floating connectors.

Table 14–1 Cables (Continued)

Cable	Description	From	To
17–03124–02	Signal (three-phase expander cabinet)	AC input	CCL
17–03125–01	Power	Power filter	TLSB backplane
17–03126–01	48V power/sense	DC distribution	Blower & CCL
17–03201–01	DEC power bus	Control panel	DEC power bus
17–03348–01	Signal	CD-ROM	Bulkhead
17–03442–01	Power/signal	DC distribution	PIUs (Q5-Q6) & CCL
17–03443–01	Power	LDC	Bulkhead
17–03444–01	Signal	LDC	Bulkhead
17–03499–05	Power cord, single-phase 60 Hz systems (US)	Wall	AC distribution
17–03500–02	Power cord, single-phase 50 Hz systems (Europe)	Wall	AC distribution
17–03508–01	Power	DC distribution	Removable media LDC
17–03511–02	Signal	54–21706–01 filter in expander cabinet	CCL in main cabinet
17–03511–03	Signal	54–21706–01 filter in expander cabinet	CCL in expander cabinet
17–03530–01	Signal	LDC	Bulkhead
17–03566–10	Signal	Removable media RX26 bulkhead	KFE70–AA

Table 14–1 Cables (Continued)

Cable	Description	From	To
17–03566–19	Signal	Removable media	KFTIA
17–03590–01	Ribbon cable	Single-phase regulator	Interconnect card
17–03591–01	Clustered cables	Single-phase regulator	AC input box
17–04178–02	Power	RX26 bulkhead	KFE70–AA
BN21H–02	Signal (2 m; 6.5 ft)	KFTIA	Rear BA350
BN21H–0H	Signal (.75 m; 2.5 ft)	KFTIA	RRDCD–CA
BN21H–03	Signal (3 m; 9.8 ft)	KFTIA	Front BA350 or rear BA350 expander
BN21H–03	Signal (3 m; 9.8 ft)	DWLPA-AA/AB	Front BA350
BN21H–01	Signal (1 m; 3.3 ft)	DWLPA-AA/AB	Adjacent BA350
BN21K–02	Signal (2 m; 6.5 ft)	KFTIA	DWZZA in rear BA350
BN21K–03	Signal (3 m; 9.8 ft)	KFTIA	DWZZA in front BA350 or in rear BA350 expander

Chapter 15

Configuration Rules

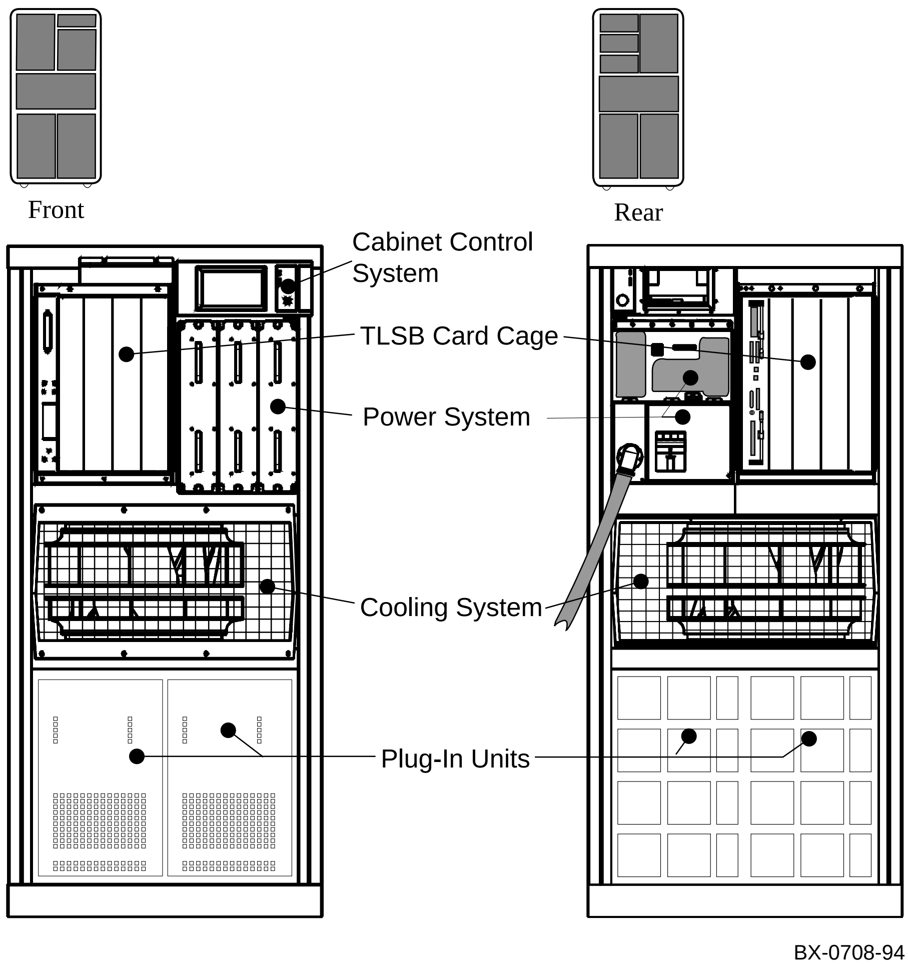
This chapter provides configuration information for the following system components:

- Main Cabinet
- Expander Cabinet
- Battery Cabinet
- Single-Phase Power System
- Three-Phase Power System
- TLSB Card Cage
- I/O Interface
- Plug-In Units
  - PCI Plug-In Unit
  - XMI Plug-In Unit
  - Futurebus+ Plug-In Unit
  - SCSI Storage Plug-In Unit
  - DSSI Disk Plug-In Unit
  - Battery Plug-In Unit

15.1 Main Cabinet

The main cabinet includes the cabinet control system and control panel, TLSB card cage with modules, power and cooling systems, and plug-in units.

Figure 15–1 Main Cabinet



About the Main Cabinet

The main cabinet, H9F00–FB/FC/FD/FE, contains the following components:

- Cabinet control system, including control panel
- TLSB card cage with processor, memory, I/O, and terminator modules
- Power and cooling systems
- One or more plug-in units for:
  - I/O
  - Disks
  - Batteries

The system must have a CD-ROM drive to use as an initial load device.

Variants of the main cabinet are listed in Table 15–1.

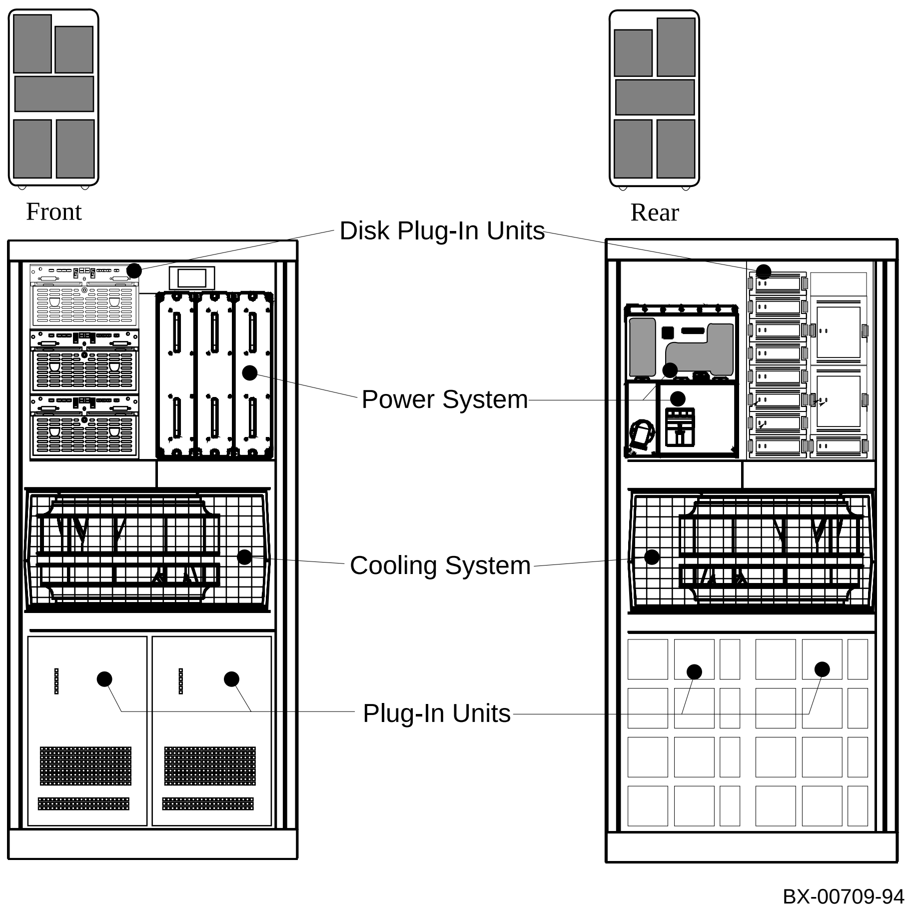
Table 15–1 Main Cabinet Variants

Cabinet Part Number	Regulator
H9F00–FB	Single phase
H9F00–FC	Three-phase, 120/208 V, 60 Hz (U.S.)
H9F00–FD	Three-phase, 220–240/380–415 V, 50 Hz (Europe)
H9F00–FE	Three-phase, 202 V, 50–60 Hz (Japan)

15.2 Expander Cabinet

The expander cabinet looks like the main cabinet, but without a TLSB card cage or a control panel. Disk plug-in units may be installed in the space that would be occupied by the TLSB card cage.

Figure 15–2 Expander Cabinet



About the Expander Cabinet

The expander cabinet, H9F00–BA/BB/BC/BD, is similar to the main cabinet. The second letter of each variant identifies voltage (see Table 15–2 for these voltages).

The expander cabinet frame is identical to the main cabinet; the contents, however, differ. The expander cabinet does not have a TLSB card cage or a control panel, and it can have disk plug-in units in the upper part of the cabinet.

Expander Cabinet Configuration Rules

- Each system can have up to two expander cabinets. The first expander cabinet is placed to the right of the system cabinet and the second to the left. See Figure 15–3.
- The expander cabinet may contain a CD-ROM drive. If used, it is located in the front of the expander cabinet, at the top.
- The configuration rules for the lower quadrants of the system cabinet (Section 15.1) also apply to the lower quadrants of the expander cabinet.
- The only plug-in units that may be installed in the upper quadrants of the expander cabinet are the SCSI storage plug-in unit and the DSSI disk plug-in unit.

Figure 15–3 System with Two Expander Cabinets (Front View)

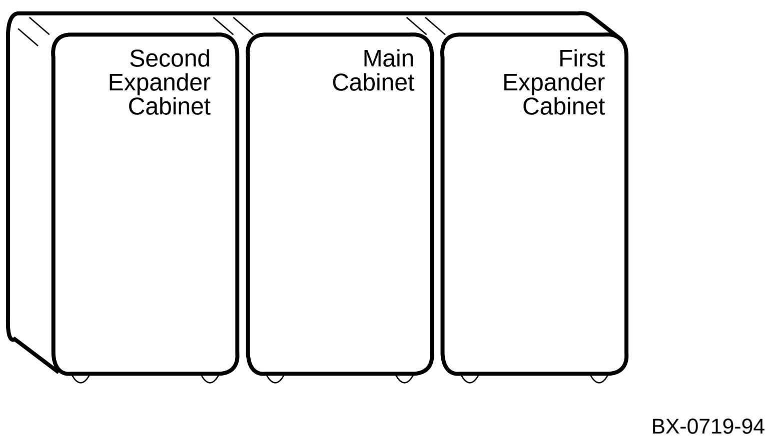


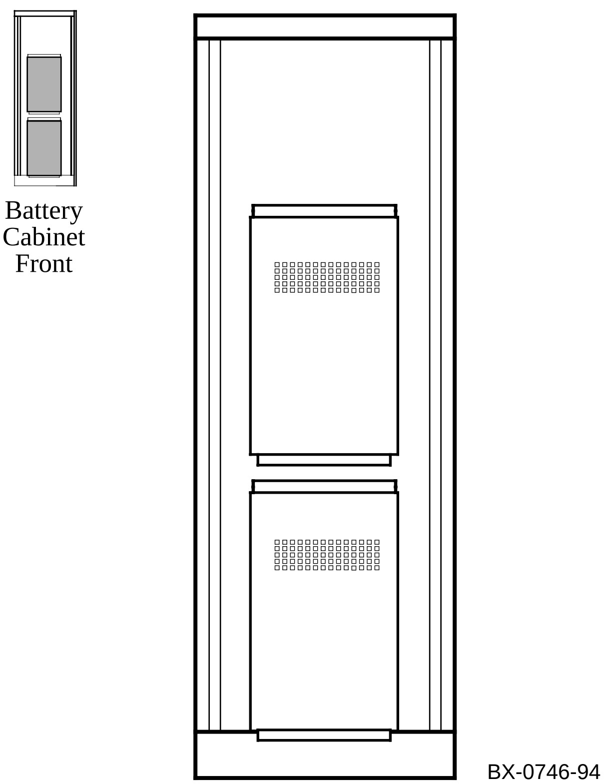
Table 15–2 Expander Cabinet Variants

Cabinet Part Number	Regulator
H9F00–BD	Single phase
H9F00–BA	Three-phase, 120/208 V, 60 Hz (U.S.)
H9F00–BB	Three-phase, 220–240/380–415 V, 50 Hz (Europe)
H9F00–BC	Three-phase, 202 V, 50–60 Hz (Japan)

15.3 Battery Cabinet

The battery cabinet holds two battery plug-in units. It is used when the lower PIU quadrants in the main and expander cabinets are filled with I/O or storage PIUs.

Figure 15–4 Battery Cabinet



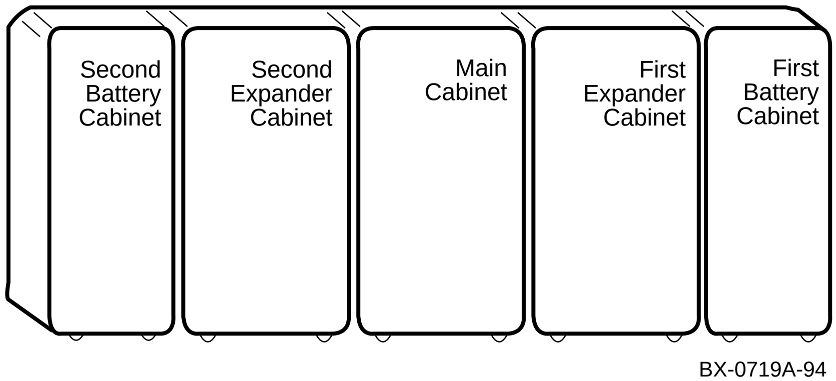
About the Battery Cabinet

The battery cabinet, H9B00–AF, holds two battery plug-in units, each of which contains 12 batteries. This cabinet contains no logic modules.

The battery cabinet is the same height as, but narrower than, the main and expander cabinets. Battery cabinets are placed as shown in Figure 15–5.

See Section 15.8.6 for battery PIU configuration rules.

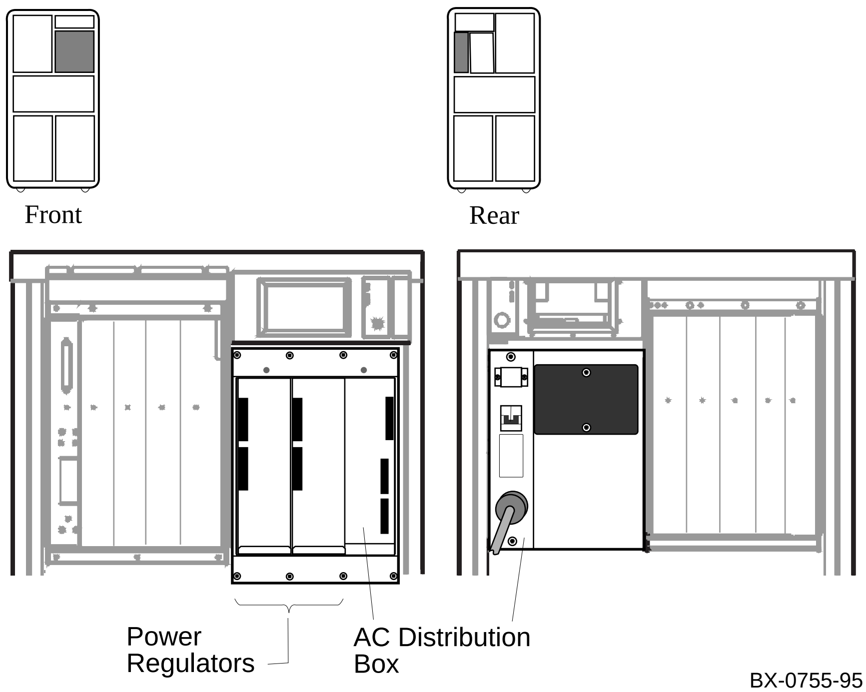
Figure 15–5 System with Two Battery Cabinets (Front View)



15.4 Single-Phase Power System

The single-phase power system consists of a 30–39579–02 AC distribution box and one or two H7264 power regulators. This power system does not support battery backup.

Figure 15–6 Single-Phase Power System



About the Single-Phase Power System

- The single-phase power system consists of a 30–39579–02 AC distribution box and one or two H7264 power regulators. (See Figure 15–6.)
- This power system may be used only in systems that do not require battery backup.
- The H7264 power regulator, unlike the H7263 regulator, does not provide status information. If the **show power** command is issued, the system responds as shown here:

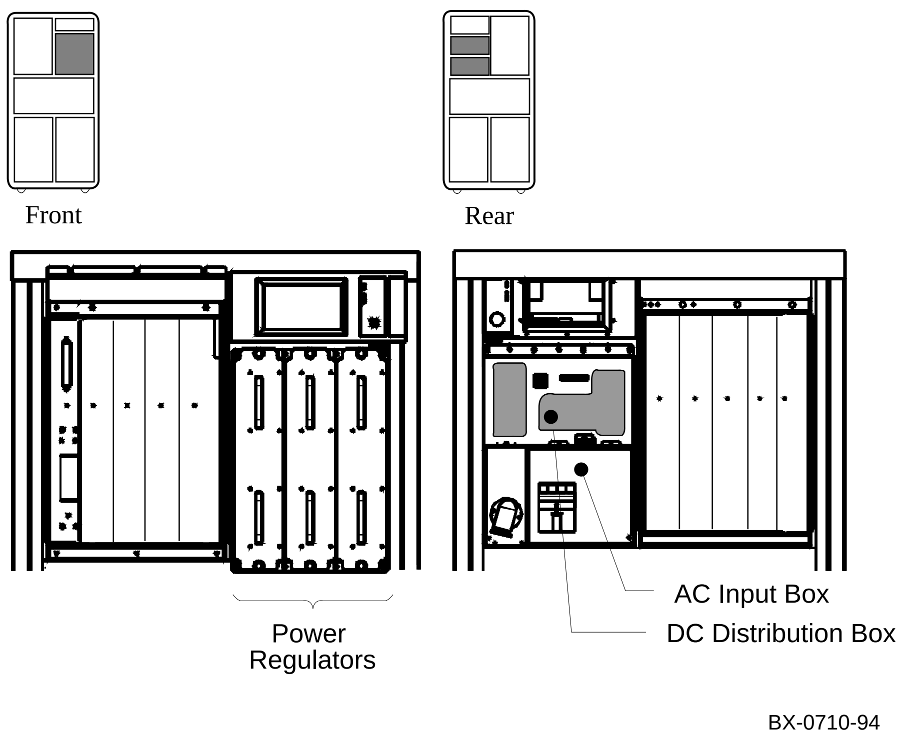
```
P00>>> show power
Power Supply Status: No response to request
```

- Each plug-in unit has a local power supply that generates the needed +5V and other miscellaneous DC voltages.

15.5 Three-Phase Power System

The three-phase power system consists of a 30–33798–0x AC input box, 30–35143–01 DC distribution box, and one or more H7263 power regulators. This power system supports battery backup.

Figure 15–7 Three-Phase Power System



About the Three-Phase Power System

- The three-phase power system consists of a 30–33798–0x AC input box, 30–35143–01 DC distribution box, and a minimum of one and a maximum of three H7263 power regulators. (See Figure 15–7.)
- The maximum system configuration requires two regulators; the third is for optional redundant power.
- Power regulators cannot be warm swapped.
- Each plug-in unit (with the exception of the battery plug-in unit) has a local power supply that generates the needed +5V and other miscellaneous DC voltages.

H7263 Power Regulator Configuration

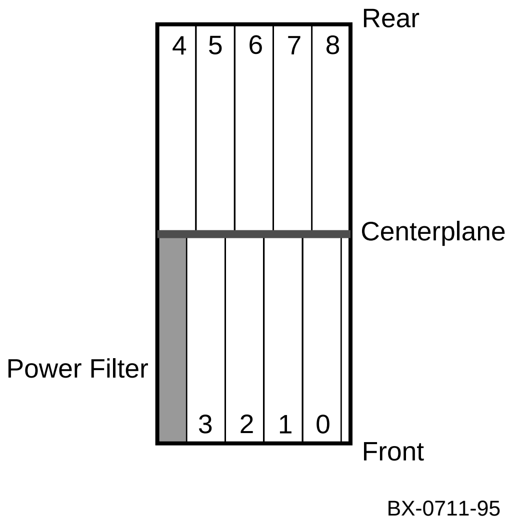
When viewed from the front of the system cabinet, the leftmost power regulator (closest to the TLSB card cage) corresponds to phase A, the middle with phase B, and the rightmost with phase C (see Figure 15–7). Power regulators are configured in manufacturing starting closest to the TLSB card cage and working to the right.

This platform, with one regulator installed, constitutes a true single-phase load. The load currents in three-phase power distribution need to be balanced. If necessary, reconfigure the regulators (and batteries, if the cabinet contains a battery plug-in unit) in multiple-system installations to balance the three-phase currents and to reduce stresses in the common neutral conductor.

15.6 TLSB Card Cage

The TLSB card cage contains nine module slots. The minimum configuration is a processor module in slot 0, a memory module in slot 7, an I/O module in slot 8, and terminator modules in all other slots. This section gives placement rules for other configurations.

Figure 15–8 TLSB Card Cage (Top View)



Module Placement Rules

Configure modules in this order:

1. Place the processor modules first. Start at slot 0, and work up to slot 5.
2. Place the KFTIA modules next. The first KFTIA module goes in slot 8, a second in slot 7.
3. Place the KFTHA modules next. The first KFTHA module goes in the highest-numbered open slot, and any others in the next slots down to 6.
4. Place memory modules last. The first memory module goes in the highest-numbered open slot, the next in the lowest numbered open slot, and so on, alternating between highest- and lowest-numbered open slots.
5. Fill all remaining open slots with terminator modules.

About the TLSB Card Cage

- The TLSB card cage has slots for nine modules. Modules used in this system are:

E2034–AA	Terminator
E2035–AA	Unpopulated memory mother board (for all but 2 Gbyte memory)
E2035–BA	128 Mbyte memory (MS7CC–BA)
E2035–CA	256 Mbyte memory (MS7CC–CA)
E2035–DA	512 Mbyte memory (MS7CC–DA)
E2035–EA	1 Gbyte memory (MS7CC–EA)
E2036–AA	2 Gbyte memory (MS7CC–FA)
E2052–AA	KFTHA (4 hose cables)
E2054–AA	KFTIA (1 hose, FWD SCSI, single-ended SCSI, NI, PCI)
E2056–CA	Single processor (KN7CC–AA)
E2056–DA	Dual processor (KN7CC–AB)

- The maximum number of processor modules is six.
- The maximum number of memory modules is seven. Memory modules may be placed in slots 1 through 7 only.
- The maximum amount of memory is 14 Gbytes. All memory modules support two-way interleaving. Mixed sizes of memory modules may be installed in the TLSB card cage. Table 15–3 (on the next page) shows the composition of memory options.
- Each system must have a minimum of one I/O module, either KFTIA or KFTHA. See Table 15–4 (on the next page) for placement of I/O modules.
- The KFTIA module can have daughter cards for FDDI (SAS multimode fiber, DEFPZ–AA; or twisted-pair copper, DEFPZ–UA) and NVRAM (ML300–AA).
- The minimum configuration is one processor module, one memory module, and one I/O module. In this configuration, the processor module must be in slot 0, the memory module in slot 7, and the I/O module in slot 8, and the rest of the slots must have terminator modules. Several configuration examples are shown in Table 15–5 (on the next page).

Table 15–3 Memory Module Options

Module	Size	SIMMs		
		Qty	Part No.	Slots
E2035–BA	128 Mbyte	16	54–21724–01	J07–J11, J18–J23, J29–J33
E2035–CA	256 Mbyte	32	54–21724–01	J02–J11, J12–J23, J24–J33
E2035–DA	512 Mbyte	16	54–21726–01	J07–J11, J18–J23, J29–J33
E2035–EA	1 Gbyte	32	54–21726–01	J02–J11, J12–J23, J24–J33
E2036–AA	2 Gbyte	36	54–21718–01	J02–J37

Table 15–4 Placement of I/O Modules

Number in System		Configuration		
KFTIA	KFTHA	Slot 8	Slot 7	Slot 6
3[13]	0	KFTIA	KFTIA	KFTIA
0	3	KFTHA	KFTHA	KFTHA
2	1	KFTIA	KFTIA	KFTHA
1	2	KFTIA	KFTHA	KFTHA
2	0	KFTIA	KFTIA	—
0	2	KFTHA	KFTHA	—
1	1	KFTIA	KFTHA	—
1	0	KFTIA	—	—
0	1	KFTHA	—	—

[13] Three KFTIA modules can be used in a system, but more optimal configurations consist of KFTIA modules with PCI options.

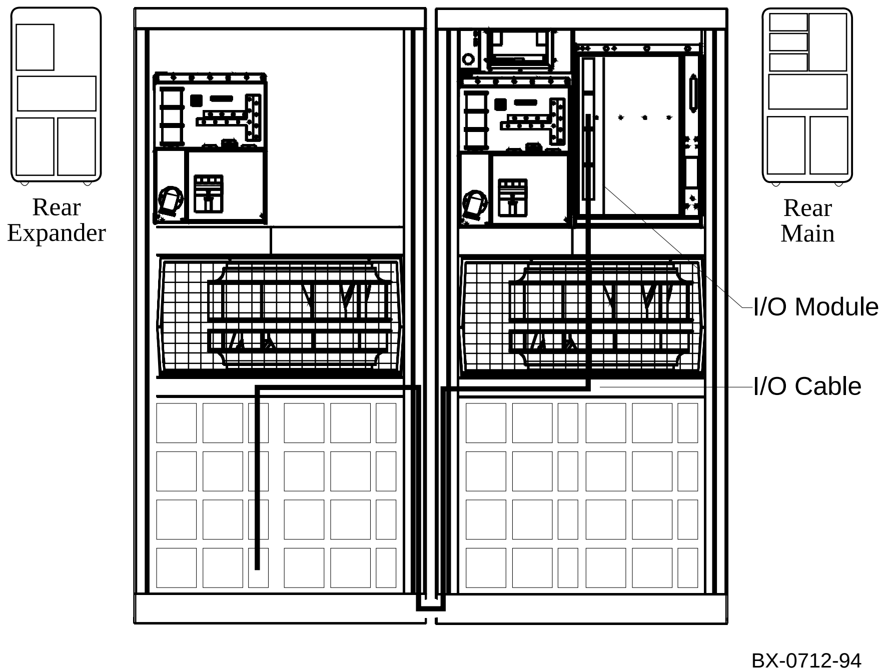
Table 15–5 Configuration Examples

	Place modules in these slots:			
Configuration	**Processor**	**Memory**	**I/O**	**Terminator**
1 KN7CC, 1 MS7CC, 1 I/O	0	7	8	1, 2, 3, 4, 5, 6
2 KN7CC, 1 MS7CC, 1 I/O	0, 1	7	8	2, 3, 4, 5, 6
1 KN7CC, 2 MS7CC, 1 I/O	0	1, 7	8	2, 3, 4, 5, 6
2 KN7CC, 3 MS7CC, 1 I/O	0, 1	2, 6, 7	8	3, 4, 5
2 KN7CC, 4 MS7CC, 1 I/O	0, 1	2, 3, 6, 7	8	4, 5
3 KN7CC, 3 MS7CC, 1 I/O	0, 1, 2	3, 6, 7	8	4, 5
4 KN7CC, 2 MS7CC, 1 I/O	0, 1, 2, 3	6, 7	8	4, 5
6 KN7CC, 2 MS7CC, 1 I/O	0, 1, 2, 3, 4, 5	6, 7	8	None
2 KN7CC, 2 MS7CC, 2 I/Os	0, 1	2, 6	7, 8	3, 4, 5

15.7 I/O Interface

The I/O interface consists of the I/O modules in the TLSB card cage (some combination of KFTIA and KFTHA) and the I/O cables, which connect the I/O module to the I/O bus.

Figure 15–9 I/O Interface



About the KFTIA Interface

The KFTIA module has several I/O connections.

- One I/O channel to support one I/O PIU. The maximum length of the cable is 3.65 meters (12 feet). This hose is always numbered 1; hose 0 is the virtual hose connecting the embedded PCI I/O devices.
- Two twisted-pair Ethernet connections
- One single-ended 8-bit SCSI connection
- Three FWD SCSI connections
- An optional FDDI connection
- An optional NVRAM daughter card (4 Mbytes). If this option is installed, no NVRAM can be configured on the physical hose.

Any unused I/O connection on the KFTIA module must be terminated.

About the KFTHA Interface

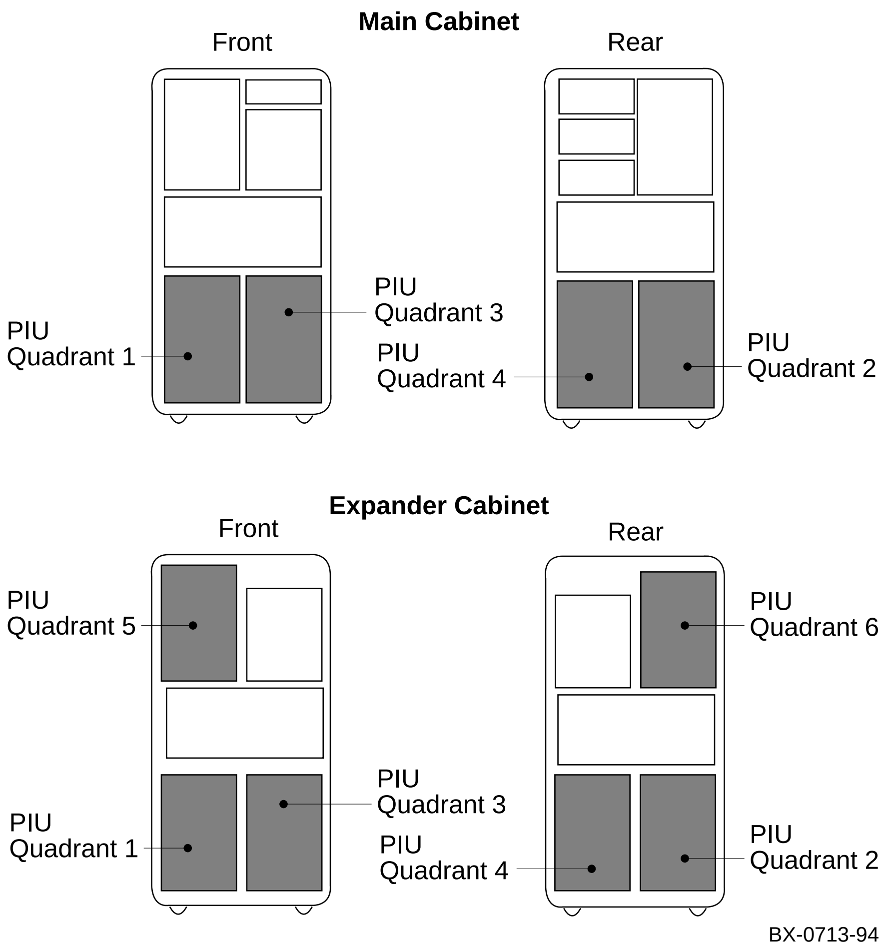
The KFTHA modules can accommodate a maximum of four I/O channels, to support a maximum of four I/O plug-in units.

- The KFTHA module can accommodate one to four I/O channels.
- Each I/O bus is housed in a plug-in unit (PIU).
- An I/O hose cable connects the KFTHA module to an I/O PIU.
- The maximum length of each I/O cable is 3.65 meters (12 feet).
- Each I/O cable consists of two separate unidirectional interconnects.

15.8 Plug-In Units

Plug-in units (PIUs) are located in the main and expander cabinets. Both cabinets have space for PIUs in the bottom. The expander cabinet also has PIU quadrants in the top.

Figure 15–10 Location of PIU Quadrants



About Plug-In Units

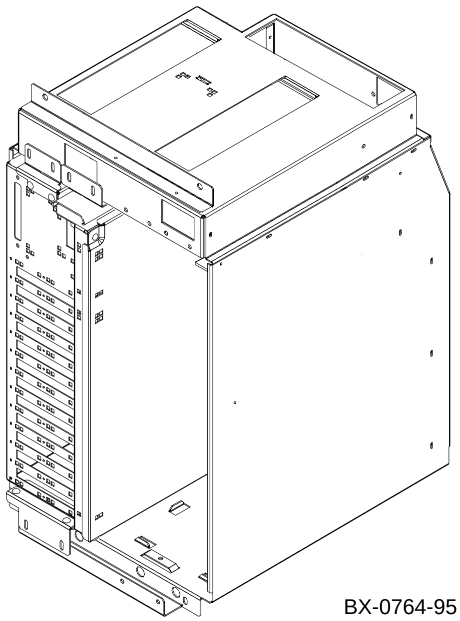
- Plug-in units (PIUs) house options in the main and expander cabinets.
- These options are housed in PIUs:
  - PCI bus
  - XMI bus
  - Futurebus+
  - SCSI storage devices
  - DSSI disks
  - Batteries
- PIUs are located in the PIU quadrants, as shown in Figure 15–10. The main cabinet has four PIU quadrants, and the expander cabinet has six.
- The XMI and battery PIUs each require two quadrants; the Futurebus+, PCI, and disk PIUs each require one quadrant.

Configuration rules for each of these PIUs are discussed in the following sections.

15.8.1 PCI Plug-In Unit

The PCI PIU contains one or two PCI shelves or one PCI shelf and one SCSI shelf. The PCI PIU is located in the bottom rear of the main cabinet or expander cabinet.

Figure 15–11 PCI Plug-In Unit



BX-0764-95

About the PCI Plug-In Unit

- A PCI PIU with one PCI shelf is shown in Figure 15–11.
- The PCI PIU consists of an enclosure and one or two shelves. A PCI shelf consists of one 12-slot PCI card cage with a 48 VDC power converter and a hose connection.
- The maximum number of PCI shelves in the main cabinet is four. The maximum number per system is 12 shelves.
- Each PCI PIU requires at least one I/O cable connection. The I/O system can accommodate a maximum of four PCI shelves for each KFTHA and one PCI shelf for each KFTIA.

PCI PIU Configuration Rules

- Each PCI PIU uses one quadrant (Q2 or Q4 — see Figure 15–10).
- Only a SCSI storage PIU (BA655–AB) may be installed in the quadrant in front of the PCI PIU (Q1 or Q3).
- Each PCI shelf fills half of the PCI PIU enclosure. The other half may hold a second PCI shelf (DWLPA–BA in the main cabinet or DWLPA–BB in the expander cabinet) or a BA658–AA StorageWorks shelf.
- The PCI-to-hose interface is standard in every PCI shelf. It does not require a PCI slot.
- One PCI shelf in a system can have an optional standard I/O module. The standard I/O module requires a floppy drive.

Configuration rules for the PCI are listed on the next page.

PCI Configuration Rules

- Each PCI shelf has 12 slots for option modules and one reserved slot for the standard I/O module (PCI-to-EISA bridge).
- In a PCI configuration (no KFE70 and no EISA options), all 12 slots are available for PCI options.
- In a PCI/EISA configuration, a maximum of eight slots are available for PCI or EISA options. Figure 15–12 shows the slots in a PCI shelf, and Table 15–6 lists the rules for each PCI slot in a PCI/EISA configuration.
- Operating system-dependent configuration limits are listed in the *Digital Systems and Options Catalog.*

Figure 15–12 PCI Shelf and Slot Assignments

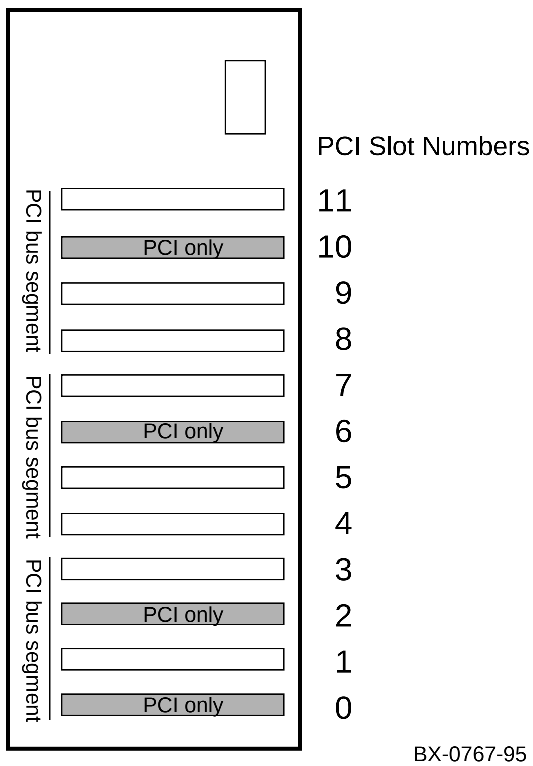


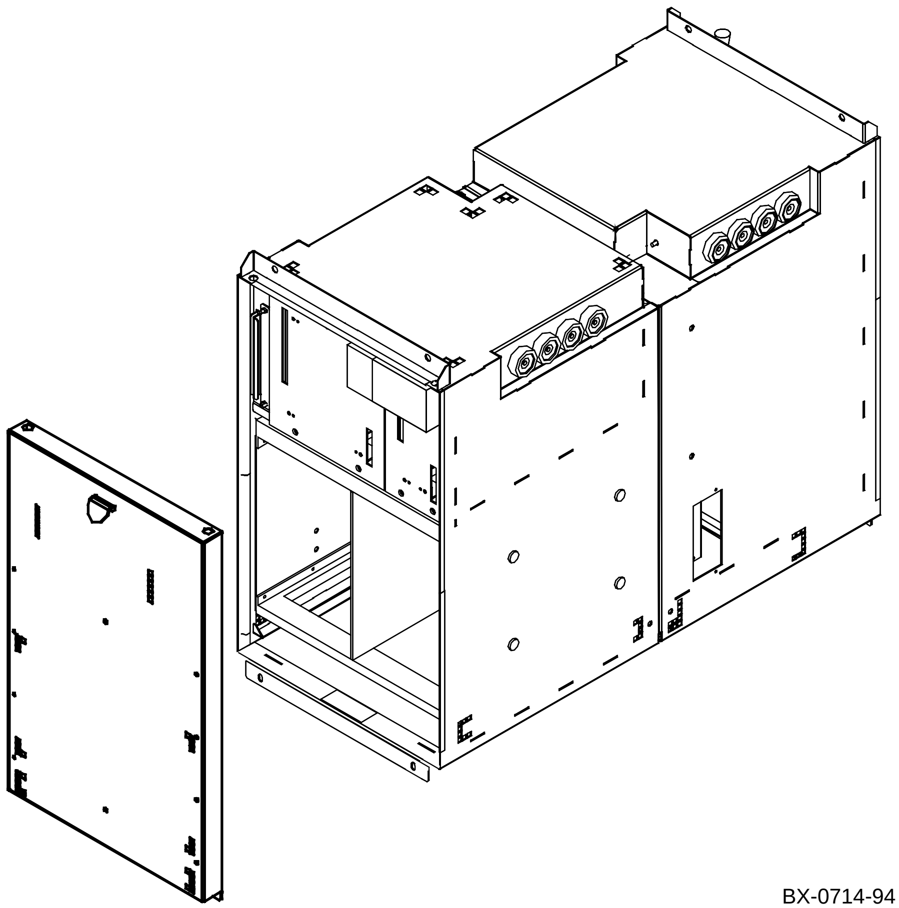
Table 15–6 PCI/EISA Configuration Rules (KFE70 Installed)

Slot	Usage
0	Standard I/O module (PCI-to-EISA bridge)
1	EISA option only
2	Connector module (floppy, keyboard, and mouse)
3	EISA option only
4	PCI or EISA option
5	PCI or EISA option
6	PCI option only
7	PCI or EISA option
8	PCI or EISA option
9	PCI or EISA option
10	PCI option only
11	PCI or EISA option

15.8.2 XMI Plug-In Unit

The XMI PIU contains an XMI card cage and power regulators. The XMI PIU is located in the bottom of the main cabinet or expander cabinet.

Figure 15–13 XMI Plug-In Unit



About the XMI Plug-In Unit

- An XMI PIU is shown in Figure 15–13.
- The maximum number of XMI PIUs per cabinet is two. The maximum per system is six.
- Each XMI PIU requires one I/O cable connection. The I/O system can accommodate a maximum of four XMI PIUs for each KFTHA and one XMI PIU for each KFTIA.

XMI PIU Configuration Rules

- Each XMI PIU uses two quadrants (Q1 and Q2 or Q3 and Q4 — see Figure 15–10). The first is located in Q1 and Q2; the second in Q3 and Q4.
- The XMI bulkhead has eight quad and four dual panels. When the PIU is located in Q1 and Q2, panel A1 (a quad panel) is used for the cable connection to the I/O module; when in Q3 and Q4, panel A5 (a dual panel) is used.
- When the XMI PIU is located in Q3 and Q4, the pull knob for opening and closing the bulkhead door interferes with panels A1 and A2. Because of this, the following cabinet kits are the only ones permitted in locations A1 and A2:
  - CK–DEMNA–KN Ethernet
  - CK–KFMSB–LB DSSI
  - CK–KZMSA–LA SCSI

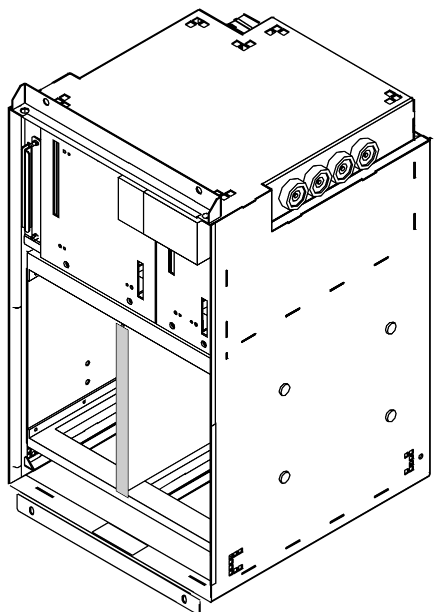
XMI Configuration Rules

- Each XMI backplane has 12 slots of usable I/O space. The backplane has 14 slots, two of which are reserved for the T2030–YA and T2028–AA modules, leaving 12 slots for I/O.
- The clock and arbitration module (T2030–YA) must be in slot 7.
- The T2028–AA module, which is the interface between the TLSB and XMI buses, must be in slot 8.
- The first option must be in either slot 1 or slot 14 to terminate the XMI bus. If the option is a two-module set, the module with the XMI corner must be in slot 1 or slot 14.
- Operating system-dependent configuration limits are listed in the *Digital Systems and Options Catalog.*

15.8.3 Futurebus+ Plug-In Unit

The Futurebus+ PIU contains a Futurebus+ card cage and power regulators. The Futurebus+ PIU is located in the bottom rear of the main cabinet or expander cabinet.

Figure 15–14 Futurebus+ Plug-In Unit



BX-0715-95

About the Futurebus+ Plug-In Unit

- A Futurebus+ PIU is shown in Figure 15–14.
- The maximum number of Futurebus+ PIUs in the main cabinet is one. The maximum number per system is one.
- Each Futurebus+ PIU requires one I/O cable connection.

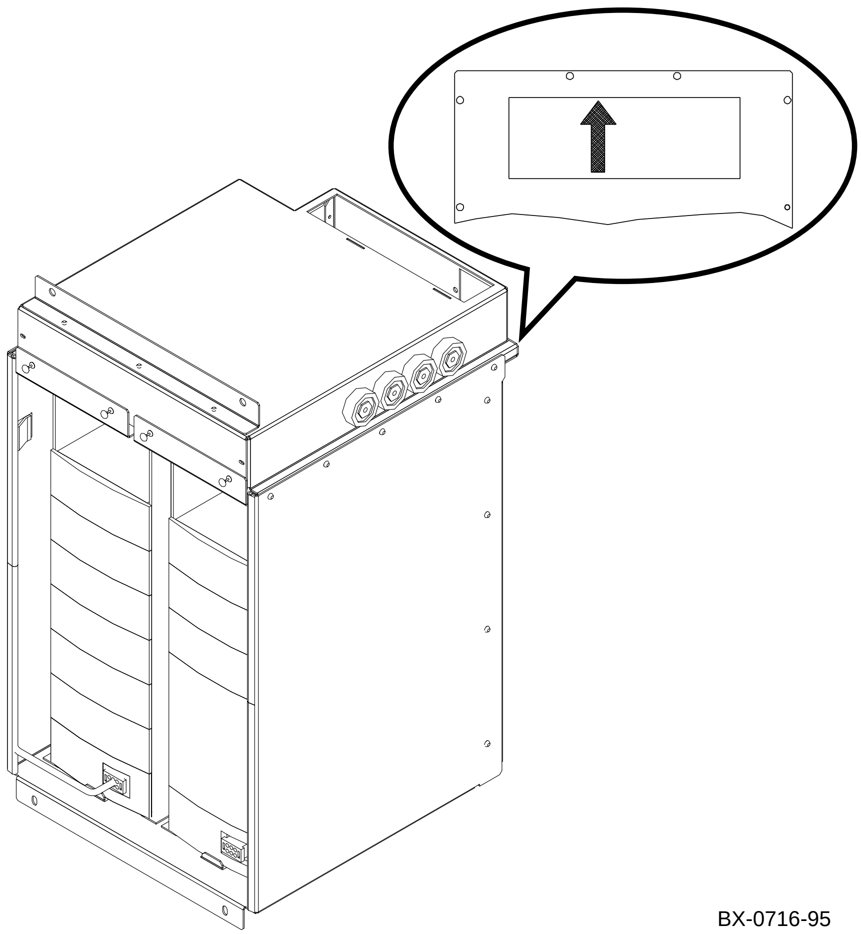
Futurebus+ Configuration Rules

- Each Futurebus+ PIU uses one quadrant (Q2 or Q4 — see Figure 15–10).
- Each Futurebus+ backplane has nine slots of usable I/O space. The backplane has 10 slots, one of which is reserved for the B2003–AA module, leaving nine slots for I/O.
- The B2003–AA module must be in slot 5.
- Operating system-dependent configuration limits are listed in the *Digital Systems and Options Catalog.*

15.8.4 SCSI Storage Plug-In Unit

The SCSI storage PIU contains a combination of 3.5-inch and 5.25-inch disk, tape, and CD-ROM drives. This PIU is located in the bottom of the main cabinet or in the top or bottom of the expander cabinet.

Figure 15–15 SCSI Storage Plug-In Unit



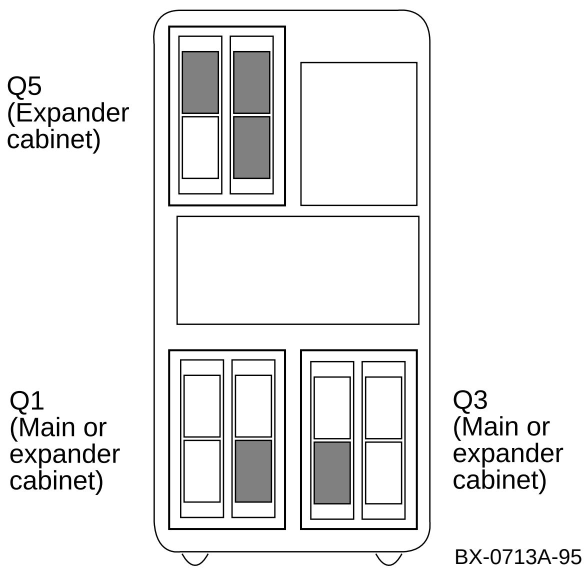
About the SCSI Storage Plug-In Unit

- The maximum number of SCSI storage PIUs is three in the main cabinet and six in an expander cabinet.
- Each SCSI disk PIU contains two shelves. Each shelf contains seven slots for disks and tapes, in any combination.
- Each 3.5-inch device uses one slot.
- Each 5.25-inch device uses three slots. See below for mounting restrictions.

SCSI Storage PIU Configuration Rules

- The SCSI disk PIU can use any quadrant (see Figure 15–10).
- The arrow on the rear panel of the PIU enclosure must point toward the blower. That is, the arrow must point up if the PIU is in Q1 through Q4; it must point down if the PIU is in Q5 or Q6.
- Mounting restrictions for HSZ20, HSD05, HSD20, TZ85, TZ86, TZ87, TZK09, TZK10, TZK11, and RRDCD: If any of these devices are used in a SCSI storage PIU in Q1 or Q3 of either the main or expander cabinet, or in Q5 of an expander cabinet, they may be mounted only in the shaded locations in Figure 15–16. Placement of these devices in any other position in these PIU quadrants will prevent the cabinet front door from closing properly.

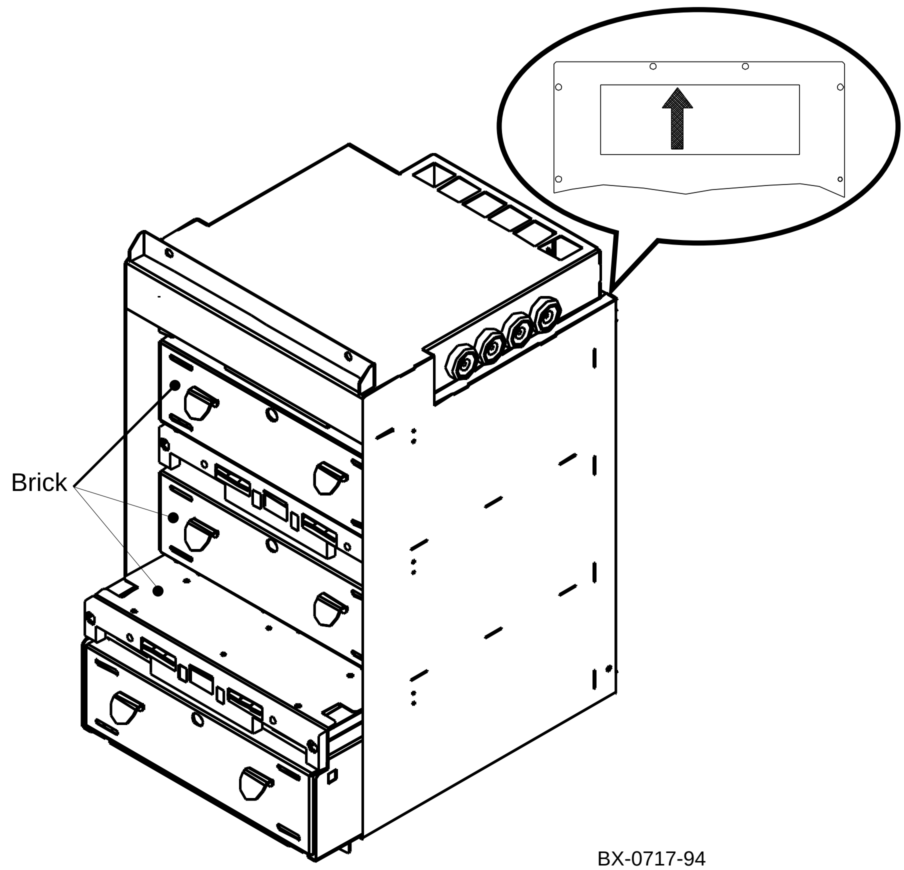
Figure 15–16 SCSI Mounting Restrictions



15.8.5 DSSI Disk Plug-In Unit

The DSSI disk PIU contains one to three bricks; each brick contains two 5.25-inch disk drives. This PIU is located in the bottom of the main cabinet or in the top or bottom of the expander cabinet.

Figure 15–17 DSSI Disk Plug-In Unit



About the DSSI Disk Plug-In Unit

- The maximum number of DSSI disk PIUs is three in the main cabinet and six in an expander cabinet.
- Each DSSI disk PIU contains a minimum of one and a maximum of three bricks; each brick contains two 5.25-inch disk drives.

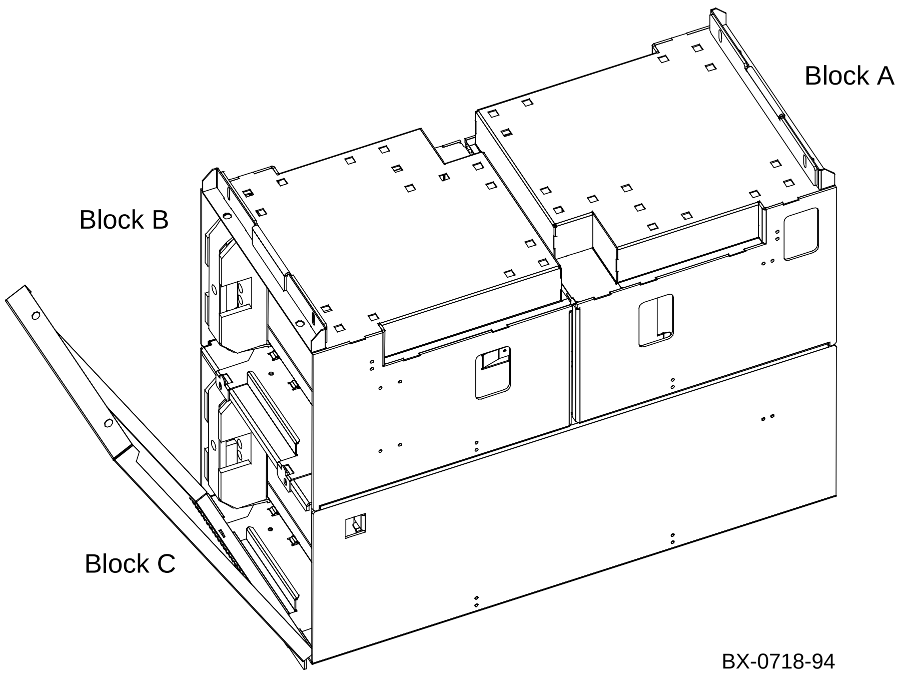
DSSI Disk PIU Configuration Rules

- The DSSI disk PIU can use any quadrant (see Figure 15–10).
- In the system cabinet or in the bottom of the expander cabinet, bricks are installed starting closest to the blower and working down.
- In the top of the expander cabinet, bricks are installed starting closest to the blower and working up.
- The arrow on the rear panel of the PIU enclosure must point toward the blower. That is, the arrow must point up if the PIU is in Q1 through Q4; it must point down if the PIU is in Q5 or Q6.

15.8.6 Battery Plug-In Unit

The battery PIU contains one to three battery blocks; each block contains four batteries. The battery PIU is located in the bottom of the main cabinet or expander cabinet or in the battery cabinet.

Figure 15–18 Battery Plug-In Unit



About the Battery Plug-In Unit

- The maximum number of battery PIUs is one in the main cabinet and one in each expander cabinet. The optional battery cabinet holds two battery PIUs.
- Each battery PIU contains a minimum of one and a maximum of three blocks of batteries. Each block contains four batteries.
- One block of batteries is required for each power regulator. When battery backup is used for the main cabinet, it is recommended that it also be used for the expander cabinets.

Battery PIU Configuration Rules

- The battery PIU uses two quadrants, Q3 and Q4 (see Figure 15–10).
- The battery block labeled A in Figure 15–18 is in the rear when the battery PIU is installed in the cabinet. It consists of two batteries in the top tray and two batteries in the bottom. Battery block B is in the front when the PIU is installed in the cabinet. It consists of four batteries in the top tray. Battery block C is also in the front; it consists of four batteries in the bottom tray.
- Battery block A corresponds to power regulator A (see Figure 15–4), battery block B to power regulator B, and battery block C to power regulator C.
- If you reconfigure the power regulators (see page 15–7), you must also reconfigure the batteries.

Chapter 16

Cabinet Doors and Panels

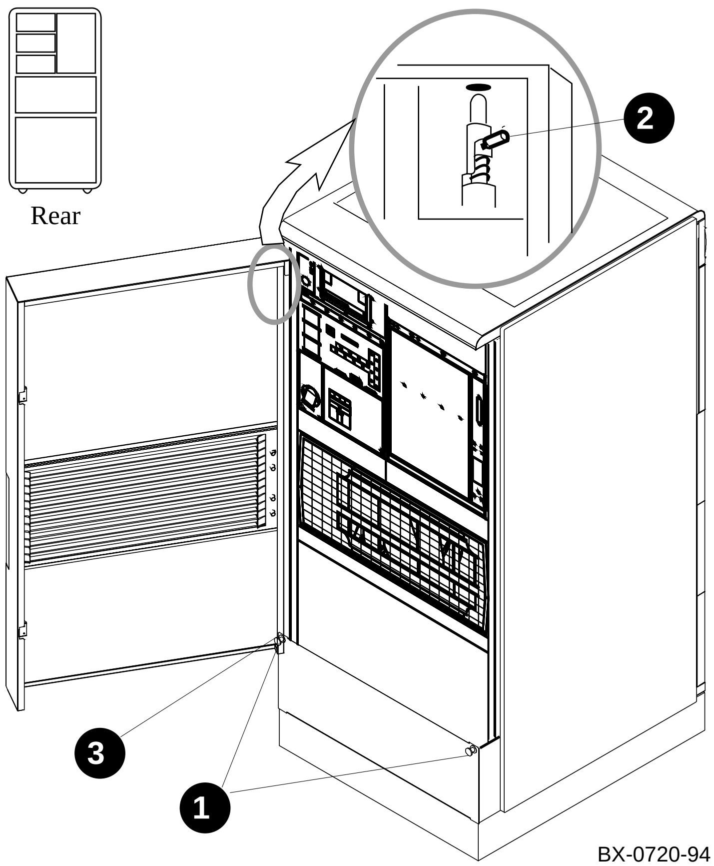
This chapter contains the following sections:

- Door and Cable Cover Removal and Replacement
- Top Panel and Air Filter Removal and Replacement
- Side Panel Removal and Replacement

16.1 Door and Cable Cover Removal and Replacement

Replace the doors and cable cover only if they sustain cosmetic damage. The front and rear doors attach to the cabinet with spring-loaded latch pins; the cable cover attaches with quarter-turn Phillips screws.

Figure 16–1 Cabinet Door and Cable Cover



Door Removal

1. Open the door.
2. Locate the spring-loaded latch in the upper corner of the door. See ❷ in Figure 16–1. Pull the pin down.
3. Lift the bottom of the door off the hinge pin. See ❸.

Door Replacement

- Reverse steps 1–3 in the Removal section.

Cable Cover Removal

1. Remove the two screws (quarter-turn Phillips) — one in each of the upper corners of the cable cover. See ❶ in Figure 16–1.
2. Swing the cable cover down and remove it from the hinges on the bottom.

Cable Cover Replacement

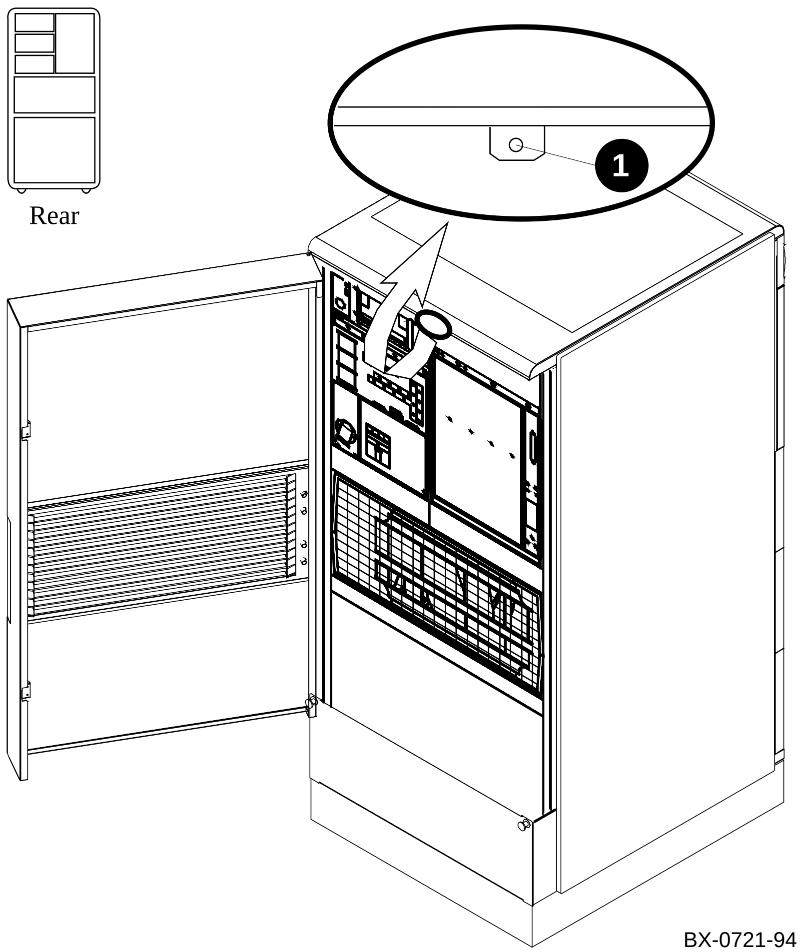
- Reverse steps 1–2 in the Removal section.

16.2 Top Panel and Air Filter Removal and Replacement

The top panel attaches to the cabinet with one Phillips screw and four plastic snaps. Remove the top cover to gain access to some field-replaceable units or to replace the top air filter.

CAUTION: Obstructions on the top panel may cause the system to shut down.

Figure 16–2 Top Panel



Top Panel Removal

1. Remove the screw (Phillips) at the rear of the top panel. See ❶ in Figure 16–2.
2. Lift the top panel until the plastic snaps disengage.

Top Panel Replacement

1. Position the top panel on the cabinet and push it down until the plastic snaps engage.
2. Replace the screw removed in step 1 of the Removal section.

Top Air Filter Removal

1. Remove the top panel (see above).
2. Grasp the foam air filter and pull it away from the top panel. No tools are required.
3. Discard the foam air filter.

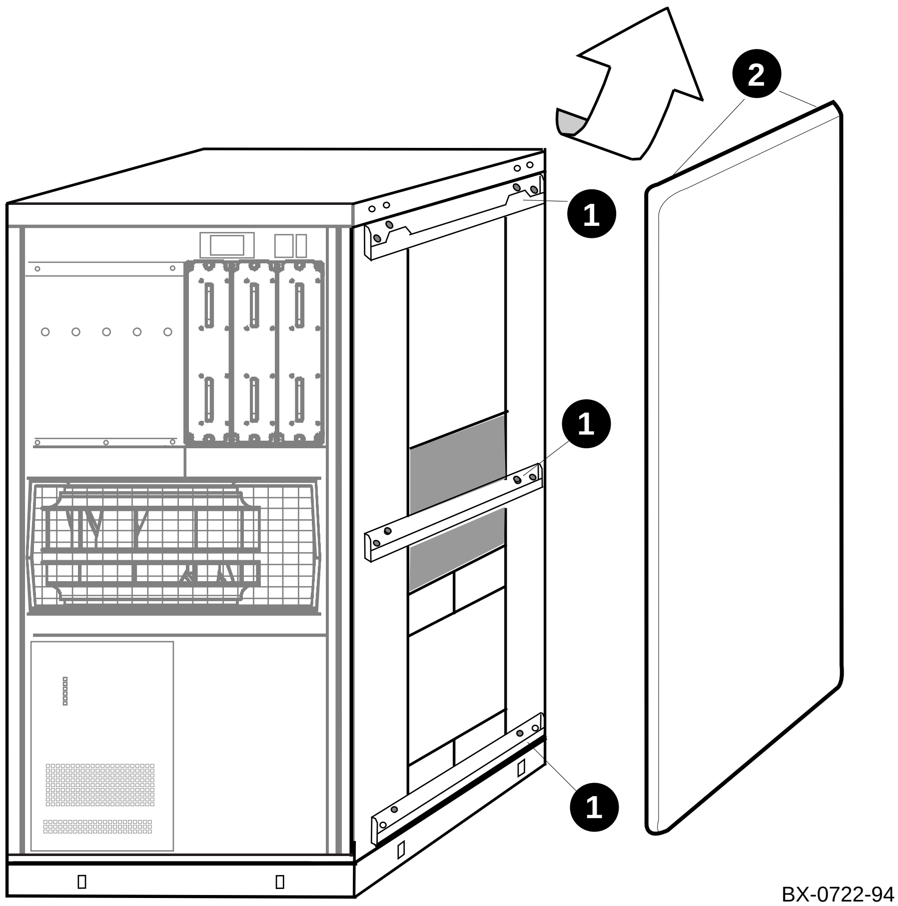
Top Air Filter Replacement

1. Lay the replacement air filter over the mesh on the top panel.
2. Push the edges of the foam under the edges of the opening.
3. Replace the top panel.

16.3 Side Panel Removal and Replacement

The side panel attaches to the cabinet with two bolts at the top and brackets on the inside of the panel.

Figure 16–3 Side Panel



Removal

1. Remove the top panel. See Section 16.2.
2. Use a 10 mm hex socket wrench to remove the bolts in the upper corners of the side panel. See ❷ in Figure 16–3.
3. Lift the panel up and away from the cabinet.

Replacement

1. Place the panel on the side of the cabinet so that all three brackets on the inside of the side panel rest in the U-shaped channels on the side of the cabinet. See ❶ in Figure 16–3.
2. Replace the bolts removed in step 2 of the Removal section.
3. Replace the top panel.

Chapter 17

Cabinet Control System

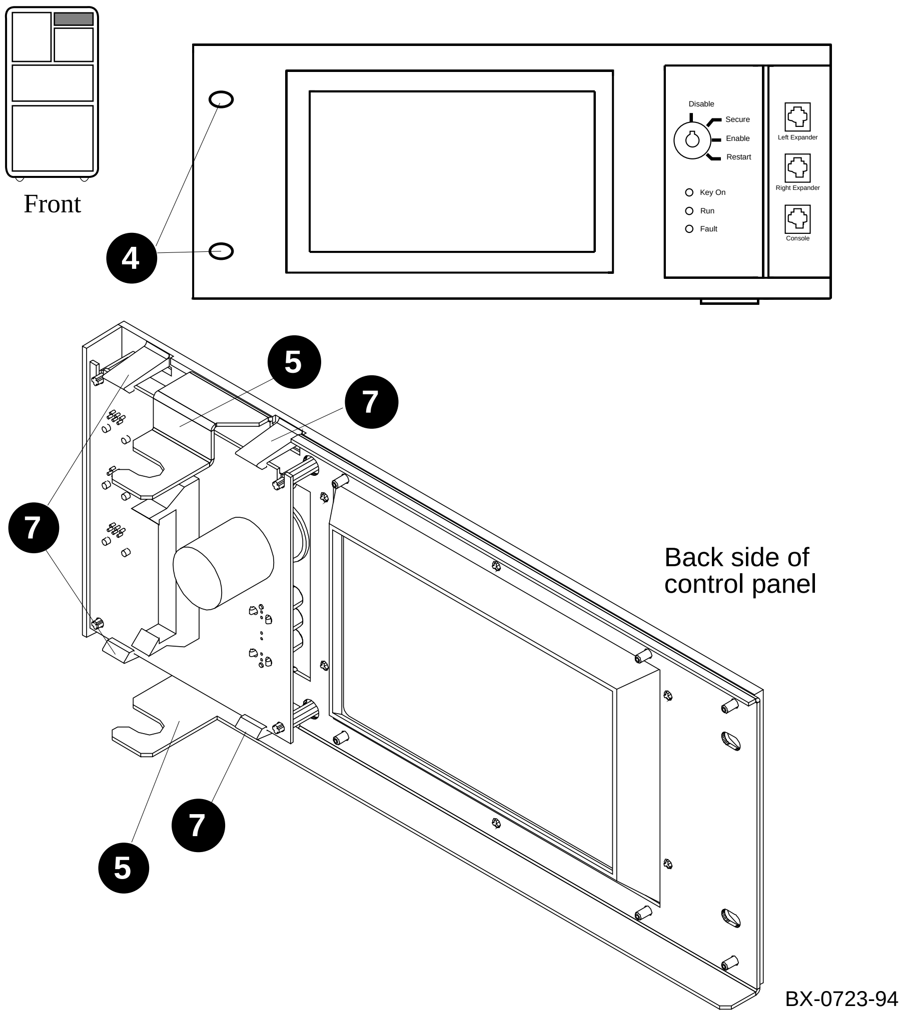
This chapter contains removal and replacement instructions for components of the cabinet control system. This chapter consists of the following sections:

- Control Panel Removal and Replacement
- CD-ROM Drive Removal and Replacement
- Floppy Drive Removal and Replacement
- Local Disk Converter Removal and Replacement
- Cabinet Control Logic Module Removal and Replacement

17.1 Control Panel Removal and Replacement

The control panel bezel attaches to the cabinet with two Phillips screws. The circuit board attaches to the back side of the bezel with four clips. Access is from the front of the cabinet.

Figure 17–1 Control Panel



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Shut the circuit breaker off by pushing down the handle.
3. Ground yourself to the cabinet with an antistatic wrist strap.
4. Remove the two screws (Phillips) on the left side of the control panel. See ❹ in Figure 17–1.
5. Swing the left side of the panel toward you. Slide the assembly to the left to remove. See ❺.
6. Disconnect the cables from the circuit board.
7. Place the control panel face down on a flat surface. Remove the circuit board by easing the clips away from the board and pulling the board up. See ❼.

Replacement

- Reverse the steps in the Removal procedure.

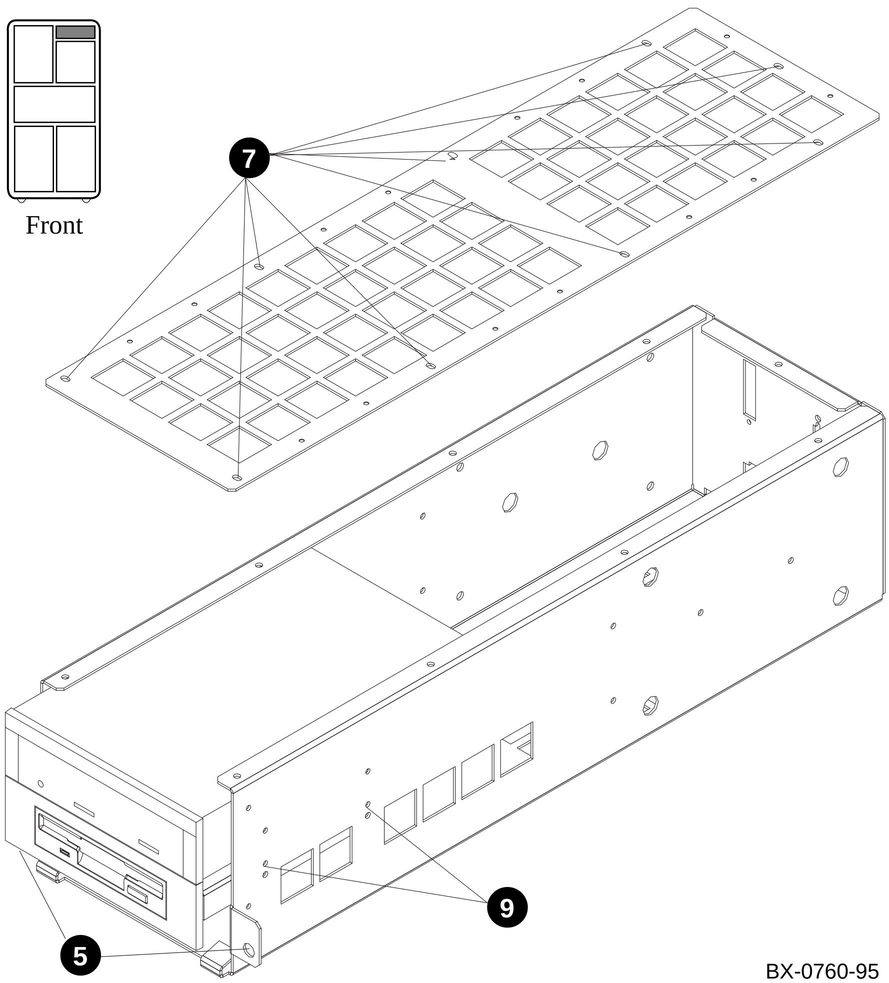
Verification

Power up the system and turn the keyswitch to Enable. Check that the Key On LED lights.

17.2 CD-ROM Drive Removal and Replacement

The CD-ROM drive is housed in a box mounted on rails in the cabinet. Slotted captive screws hold the box in the cabinet; Phillips screws attach the top to the box and the CD-ROM drive to the box. Access is from the front of the cabinet.

Figure 17–2 CD-ROM Drive



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Shut the circuit breaker off by pushing down the handle.
3. Remove all cable connectors from the rear of the box that houses the CD-ROM drive.
4. Remove the control panel. See Section 17.1.
5. Loosen the two captive screws (slotted) at the lower sides of the box. See ❺ in Figure 17–2.
6. Slide the box out of the cabinet and place it on a stable work surface.
7. Remove the top cover of the box by removing the nine screws (Phillips) and lifting the cover off. See ❼.
8. Disconnect the cables from the back of the drive.
9. Remove the four screws (Phillips) that hold the CD-ROM drive in place. There are two screws on each side of the box. See ❾.
10. Slide the CD-ROM drive out of the box.

Replacement

- Reverse the steps in the Removal procedure.

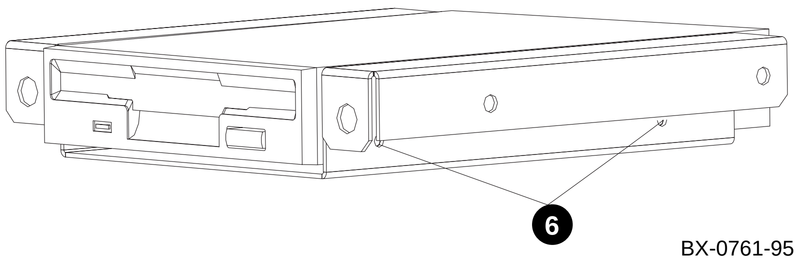
Verification

Boot LFU. See Chapter 6.

17.3 Floppy Drive Removal and Replacement

Remove the control panel and CD-ROM drive. Remove the cables from the back of the floppy drive. Remove the four screws that attach the floppy drive bracket to the box and the four that attach the drive to the bracket.

Figure 17–3 Floppy Drive



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Shut the circuit breaker off by pushing down the handle.
3. Remove the control panel (see Section 17.1) and the CD assembly box and CD-ROM drive (see Section 17.2).
4. Remove the two cables (power and signal) from the back of the floppy drive.
5. Remove the four screws that attach the floppy drive bracket to the box. (There are two screws on each side of the box.)
6. Remove the four screws that hold the floppy drive in the bracket. See ❻ in Figure 17–3.
7. Slide the floppy drive out of the bracket.

Replacement

- Reverse the steps in the Removal procedure.

Verification

Run ECU. Place the ECU diskette in the floppy drive and type:

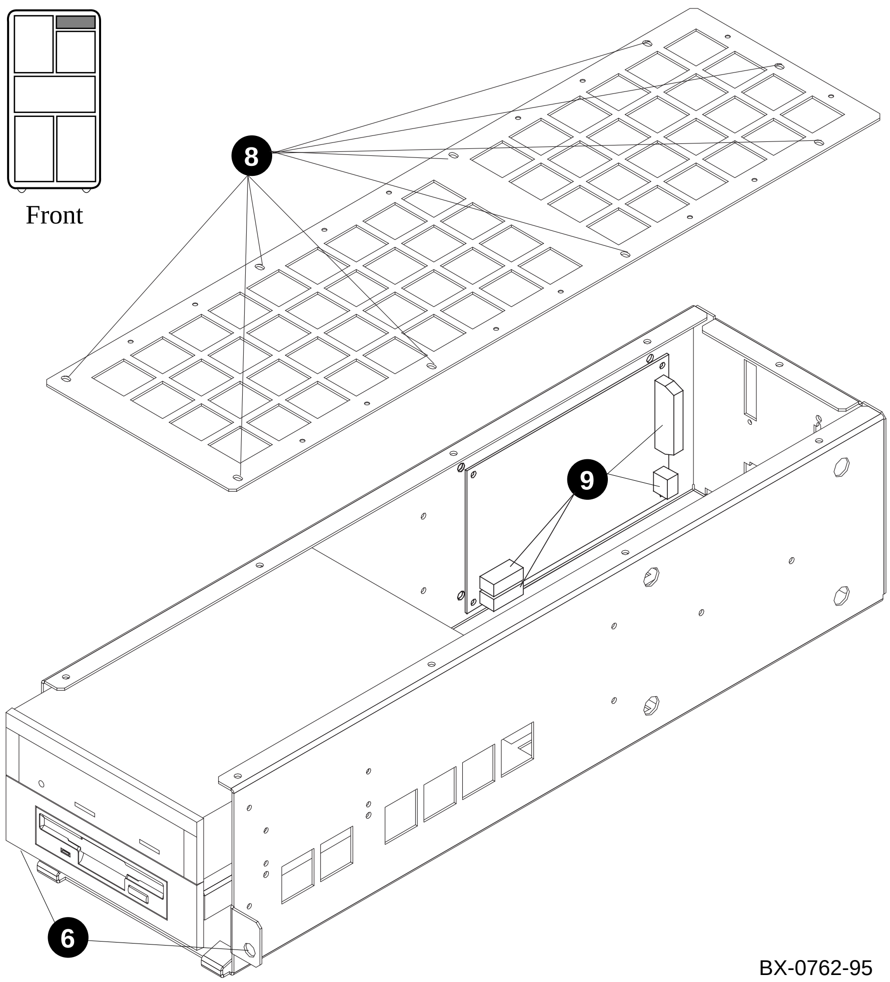
```
P00>>> set arc_enable on
P00>>> init
        [self-test display appears]
P00>>> runecu  ! Note that there is no space after run
```

Select exit from the menu.

17.4 Local Disk Converter Removal and Replacement

The local disk converter is mounted on the side of the CD-ROM drive box (Section 17.2). Phillips screws attach the circuit board to the box. Access is from the front of the cabinet.

Figure 17–4 Local Disk Converter



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Shut the circuit breaker off by pushing down the handle.
4. Remove all cable connectors from the rear of the box that holds the CD-ROM drive.
5. Remove the control panel. See Section 17.1.
6. Loosen the two captive screws (slotted) at the lower sides of the box. See ❻ in Figure 17–4.
7. Slide the box out of the cabinet and place it on a stable work surface.
8. Remove the top cover of the box by removing the nine screws (Phillips) and lifting the cover off. See ❽.
9. Disconnect the four cables from the local disk converter module. See ❾.
10. Remove the local disk converter module by removing the four screws (Phillips) from the corners of the module. Use a long screwdriver, and insert it through the holes on the side of the box opposite the local disk converter module.

Replacement

- Reverse the steps in the Removal procedure.

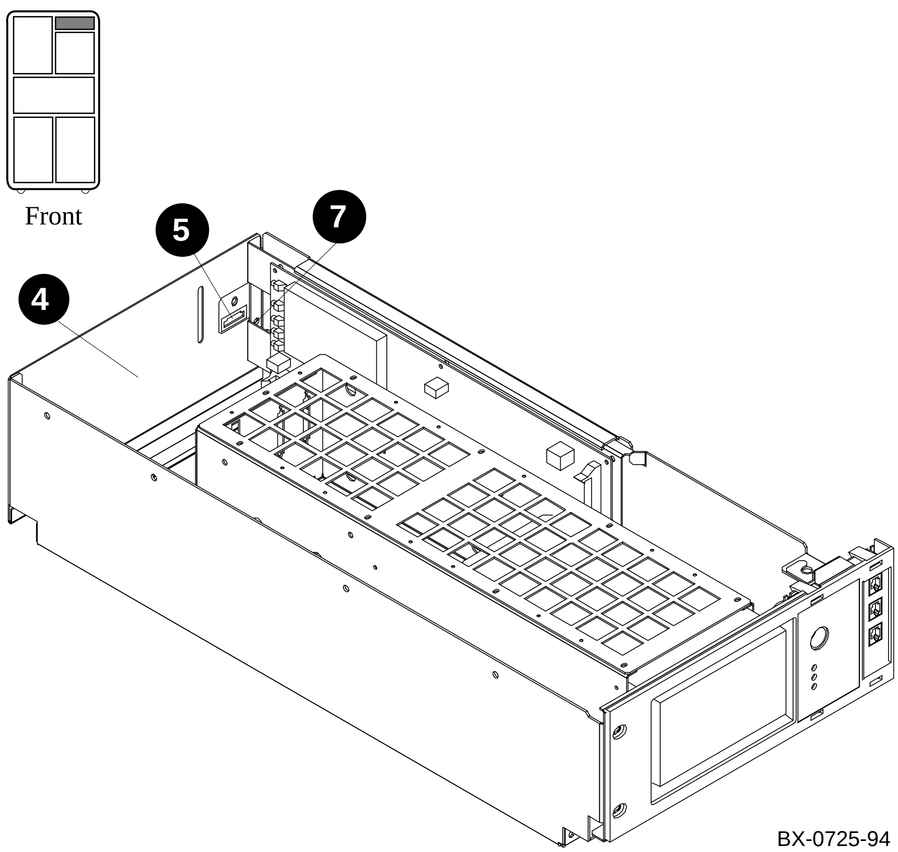
Verification

Boot LFU. See Chapter 6.

17.5 Cabinet Control Logic Module Removal and Replacement

The cabinet control logic (CCL) module is mounted on a slide plate with Phillips screws. The slide plate is held in place with slotted captive screws. Access is from the rear of the cabinet.

Figure 17–5 Cabinet Control Logic Module (Viewed from Front of Cabinet)



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Shut the circuit breaker off by pushing down the handle.
3. Ground yourself to the cabinet with an antistatic wrist strap.
4. At the rear of the system, remove the rear panel of the cabinet control system box. See ❹ in Figure 17–5.
5. If a DEC power bus cable is connected to the end of the slide plate on which the cabinet control logic module is mounted, remove the connector. See ❺.
6. Remove all connectors from the cabinet control logic module.
7. Loosen the two captive screws (slotted) on the end of the slide plate. See ❼.
8. Pull the slide plate out.
9. Remove the cabinet control logic module from the slide plate by removing the six screws (Phillips) that are in the corners and the center of each long side.

Replacement

- Reverse the steps in the Removal procedure.

Verification

Power up the system and turn the keyswitch to Enable. Check that the Key On LED lights.

Chapter 18

Power and Cooling Systems

This chapter contains the following sections:

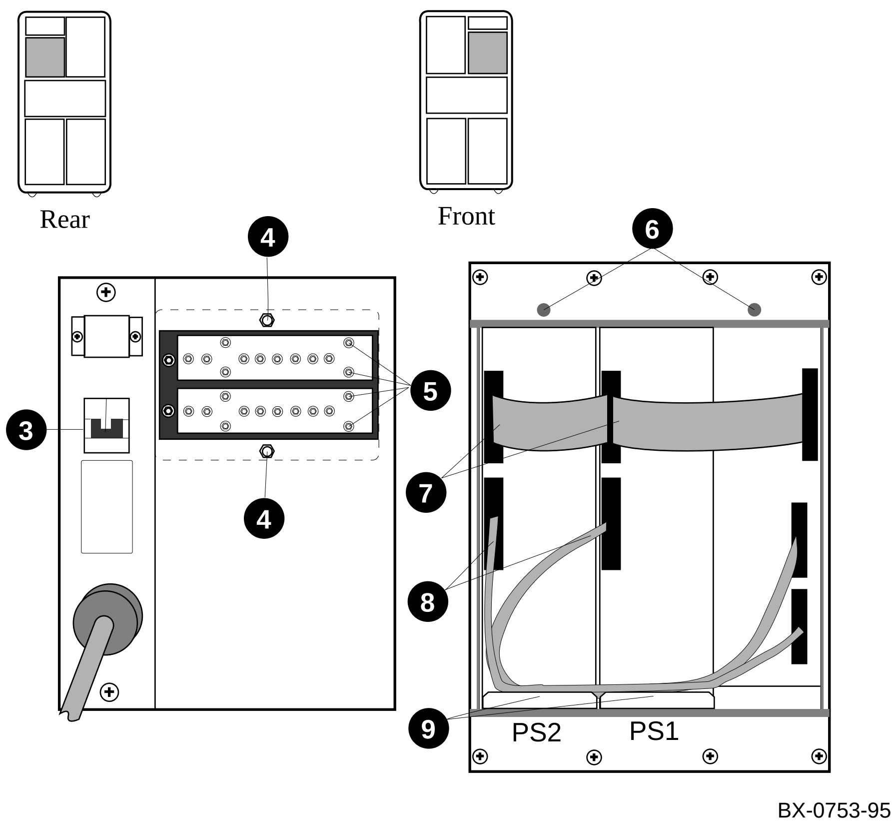
- Single-Phase Power System
  - H7264 Power Regulator Removal and Replacement
  - AC Distribution Box Removal and Replacement
- Three-Phase Power System
  - H7263 Power Regulator Removal and Replacement
  - AC Input Box Removal and Replacement
  - DC Distribution Box Removal and Replacement
- Blower Removal and Replacement

18.1 Single-Phase Power System

18.1.1 H7264 Power Regulator Removal and Replacement

Shut off the circuit breaker, detach the regulator from the bus bar, disconnect the cables, release the captive fastener, and slide the regulator out the front of the cabinet. Tools required: Phillips screwdriver, M5 nutdriver, 8 mm nutdriver.

Figure 18–1 H7264 Power Regulators



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. At the rear of the cabinet, shut off the system circuit breaker by pushing down on the handle (see ❸ in Figure 18–1).
4. Remove the bus bar cover by removing the two M5 nuts (see ❹ — the cover is shown in Figure 18–1 in outline).
5. Remove and save the four 8 mm nuts that attach the regulator to the bus bar assembly (see ❺). The four nuts on the right side of the bus bar are for PS2; those to the left are for PS1.
6. At the front of the cabinet, remove the cover from the power system box. Use a Phillips screwdriver to release the two quarter-turn fasteners (see ❻). Lift the cover from the bottom slots. (Figure 18–1 shows the power system with the cover already removed.)
7. Disconnect the signal cable (see ❼).
8. Disconnect the power cable (see ❽).
9. Release the captive fastener at the bottom front of the regulator (see ❾).
10. Slide the regulator out the front of the power system box.

Replacement

1. Slide the replacement regulator between the guides in the front of the power system box.
2. Tighten the captive fastener at the bottom front of the regulator.
3. At the rear of the cabinet, attach the regulator to the bus bar assembly with the four reserved 8 mm nuts.
4. Replace the bus bar cover.
5. At the front of the cabinet, connect the power and signal cables.
6. Replace the cover on the power system box.
7. Turn on the system circuit breaker by pushing the handle up.

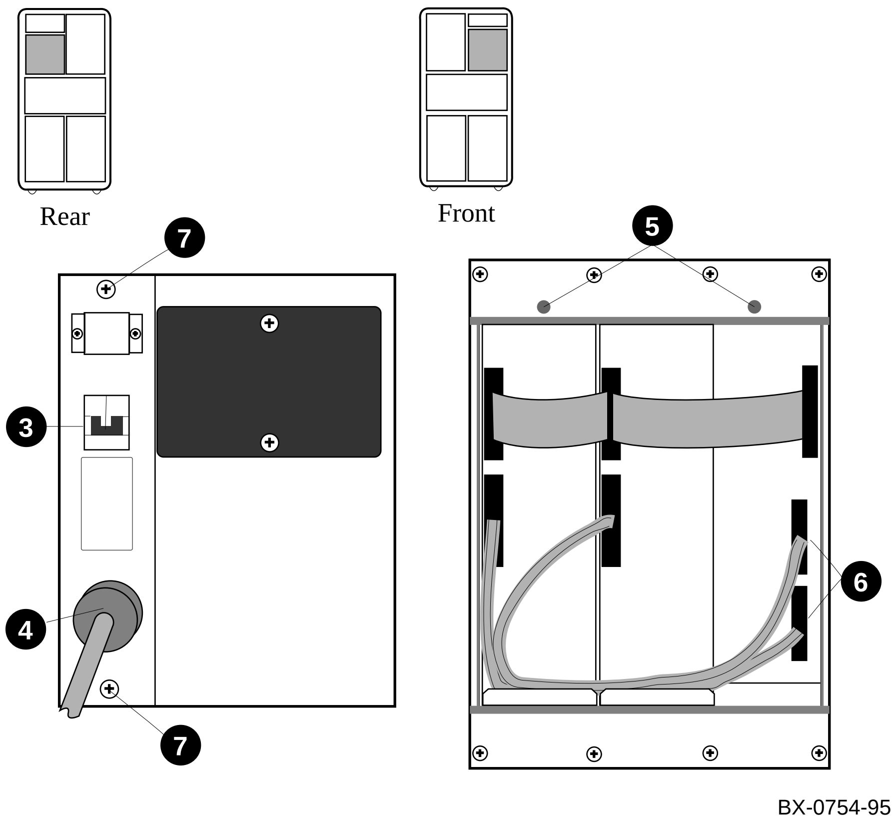
Verification

Power up the system and check that the MOD OK LED lights.

18.1.2 Single-Phase AC Distribution Box Removal and Replacement

Shut off the circuit breaker, disconnect the power cord, disconnect the power cables on the front of the box, and release the captive fasteners on the back of the box. Tool required: Phillips screwdriver.

Figure 18–2 Single-Phase AC Distribution Box



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. At the rear of the cabinet, turn off the system circuit breaker by pushing down on the handle (see ❸ in Figure 18–2).
4. Disconnect the power cord (see ❹).
5. At the front of the cabinet, remove the cover from the power system box. Use a Phillips screwdriver to release the two quarter-turn fasteners (see ❺). Lift the cover from the bottom slots. (Figure 18–2 shows the power system with the cover already removed.)
6. Disconnect the AC power cable (see ❻). The AC distribution box has one or two power cables, depending on the number of power regulators.
7. At the rear of the cabinet, use a Phillips screwdriver to release the captive fasteners (see ❼).

Replacement

- Reverse the steps in the Removal section.

Verification

Power up the system and check that the circuit breaker does not trip. Check that the LEDs on the power regulators light.

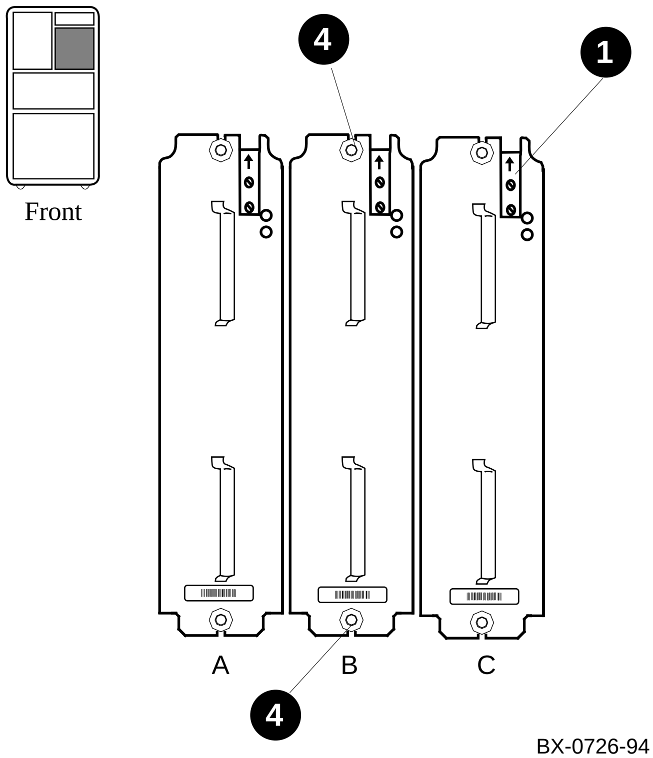
18.2 Three-Phase Power System

18.2.1 H7263 Power Regulator Removal and Replacement

The power regulators attach to the cabinet with Phillips captive screws. Access is from the front of the cabinet.

WARNING: The power regulator has a heated surface on one side.

Figure 18–3 H7263 Power Regulators



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. At the rear of the cabinet, shut the circuit breaker off by pushing down the handle. To ensure that the circuit breaker is not unintentionally switched on again, flip the lockout tag down. Lock the tag in place with the padlock from the Electrical Safety Toolkit. Place the padlock in the bottom hole of the bracket on either side of the tag. (See Section 18.2.2, step 4.)
4. From the front of the cabinet, loosen the two captive screws (Phillips), one each at the top and bottom of the power regulator to be removed. See ❹ in Figure 18–3.

   WARNING: One side of the power regulator has a heated surface. Do not touch the side when removing the power regulator.

   CAUTION: The power regulator weighs 20 kg (40.4 lb). Because of the height of this unit in the cabinet, you should not remove the power regulator from the cabinet by yourself.

5. Slide the power regulator out from the front of the cabinet. There will be some resistance.

Replacement

1. From the front of the cabinet, seat the replacement power regulator in its slot and push it in as far as it will go without lifting the precharge stop (see ❶ in Figure 18–3). Wait 5 seconds, and then lift the precharge stop and push the power regulator in the rest of the way.
2. Tighten the captive screws at the top and bottom of the power regulator.

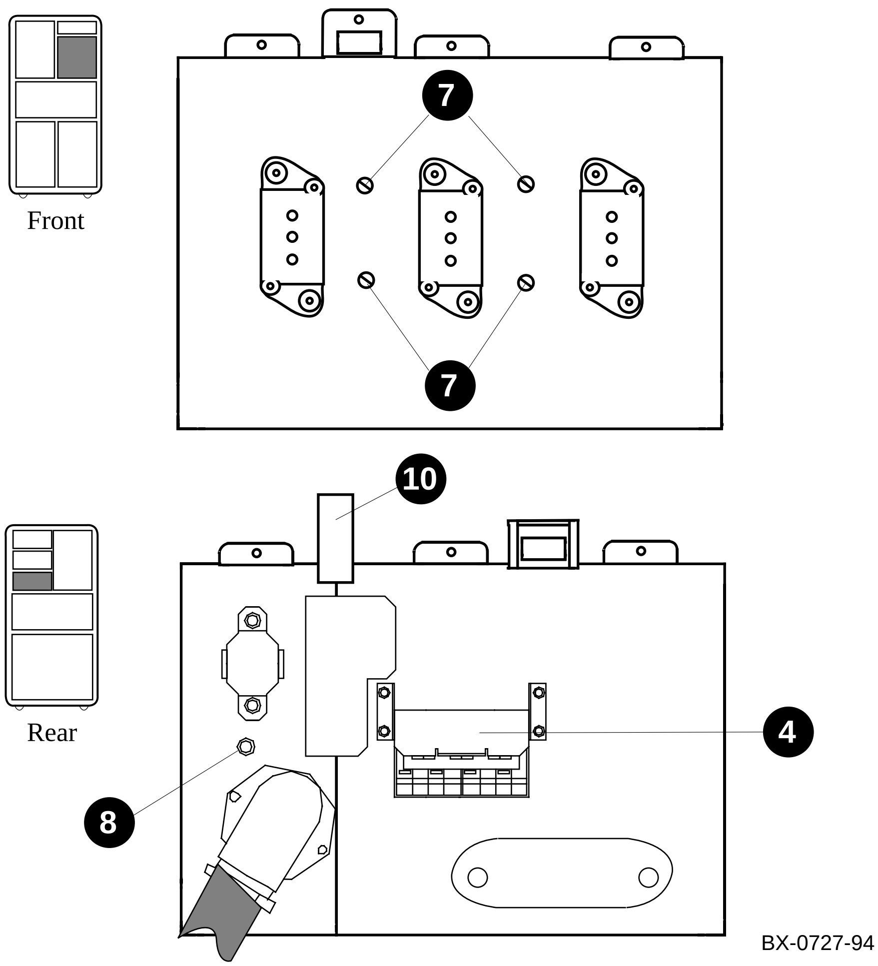
Verification

Power up the system and check that the top (green) LED on each power regulator lights.

18.2.2 Three-Phase AC Input Box Removal and Replacement

The AC input box attaches to the cabinet with slotted captive screws; the ground strap attaches to the AC input box with an 8 mm nut. Removal and replacement require access to both the front and rear of the cabinet.

Figure 18–4 Three-Phase AC Input Box



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. At the rear of the cabinet, shut the circuit breaker off by pushing down the handle.
4. To ensure that the circuit breaker is not unintentionally switched on again, flip the lockout tag down. See ❹ in Figure 18–4. Lock the tag in place with the padlock from the Electrical Safety Toolkit. Place the padlock in the bottom hole of the bracket on either side of the tag.
5. Disconnect the system power cord.
6. From the front of the cabinet, remove all power regulators and filler modules. See Section 18.2.1 for power regulator removal. To remove any filler modules, do the following:
   a. Loosen the captive screws at the top and bottom of the filler module.
   b. Grasp the handles and remove the filler module by sliding it forward.
7. Loosen the four captive screws on the front of the AC input box. See ❼ in Figure 18–4 (shown with power regulators removed).
8. At the rear of the cabinet, remove the ground strap at the AC input box end (8 mm nut). See ❽.
9. Remove the right plastic cover from the DC distribution box (above the AC input box).
10. Hold the AC input box to prevent it from falling. Pull the bracket attached to the DC distribution box up and push the bracket to the right to hold it in place. See ❿. (This bracket is partially obscured by the left plastic cover on the DC distribution box. Do not remove this plastic cover.)
11. Remove the AC input box from the rear of the cabinet.

Replacement

- Reverse the steps in the Removal procedure.

Verification

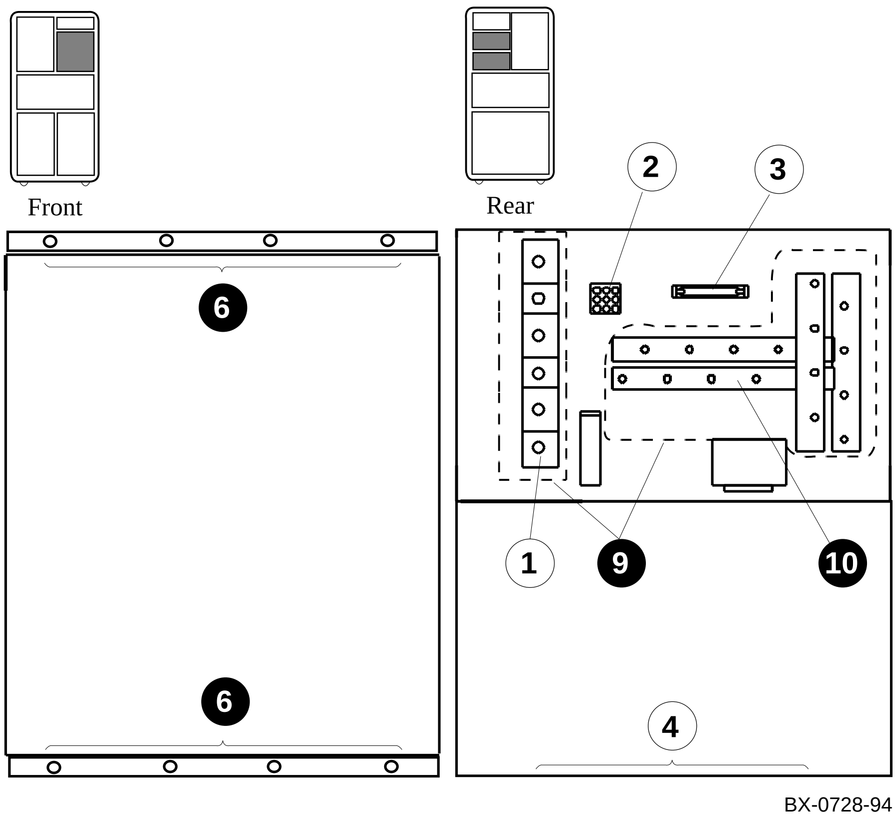
Power up the system and check that the circuit breaker does not trip.

18.2.3 Three-Phase DC Distribution Box Removal and Replacement

---

The DC distribution box is installed in the cabinet with Phillips screws. Connections to the assembly use 8 mm and 10 mm nuts. Removal and replacement require access to both the front and rear of the cabinet.

Figure 18–5 Three-Phase DC Distribution Box



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. At the rear of the cabinet, shut the circuit breaker off by pushing down the handle. To ensure that the circuit breaker stays off, flip the lockout tag down. Lock the tag in place with the padlock from the Electrical Safety Toolkit. Place the padlock in the bottom hole of the bracket on either side of the tag. (See Section 18.2.2, step 4.)
4. Disconnect the system power cord.
5. From the front of the cabinet, remove the power regulators. See Section 18.2.1.
6. Remove the eight screws (Phillips) from the top and bottom flanges (four each). See ❻ in Figure 18–5.
7. From the rear of the cabinet, remove the AC input box. See Section 18.2.2.
8. If this cabinet has a battery plug-in unit, disconnect the two-pin connector in each block of batteries. See Section 15.2, steps 3 and 4.
9. At the rear of the cabinet, remove the plastic covers from the battery terminals and the DC distribution bars. See ❾ in Figure 18–5.
10. Remove all 48VDC connections (8 mm nuts). See ❿.
11. Disconnect any battery connections (10 mm nuts). See ①.
12. If present, disconnect the battery sense cable. See ②.
13. Disconnect the control/status cable. See ③.
14. Remove the four flathead screws (Phillips) from the floor of the enclosure. See ④.
15. Pull the DC distribution box out from the front.

Replacement

1. Reverse the steps in the Removal procedure. When reconnecting the 48 VDC and battery connections (steps 10 and 11 in the Removal procedure), torque the nuts to 2.5 newton-meters (22 inch-pounds).
2. Check that battery connections (step 11 in the Removal procedure) are correct.
3. Check that 48V connections (step 10 in the Removal procedure) are correct.

Verification

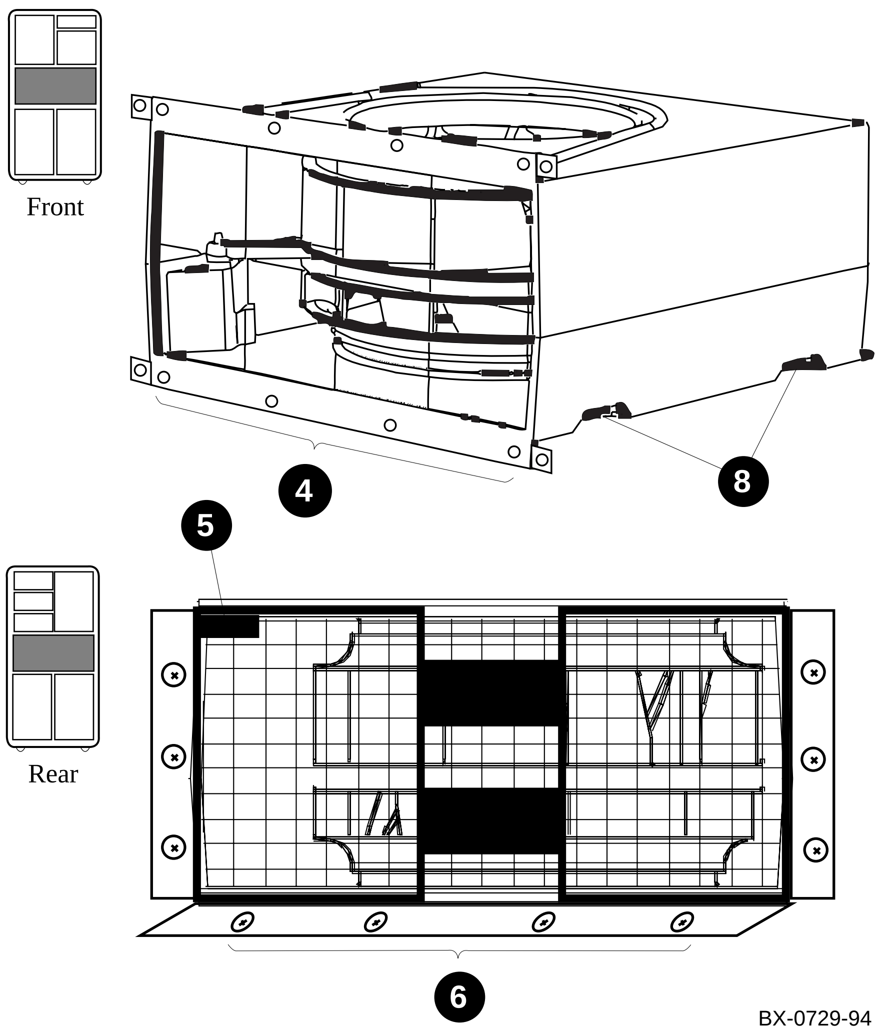
Power up the system and check that the yellow LED on the CCL module lights, that the PIU LEDs on the CCL module light, and that the blower turns on.

18.3 Blower Removal and Replacement

The blower attaches to the cabinet with Phillips screws. Removal and replacement require two persons and access to the front and rear of the cabinet.

WARNING: The blower weighs 25 kg (55 lb).

Figure 18–6 Blower



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Open the rear door of the cabinet. Shut the circuit breaker off. If the system has three-phase power, ensure that the circuit breaker is not unintentionally switched on again by flipping the lockout tag down and locking the tag in place with the padlock from the Electrical Safety Toolkit. Place the padlock in the bottom hole of the bracket on either side of the tag. (See Section 18.2.2, step 4.)
4. Remove the eight screws (Phillips) from the top and bottom blower flanges (four each). See ❹ in Figure 18–6.
5. Disconnect the 48V cable. See ❺.
6. Remove the four screws (Phillips) in the tabs protruding from the bottom of the blower box. See ❻.

   WARNING: The blower weighs 25 kg (55 lb). Do not remove the blower from the cabinet by yourself.

7. From the rear, push the blower assembly forward out of the cabinet 16 inches.
8. From the front of the cabinet and with one person on each side of the blower, use the handholds on the sides of the box to grasp and pull the blower assembly out the rest of the way. See ❽ in Figure 18–6.

Replacement

1. Apply silicone lubricant to the gaskets on the top and bottom surfaces of the replacement blower.
2. Orient the replacement blower so that the handholds in the box are at the bottom.
3. Reverse the steps in the Removal procedure.

Verification

Power up the system and check that the blower turns on.

Chapter 19

TLSB Card Cage

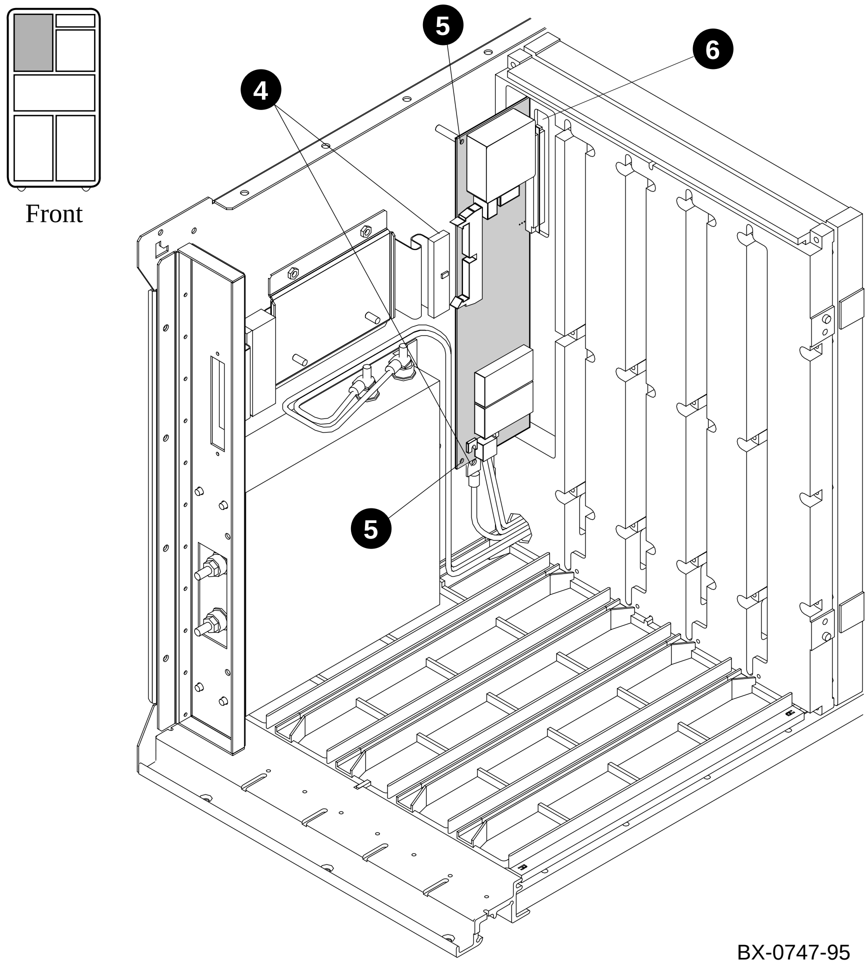
This chapter contains the following sections:

- System Clock Module Removal and Replacement
- TLSB Card Cage Removal and Replacement

19.1 System Clock Module Removal and Replacement

Remove all modules from the front of the card cage, disconnect the cables from the clock card, and remove the two Phillips screws from the clock card.

Figure 19–7 System Clock Module



Removal

1. Shut down the operating system. At the console prompt, find the system serial number:

   ```
   P00>>> show sys_serial_num
   ```

   Make a note of the response.

1. Turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Remove all modules from the front of the card cage (see Section 5.4).
4. Disconnect the power and CCL cables from the clock card (see ❹ in Figure 19–7).
5. Remove the two Phillips screws from the clock card (see ❺). Save the screws.
6. Remove the clock module from the centerplane connector (see ❻).

Replacement

1. Insert the replacement clock module in the centerplane connector.
2. Fasten the module in place with the reserved screws.
3. Connect the power and CCL cables. (The connectors are keyed.)
4. Replace the modules in the card cage. (See Section 5.4.) Be sure to insert the modules from left to right to avoid damaging the EMI gaskets.
5. Power up the system. At the console prompt set the system model number and serial number:

   ```
   P00>>> set mode adv
   P00>>> set sys_model_num 8400
   P00>>> set sys_serial_num <number>
   ```

   The variable **<number>** is the response you noted in step 1 of the Removal procedure.

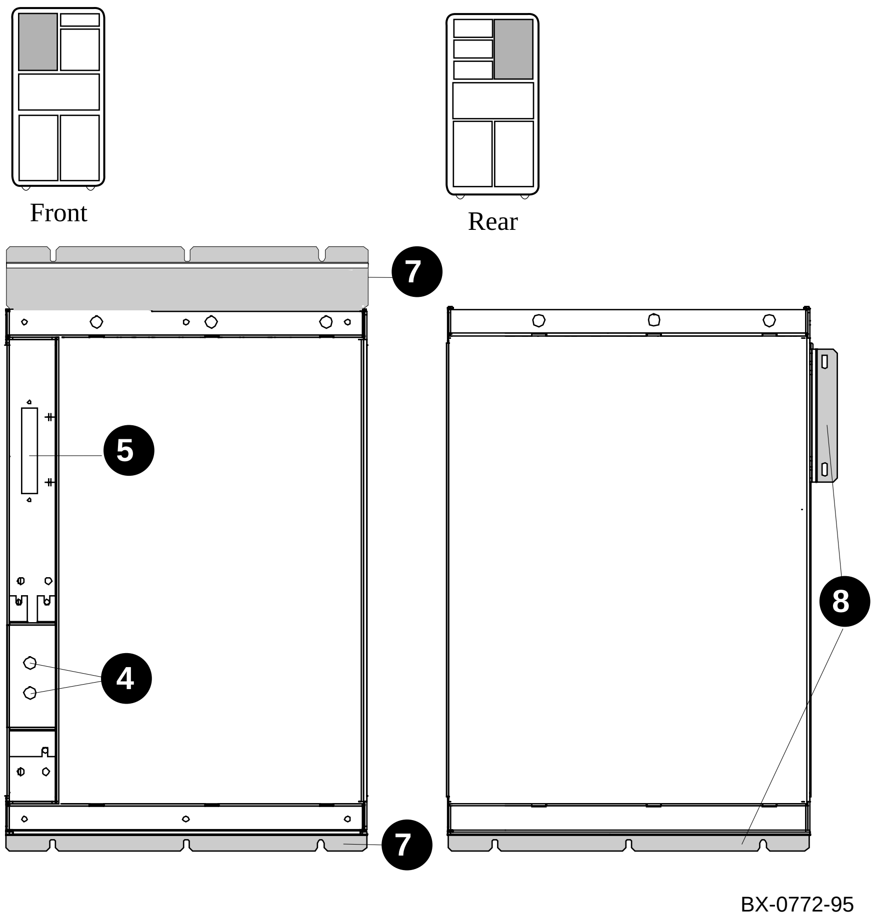
Verification

Power up the system and check that the entire self-test display prints.

19.2 TLSB Card Cage Removal

Remove all modules (front and rear), disconnect the cables from the front of the card cage, remove the system clock card, remove and save the mounting brackets, and slide the cage out from the front. You will need a Phillips head screwdriver and 8 mm and 10 mm nutdrivers.

Figure 19–8 TLSB Card Cage Removal



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Note the locations of the modules in the card cage and remove the modules. See Sections 5.4, 5.6, and 5.7.
4. At the front of the card cage, use the 8 mm nutdriver to remove the kepnuts from the terminal cover (see ❹ in Figure 19–8). Save the kepnuts. Using the 10 mm nutdriver, remove the nuts and washers that attach the power and ground cables to the power posts. Save the nuts and washers.
5. Disconnect the CCL cable. See ❺.
6. Remove the clock card. See Section 19.1.
7. At the front of the cabinet, use the Phillips head screwdriver to remove the top and bottom brackets from the card cage and the frame (see ❼). Save the brackets and screws.
8. At the rear of the cabinet, remove the side and bottom brackets from the frame and from the card cage (see ❽). Save the brackets and screws.

   CAUTION: The following step requires two people. Because of the height of the card cage in the cabinet, you should not remove this assembly from the cabinet by yourself.
9. Slide the card cage assembly out the front of the cabinet.

Replacement

1. Ground yourself to the cabinet with an antistatic wrist strap.

   CAUTION: The following step requires two people. Because of the height of the card cage in the cabinet, you should not install this assembly in the cabinet by yourself.
2. From the front, slide the replacement card cage into the cabinet so that the label is at the top on the front and the power filter is to the left.
3. Attach the reserved front top and bottom brackets and the rear bottom bracket to the card cage using the reserved flathead screws.

   NOTE: The rear bottom bracket is deeper than the front one. If these two brackets are swapped, the holes in the side rear bracket will not line up correctly in the next step.

Continued on next page

4. At the rear of the cabinet, use the Phillips head screwdriver to loosely install the reserved side bracket to the frame with two reserved screws. Line up the other two holes in the bracket with the card cage holes and insert two reserved screws. Tighten all four screws. Attach the card cage to the frame at the bottom with three reserved screws.
5. At the front of the cabinet, use the Phillips head screwdriver to attach the card cage to the frame at the top and bottom with five reserved screws.
6. Install the clock card. See Section 19.1.
7. Attach the CCL cable.
8. Use the 10 mm nutdriver and the reserved nuts to attach the power and ground cables to the power posts. (Place a washer behind the power cable connector and one in front of the connector, then attach and tighten the nut.) The yellow cable (+48 V) attaches to the top post; the gray cable (ground) attaches to the bottom post.
9. Use the 8 mm nutdriver and the reserved kepnuts to install the terminal cover over the power posts.

Verification

Power up the system and check that all modules appear in the self-test display. Enter the **show configuration**, **show device**, and **test** commands.

Chapter 20

PCI Plug-In Unit

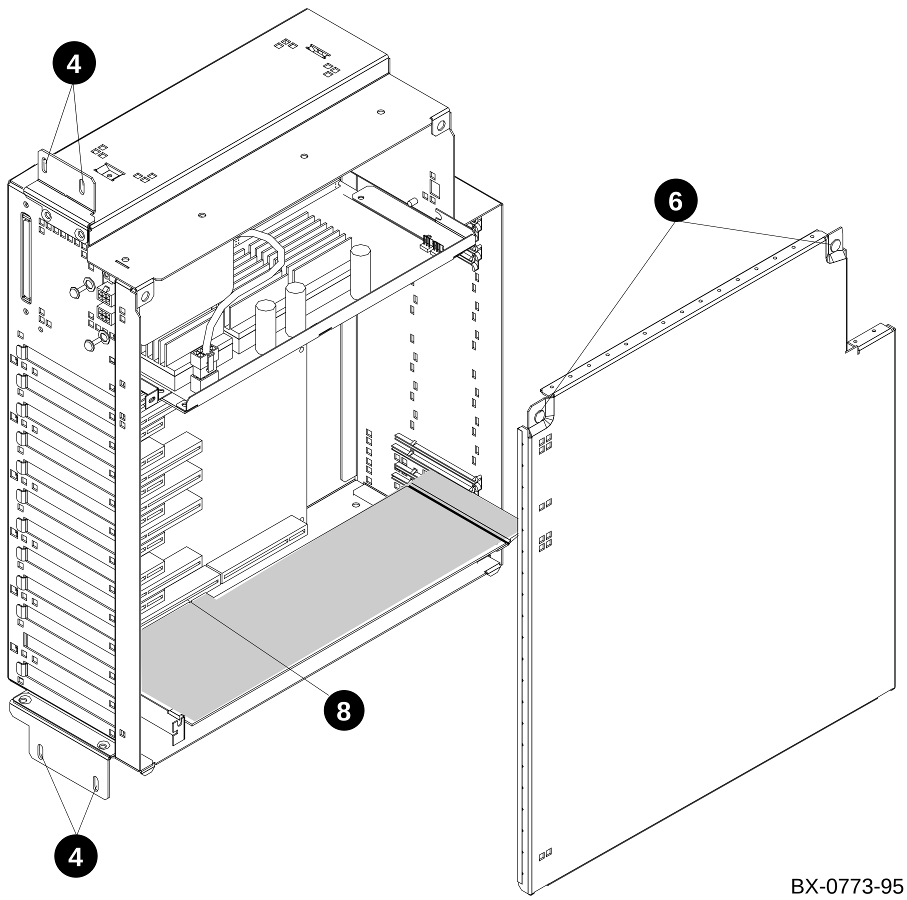
This chapter contains the following sections:

- Option Board Removal and Replacement
- Power Board Removal and Replacement
- Motherboard Removal and Replacement

20.1 Option Board Removal and Replacement

Disconnect cables from the front of the PCI shelf, remove four screws (two each top and bottom) that hold the shelf in place, and extend the shelf fully on its slides. Release the quarter-turn screws on the side panel and open the shelf. Remove the option board from its connector.

Figure 20–1 PCI PIU Option Boards



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Disconnect the two power connectors and any I/O cables that will prevent the shelf from fully extending on its slides.
4. Remove the two screws (Phillips) at the top and two at the bottom that hold the PCI shelf in place (see ❹ in Figure 20–1).
5. Slide the shelf out until the slides lock.
6. Loosen the two quarter-turn screws (Phillips) in the top corners of the side panel (see ❻). Remove the side panel by holding it at the top and bottom and swinging it out from the top.
7. If you did not do so in step 3, disconnect the I/O cable from the option.
8. Remove the option board from its connector (see ❽).

Replacement

1. Insert the option board in the appropriate connector.
2. Replace the side panel. Ensure that the EMI shield is in place and fasten the two quarter-turn screws.
3. Press the top and bottom slide locks and slide the PCI shelf into the enclosure.
4. Replace the two screws at the top and two at the bottom that hold the PCI shelf in place.
5. Connect all cables.
6. If you replaced the standard I/O module, run ECU. Place the ECU diskette in the floppy drive and type:

```
P00>>> set arc_enable on
P00>>> init
    [self-test display appears]
P00>>> runecu      ! Note that there is no space after run
```

   See the *Operations Manual* for information on this command.

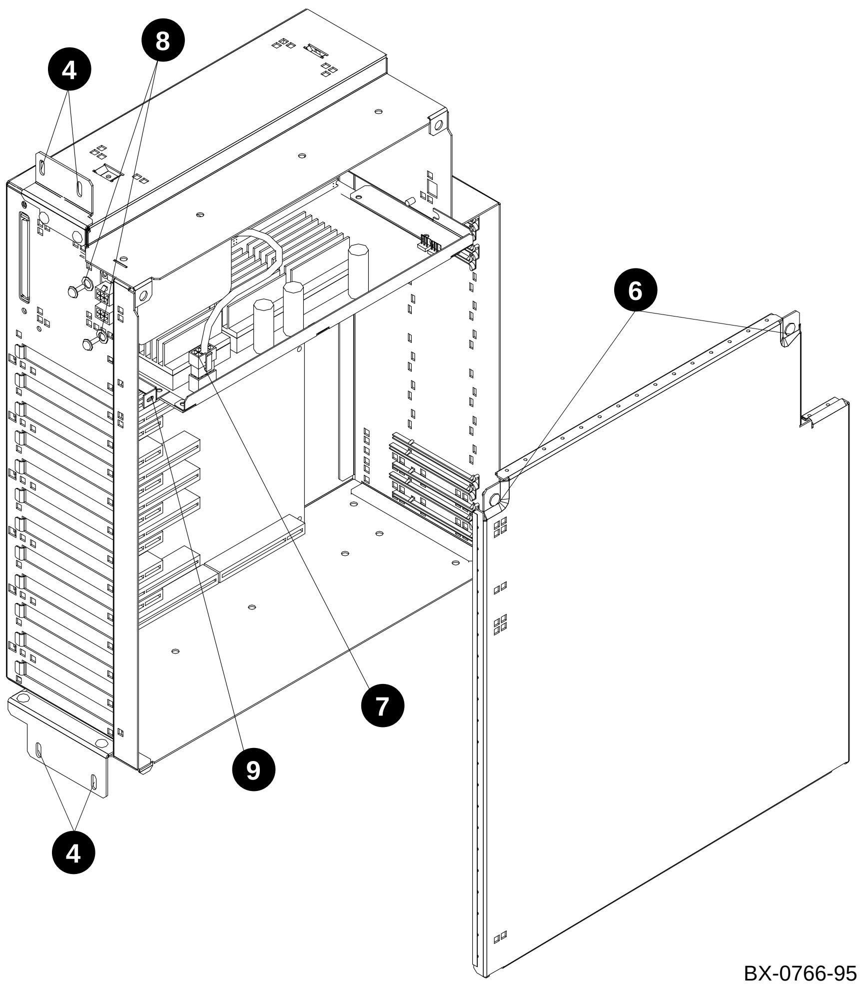
Verification

Power up the system and check the self-test display for plus signs in the PCI section.

20.2 Power Board Removal and Replacement

Disconnect cables from the front of the PCI shelf, remove four screws (two each top and bottom) that hold the shelf in place, and extend the shelf fully on its slides. Release the quarter-turn screws and open the side panel. Disconnect the cable to the line filter and remove the power board mounting screw.

Figure 20–2 PCI PIU Power Board



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Disconnect any cables from the front of the PCI shelf that might inhibit the PCI shelf from being fully extended on its slides.
4. Remove the two screws (Phillips) at the top and two at the bottom that hold the PCI shelf in place (see ❹ in Figure 20–2).
5. Slide the shelf out until the slides lock.
6. Loosen the two quarter-turn screws (Phillips) in the top corners of the side panel (see ❻). Remove the side panel by holding it at the top and bottom and swinging it out from the top.
7. Disconnect the line filter power cable from the power board (see ❼).
8. Remove the two screws (Phillips) and washers that hold the line filter in place (see ❽). Remove the line filter from the box and set it aside.
9. Remove the power board mounting screw (see ❾).
10. Slide the power board straight out.

Replacement

1. Slide the power board in place and align it with the locating pins.
2. Attach the power board mounting screw.
3. Replace the line filter and install its two mounting screws and washers. Connect the line filter power cable to the power board.
4. Replace the side panel. Ensure that the EMI shield is in place and fasten the two quarter-turn screws.

   CAUTION: Be careful not to damage the power cable in the following step.

5. Press the top and bottom slide locks and slide the PCI shelf into the enclosure.
6. Replace the two screws at the top and two at the bottom that hold the PCI shelf in place.
7. Connect all cables.

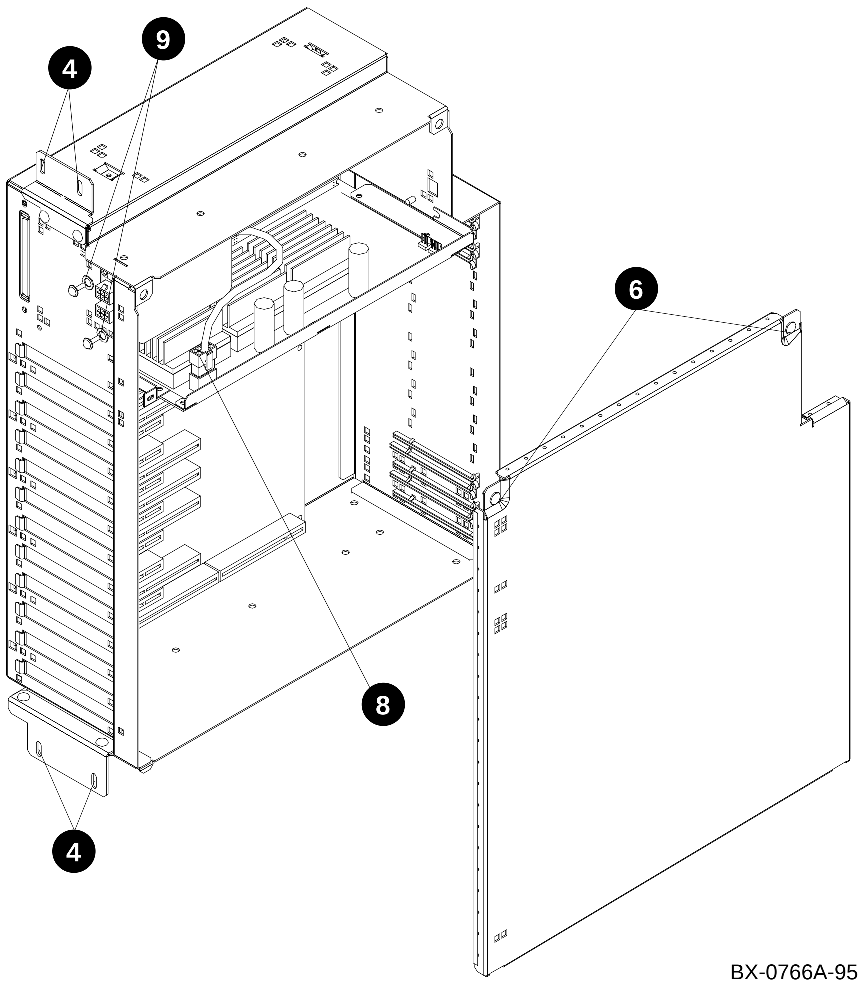
Verification

Power up the system and check that LEDs 1 and 3 (see Figure 2–5) on the motherboard light.

20.3 Motherboard Removal and Replacement

Remove all option boards, the line filter, and the power board. Remove the 11 mounting screws, slide the motherboard to the right, and rotate the bottom toward you.

Figure 20–3 PCI PIU Motherboard



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Disconnect any cables from the front of the PCI shelf that might inhibit the PCI shelf from being fully extended on its slides.
4. Remove the two screws (Phillips) at the top and two at the bottom that hold the PCI shelf in place (see ➍ in Figure 20–3).
5. Slide the shelf out until the slides lock.
6. Loosen the two quarter-turn screws in the top corners of the side panel (see ➏). Remove the side panel by holding it at the top and bottom and swinging it out from the top.
7. Remove all option boards. See Section 20.1.
8. Disconnect the line filter power cable from the power board (see ➑).
9. Remove the two screws (Phillips) and washers that hold the line filter in place (see ➒). Remove the line filter from the box and set it aside.
10. Remove the power board. See Section 20.2.
11. Remove the 11 mounting screws from the motherboard.
12. Holding the motherboard by the sides, slide it slightly to the right, then rotate the bottom toward you. Remove the board.

Replacement

1. Slide the top of the motherboard in place, then rotate the bottom away from you.
2. While pressing the motherboard toward the front of the shelf (to make good contact between the EMI shield on the shelf and the hose cover), insert and tighten the 11 mounting screws. (If the motherboard is not pushed forward far enough when mounting, the I/O hose cable will not make contact. If the PCI does not come up in the self-test display, this might be the reason.)
3. Replace the power board. See Section 20.2.
4. Replace the line filter and install its two mounting screws and washers. Connect the line filter power cable to the power board.
5. Replace the option boards. See Section 20.1.
6. Replace the side panel. Ensure that the EMI shield is in place and fasten the two quarter-turn screws.

Continued on next page

CAUTION: Be careful not to damage the power cable in the following step.

7. Press the top and bottom slide locks and slide the PCI shelf into the enclosure.
8. Replace the four screws that hold the PCI shelf in place.
9. Connect all cables.

Verification

Power up the system and check the LEDs on the left front of the shelf.

Chapter 21

XMI and Futurebus+ Plug-In Units

Since the field-replaceable units in these plug-in units are removed and replaced in the same way, only one set of instructions is given.

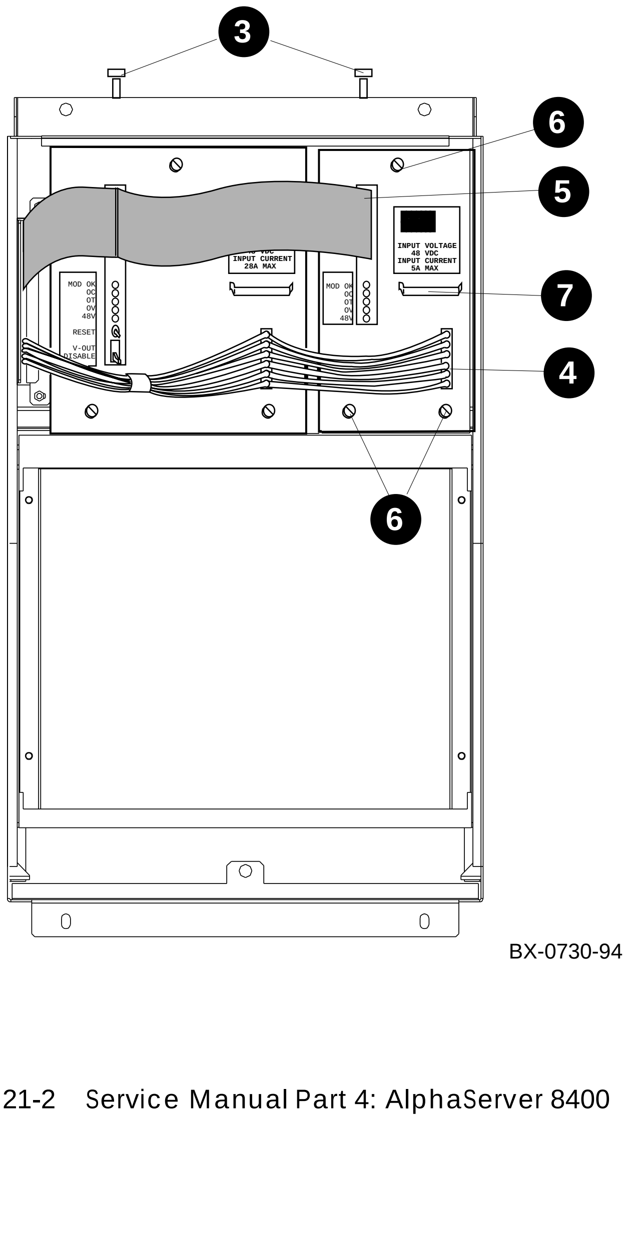
This chapter contains the following sections:

- Power Regulator Removal and Replacement
- Enclosure and Card Cage Removal and Replacement
- Air Filter Cleaning

21.1 Power Regulator Removal and Replacement

Disconnect the cables and loosen the three slotted captive screws on the front of the regulator. Grasp the handhold and pull the power regulator out of the enclosure.

Figure 21–1 XMI and Futurebus+ PIU Power Regulators



NOTE: The following instructions apply to both power regulators.

Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Loosen the two spring-loaded Phillips fasteners and remove the enclosure door. See ❸ in Figure 21–1.
4. Disconnect the 48V cable (two connectors). See ❹.
5. Disconnect the control and status cable (two connectors). See ❺.
6. Loosen the captive screws (slotted): one at the top and two at the bottom of each regulator. See ❻.
7. Using the handhold, pull out the power regulator. See ❼.

   CAUTION: Do not bend or touch the connectors (power blades) at the rear of the power regulator.
8. Place the power regulator on an ESD mat.

Replacement

To replace a power regulator, reverse the steps in the Removal procedure. Wear an antistatic wrist strap. The enclosure has a guide for the printed circuit board; be sure the edge of the board is in the guide. Put the switch on the large regulator in the Enable position.

Verification

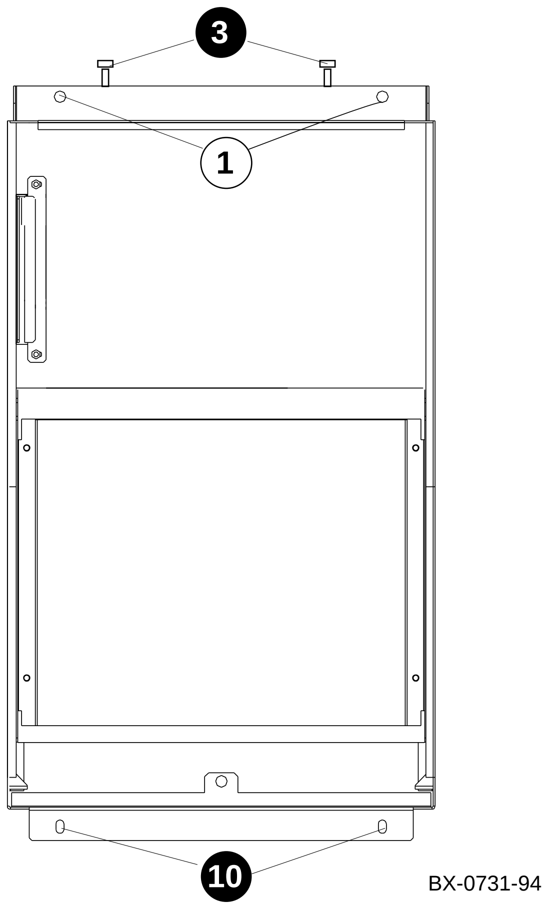
Power up the system and check the indicators on the power regulator:

- The 48V LED is on when the system is initialized.
- The MOD OK LED lights after power-up.

21.2 Enclosure and Card Cage Removal and Replacement

An XMI PIU uses two quadrants, front to rear. A Futurebus+ PIU uses one quadrant, in the rear of the cabinet only. Use a Phillips screwdriver to remove any of these PIUs.

Figure 21–2 XMI and Futurebus+ PIU Enclosure



NOTE: The following procedure is for the front half of the XMI enclosure. The rear half remains in the cabinet. This procedure is for the entire Futurebus+ enclosure.

Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Loosen the two spring-loaded Phillips fasteners and remove the enclosure door. See ❸ in Figure 21–2.

   CAUTION: Hold the handle on the XMI card cage while removing or inserting a module. If it is not held in place, the handle can spring down and damage the module.

4. Remove all modules from the card cage. Store the modules in ESD boxes or on ESD mats. Do not stack the modules.
5. Remove the power regulators. See Section 21.1.
6. Open the rear door of the cabinet.
7. Open the I/O bulkhead: pull up and twist the two door pins, and then swing the bulkhead open.
8. Disconnect the Ethernet power cables from the bulkhead connectors.
9. Disconnect the I/O cables from the backplane.
10. At the front of the cabinet, remove the two screws (Phillips) at the bottom of the PIU enclosure. See ❿ in Figure 21–2.
11. Loosen the two captive screws (slotted) at the top of the enclosure. See ①.
12. Pull the enclosure out from the front of the cabinet (from the rear if Futurebus+).

Replacement

1. For XMI PIUs: Tightening the top captive screws compresses the EMI gasket between the front and rear halves of the enclosure. Inspect the EMI gasket before replacing the front half of the enclosure to determine that the gasket is not broken.
2. Reverse the steps in the Removal procedure.

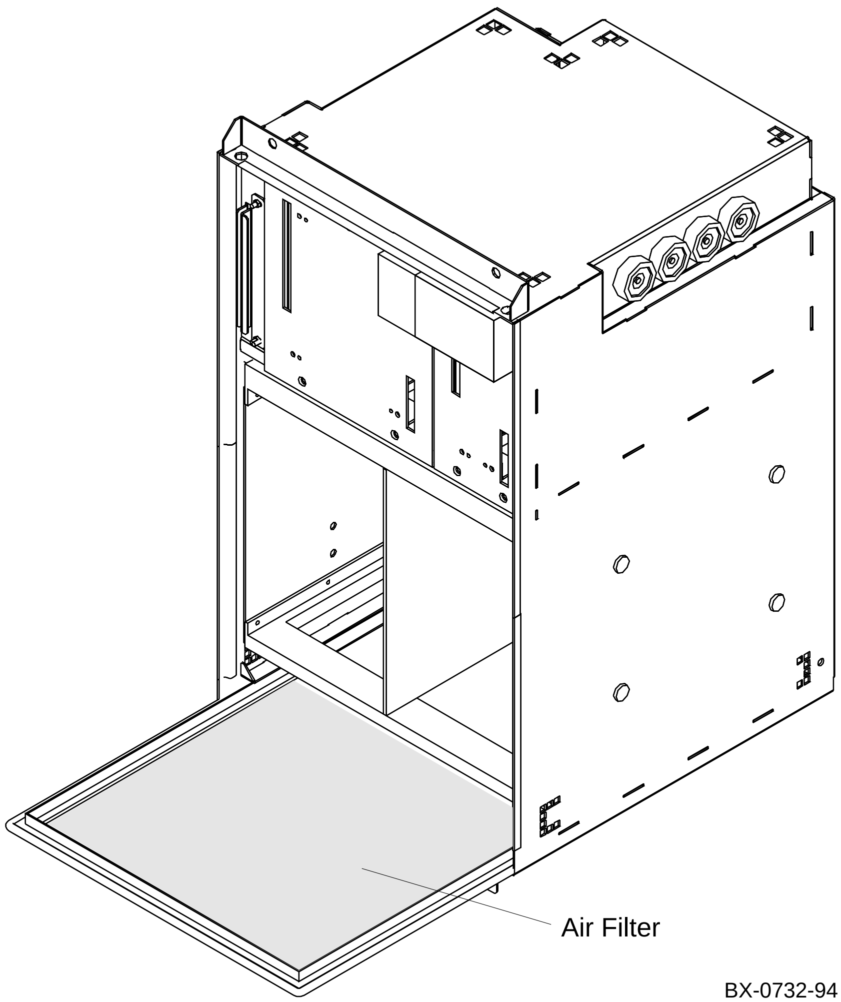
Verification

Check the PIU LEDs on the CCL module to be sure power is reaching the quadrant with the card cage you replaced.

21.3 Air Filter Cleaning

The air filter is located in the bottom of the I/O PIU enclosure (front half). Clean it with a vacuum cleaner or a wire brush (preferably brass).

Figure 21–3 XMI and Futurebus+ PIU Air Filter



Air Filter Cleaning

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. If you are working on an XMI PIU, loosen the two spring-loaded fasteners (Phillips) and remove the PIU enclosure door.
4. Slide the filter out.
5. Clean the filter with a vacuum cleaner or a wire brush (preferably brass).
6. Replace the filter.
7. Replace the enclosure door.
8. Close the cabinet door.

Chapter 22

SCSI Storage Plug-In Unit

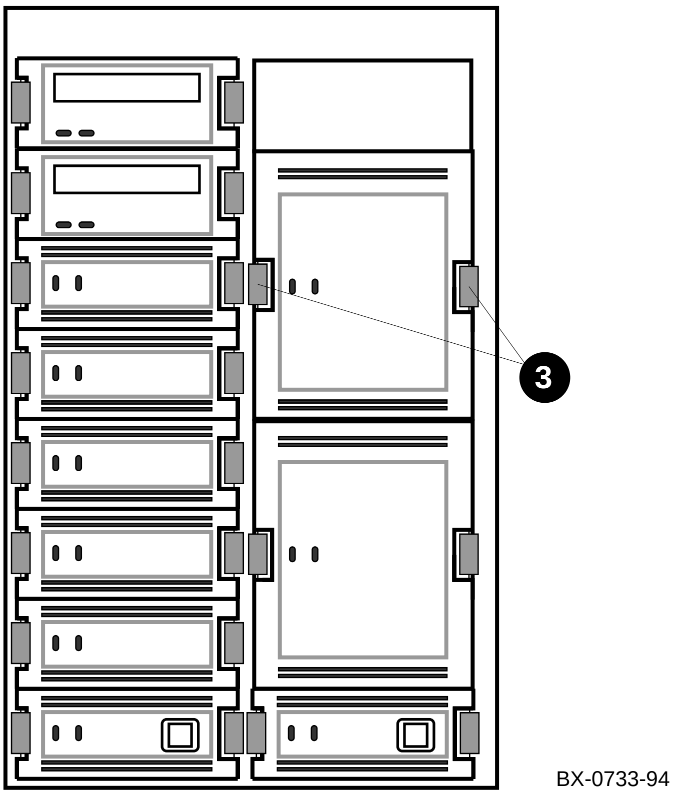
This chapter contains the following sections:

- Device Removal and Replacement
- Power Supply Removal and Replacement

22.1 Device Removal and Replacement

Press both mounting tabs in and slide the disk or tape drive out of the shelf. Use both hands to fully support the weight of the drive.

Figure 22–1 SCSI PIU Devices



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Press in both mounting tabs on the disk or tape drive. See ❸ in Figure 22–1.
4. Using both hands to support the weight, slide the device out of the shelf.

Replacement

1. Insert the disk or tape drive in the guide slots.
2. Push the drive in until the mounting tabs lock in place.

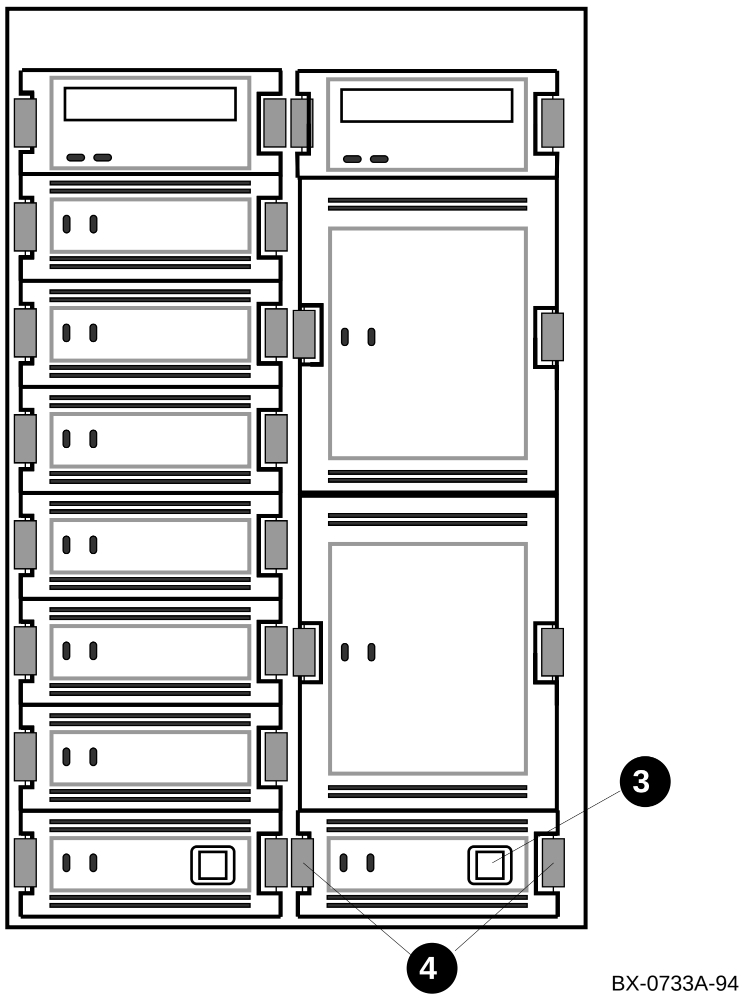
Verification

Power up the system and check the LEDs on the drive you replaced.

22.2 Power Supply Removal and Replacement

Disconnect the cable from the power supply. Press the mounting tabs in and slide the power supply out of the shelf. Use both hands to fully support the weight.

Figure 22–2 SCSI PIU Power Supply



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Disconnect the input power cord from the power supply. See ❸ in Figure 22–2.
4. Press in both mounting tabs on the power supply. See ❹.
5. Using both hands to support the weight, slide the power supply out of the shelf.

Replacement

1. Insert the power supply in the guide slots.
2. Push the power supply in until the mounting tabs lock in place.
3. Connect the input power cord.

Verification

Power up the system and check the LEDs on the power supply.

Chapter 23

DSSI Disk Plug-In Unit

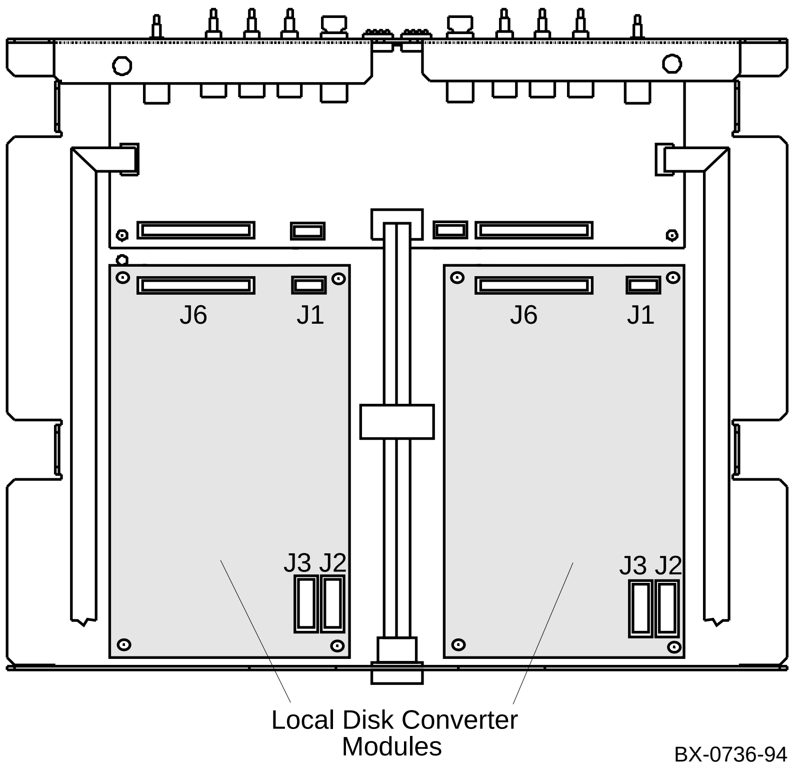
This chapter contains the following sections:

- Local Disk Converter Removal and Replacement
- Remote Front Panel Removal and Replacement
- Disk Removal and Replacement
- Power and Signal Harness Removal and Replacement

23.1 Local Disk Converter Removal and Replacement

Pull the brick from the enclosure and remove the 13 Phillips screws from the cover. The local disk converter module is attached to the underside of the brick cover by four Phillips screws.

Figure 23–1 DSSI PIU — Underside of Brick Cover Showing Local Disk Converter



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Remove the disk brick from the enclosure by removing the screws in the upper right and upper left corners and pulling the brick toward you.
4. Set the disk brick on a stable work surface.
5. Remove the top cover of the disk brick. The cover is attached by nine Phillips screws at the back (three on each side and three on the bottom) and two flathead Phillips screws in each channel on the sides of the disk brick.
6. Remove all cable connectors from the local disk converter module (connectors J1, J2, J3, and J6 — see Figure 23–1).
7. Remove the four screws (Phillips) from the corners of the local disk converter module.

Replacement

- Reverse the steps in the Removal procedure.

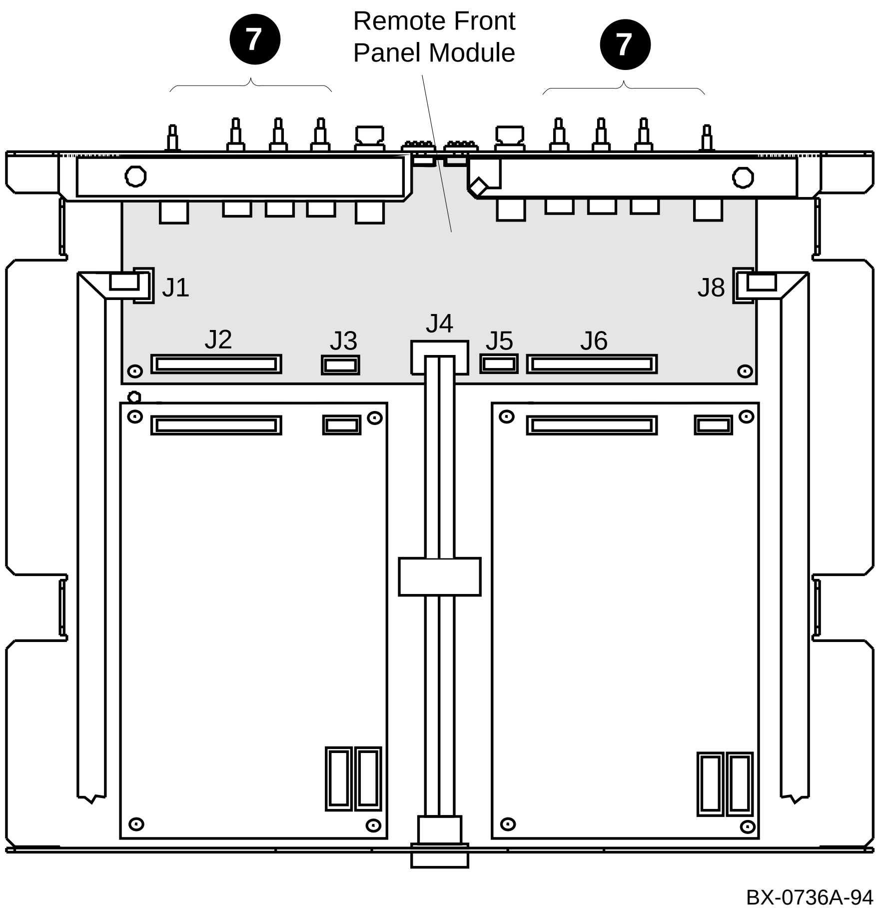
Verification

Power up the system and check the LEDs on the front of the disk brick.

23.2 Remote Front Panel Removal and Replacement

Pull the brick from the enclosure and remove the 13 Phillips screws from the cover. The remote front panel module is attached to the underside of the brick cover by six Phillips screws.

Figure 23–2 DSSI PIU — Underside of Brick Cover Showing Remote Front Panel



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Remove the disk brick from the enclosure by removing the screws in the upper right and upper left corners and pulling the brick toward you.
4. Place the disk brick on a stable work surface.
5. Remove the top cover of the disk brick. The cover is attached by nine Phillips screws at the back (three on each side and three on the bottom) and two flathead Phillips screws in each channel on the sides of the disk brick.
6. Remove all cable connectors from the remote front panel module (J1 through J6 and J8 — see Figure 23–2).
7. With a pair of needle nose pliers, pull the switch buttons from the front bezel. See ❼ in Figure 23–2.
8. Remove the six screws (Phillips) that hold the remote front panel module in place.

Replacement

- Reverse the steps in the Removal procedure.

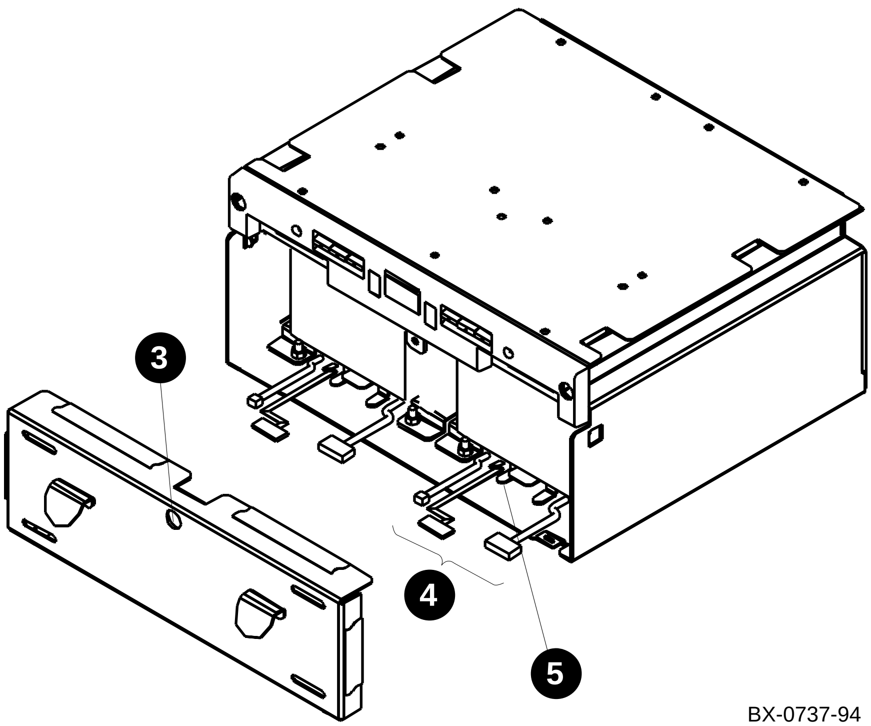
Verification

Power up the system and check the LEDs on the front of the disk brick.

23.3 Disk Removal and Replacement

Pull the brick from the enclosure and loosen the two slotted captive screws in the front bezel. Disconnect cables, press the latch pin, and slide the disk drive from the brick.

Figure 23–3 DSSI PIU Disks



NOTE: These instructions apply to either drive in the brick.

Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Remove the front bezel from the disk brick by loosening the captive screw and pulling the bezel away from the brick. See ❸ in Figure 23–3.
4. Remove the three cables from the connectors beneath the disk drive. See ❹.
5. Press down the latch pin under the skid plate on the disk drive. See ❺. Slide the disk drive forward.

Replacement

- Reverse the steps in the Removal procedure.

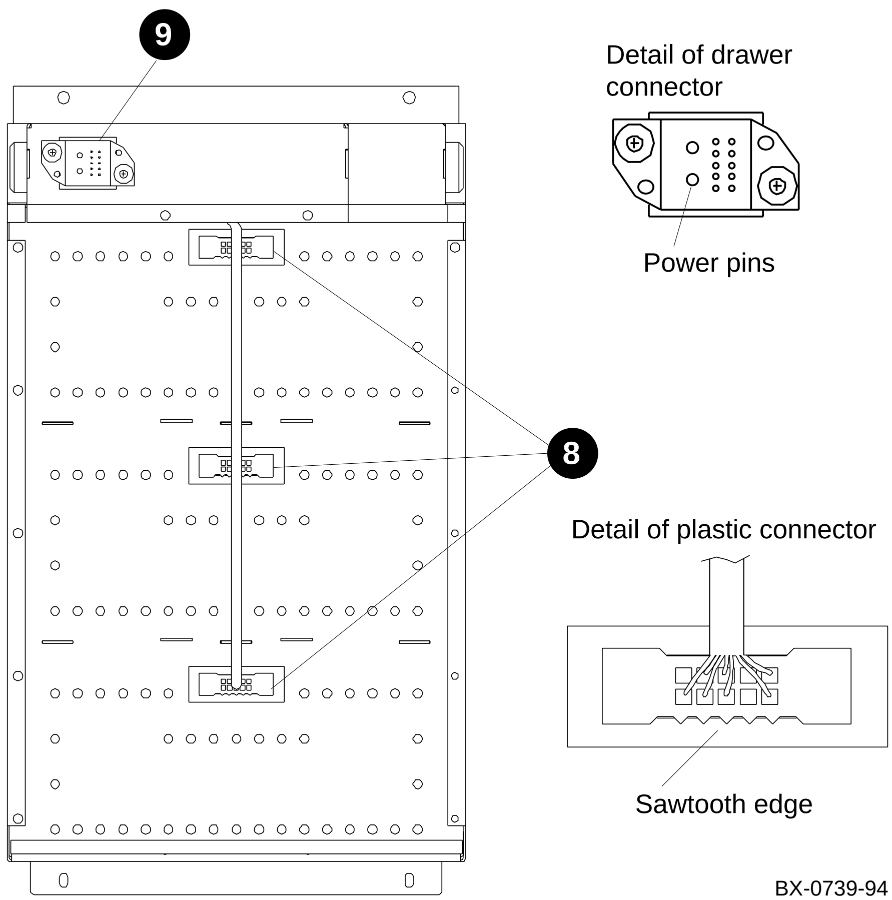
Verification

Power up the system and check the LEDs on the front of the disk brick.

23.4 Power and Signal Harness Removal and Replacement

Remove the enclosure from the cabinet. Remove the rear panel, which is attached to the enclosure by 12 Phillips screws. Pull the three plastic connectors straight out; remove the two Phillips screws from the drawer connector and compress and push the pins from the front.

Figure 23–4 DSSI PIU Power and Signal Harness



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. Remove the disk bricks from the enclosure by pulling each brick toward you.
4. Loosen the two slotted captive screws at the top front of the enclosure.
5. Remove the two Phillips screws at the bottom front of the enclosure.
6. Pull the enclosure straight out of the cabinet.
7. Remove the rear panel of the enclosure, which is attached to the enclosure by 12 Phillips screws.
8. Remove the three plastic connectors at the rear of the enclosure by pulling them straight out. See ❽ in Figure 23–4. From the front of the enclosure, compress the pins on one side of the plastic connector and push them through the hole; repeat on the other side. Pull the connector out from the rear.
9. Remove the drawer connector (see ❾) by removing the two Phillips screws.
10. Pull the cable harness through the opening for the drawer connector.

Replacement

1. Snake the replacement harness through the opening for the drawer connector.
2. Position the drawer connector so that the side with the two large power pins is to the left (see detail of drawer connector in Figure 23–4). Attach the drawer connector with the two Phillips screws.
3. Insert the three plastic connectors in the openings in the rear of the enclosure so that the sawtooth edge of each is at the bottom (see detail of plastic connector). Push each connector into the opening until it snaps in place.
4. Replace the rear panel of the enclosure. The arrow on the panel must point toward the blower.
5. Slide the enclosure into the cabinet.
6. Replace the bottom two Phillips screws and tighten the top two captive screws.
7. Replace the disk bricks.

Verification

Power up the system and check the CCL module for power to the quadrant. Check the LEDs on the front of all disk bricks.

Chapter 24

Battery Plug-In Unit

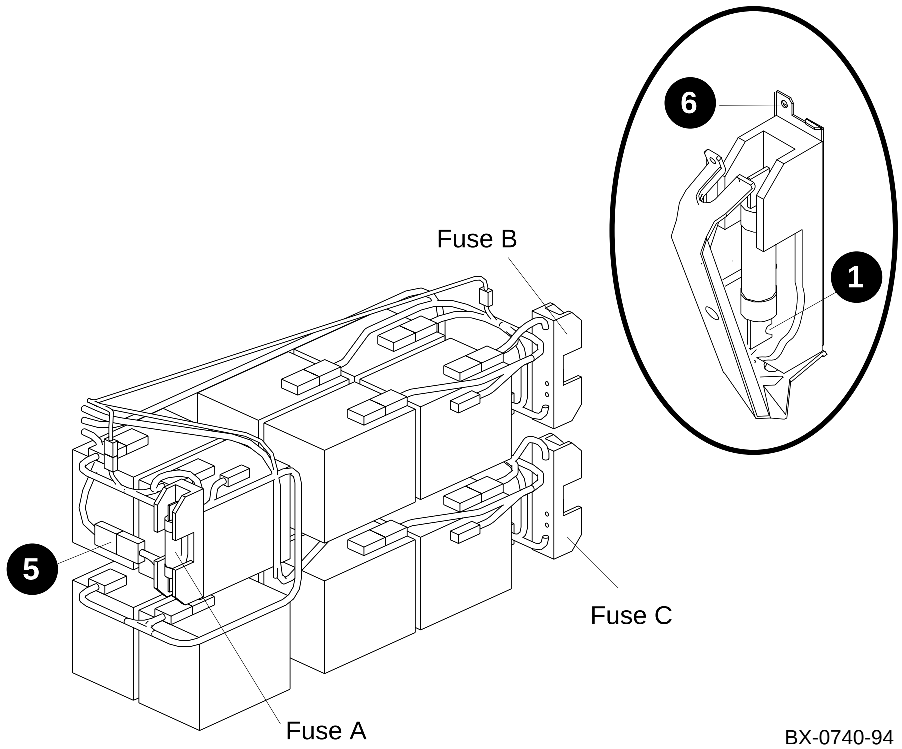
This chapter contains the following sections:

- Fuse Removal and Replacement
- Cable Removal and Replacement
- Battery Removal and Replacement

24.1 Fuse Removal and Replacement

Shut the circuit breaker off, padlock the lockout tag in place, and break the main cable connection to the battery block in which you are working. Remove the fuse cover and use the fuse puller to remove the fuse.

Figure 24–1 Battery PIU Fuse



Removal

1. Shut down the operating system and turn the keyswitch to Disable.
2. Ground yourself to the cabinet with an antistatic wrist strap.
3. At the rear of the cabinet, shut the circuit breaker off by pushing down the handle. To ensure that the circuit breaker is not unintentionally switched on again, flip the lockout tag down. Lock the tag in place with a padlock in the bottom hole of the bracket on either side of the tag. (See Section 18.2.2, step 4.)
4. Remove the appropriate panel of the battery plug-in unit. If you are working in battery block A, remove the rear panel; if battery block B or C, remove the front panel.
5. Break the main cable connection to the block of batteries in which you are working. See ❺ in Figure 24–1, which shows the location of the main cable connection for battery block A. This connection is in a similar location for blocks B and C: next to the bottom half of the fuse.
6. Remove the fuse cover by removing the screw (Phillips) at the top of the cover and pulling the cover toward you and down. See ❻.
7. Use the fuse puller from the Electrical Safety Kit to grip the fuse and pull it out.

Replacement

1. Position the cutout in the fuse contact over the rivet in one end of the fuse holder. See ❶ in Figure 24–1. Push the fuse into place.
2. Replace the fuse cover.
3. Connect the main cable connection to the battery block.
4. Close the door of the battery plug-in unit.

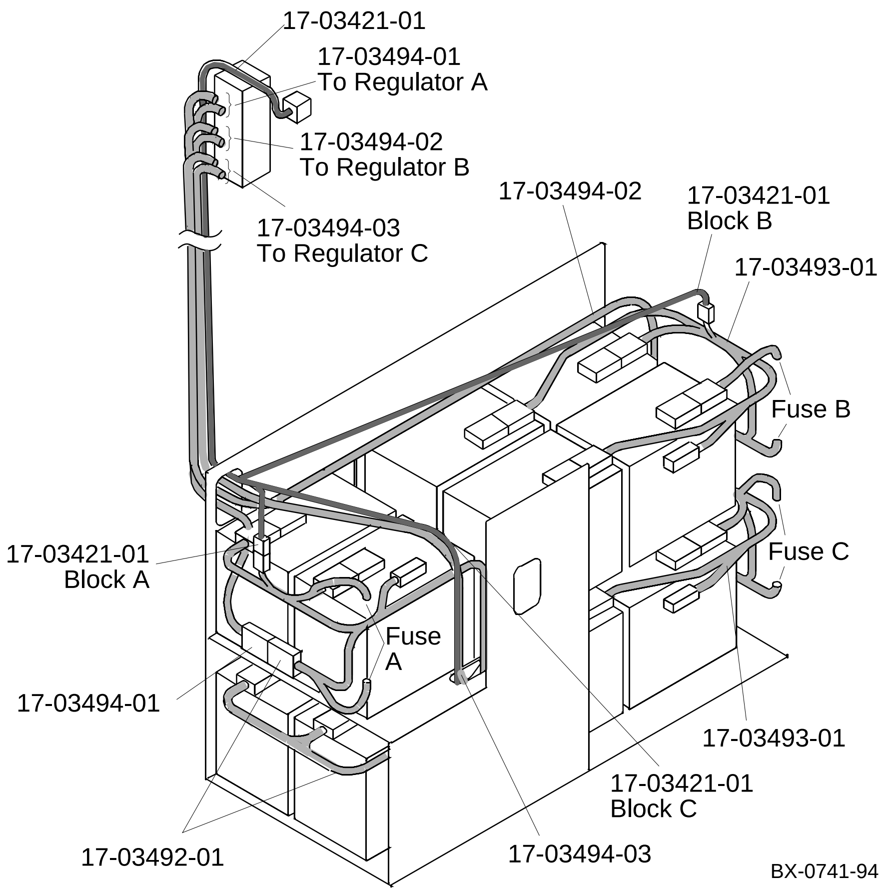
Verification

Power up the system and run the **show power** command.

24.2 Cable Removal and Replacement

Remove the fuse for the battery block with which you are working before removing the cable.

Figure 24–2 Battery PIU (Rear) Showing Cable Routing



Removal

1. Follow the procedure in Section 24.1 to remove the fuse.
2. Disconnect the cable and remove it. See the detail drawing of the cable in Figure 24–2 for routing.

Replacement

1. Snake the replacement cable through the channel in the side of the cabinet.
2. Make all cable connections as shown in Figure 24–2.
3. If you are replacing the battery sense cable (17–03421–01), route it along the power cable path to the appropriate battery block.
4. Replace the fuse. See the Replacement procedure in Section 24.1.

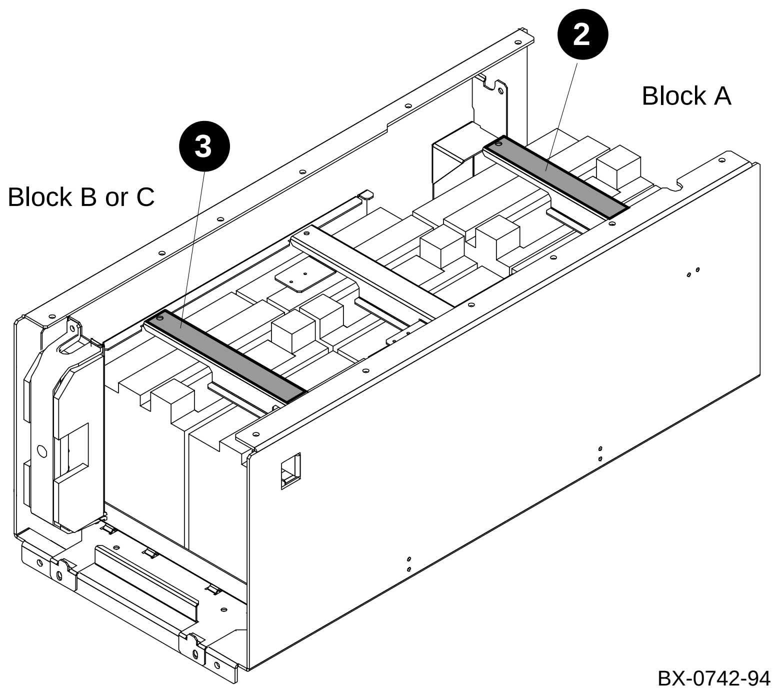
Verification

Power up the system and run the **show power** command.

24.3 Battery Removal and Replacement

Remove the fuse for the battery block you are replacing. Then remove the battery hold-down bracket and the batteries. For blocks B and C, remove the front batteries, then pull the tray out and tilt it down to gain access to the rear batteries.

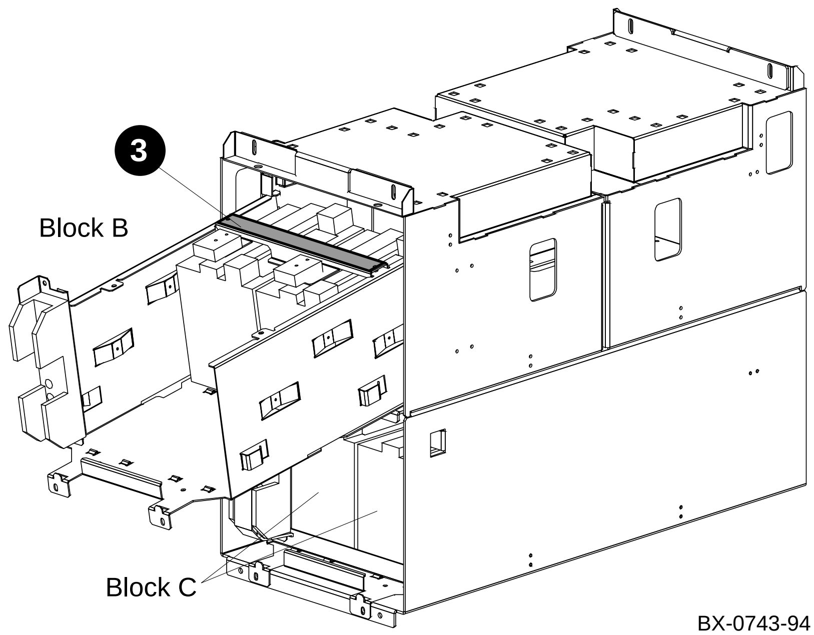
Figure 24–3 Battery Hold-Down Brackets



Removal

1. Remove the fuse from the battery block in which you are working (see Section 24.1).
2. To remove the batteries in block A, remove the battery hold-down bracket from the top pair of batteries (see ❷ in Figure 24–3). Disconnect the cables and remove the batteries. Repeat for the bottom pair of batteries.
3. To remove the batteries in block B or C, remove the battery hold-down bracket from the pair of batteries closer to you (see ❸ in Figure 24–3). Disconnect the cables and remove the batteries. Then pull the tray out and tilt it down until it locks in place. Remove the rear hold-down bracket (see ❸ in Figure 24–4), disconnect the cables, and remove the batteries.

Figure 24–4 Rear Batteries (Blocks B and C)



Continued on next page

Replacement

- Reverse the steps in the Removal procedure.

REPLACEMENT OF BATTERIES: When batteries are replaced, use only batteries that are compatible with the product's electrical requirements and recharging circuitry, if applicable. Consult your local Digital Service Center for information and proper servicing.

BATTERY DISPOSAL: Recycle or dispose of batteries contained in this product properly, in accordance with local regulations for the battery type as marked on the battery. Prior to disposal or recycling, protect batteries against accidental short circuiting by affixing nonconductive tape across battery terminals or conductive surfaces. If the battery is not marked, or if you require other information regarding batteries, consult your nearest Digital Service Center.

Verification

Power up the system and enter the **show power** command.

Appendix A

Console Commands and Environment Variables

A.1 Console Commands

Table A–1 is a summary of the console commands, showing syntax and brief descriptions. For more information, see the Operations Manual.

Table A–1 Summary of Console Commands

Command	Description
b[oot] [-flags M, PPPP] [-file <filename>] <device_name>	Boot the operating system. **-fl[ags]** — overrides the **boot_osflags** environment variable. **M** — specifies the system root to be booted from the system disk. **PPPP** — operating system bootstrap loader options. **-file** — boot from the file **<filename>** (overrides the **boot_file** environment variable).
bu[ild] -c <device>	Copy the EEPROM environment variables from a secondary processor to the primary processor. **<device>** — KN7CC–AA or KN7CC–AB.
bu[ild] -e <device>	Initialize a module's EEPROM. **<device>** — KN7CC–AA or KN7CC–AB.
bu[ild] -n <device>	Initialize the CPU's nonvolatile RAM. **<device>** — KN7CC–AA or KN7CC–AB.
bu[ild] -s <device>	Initialize a module's serial EEPROM. **<device>** — MS7CC, MS7BB, KFTIA, KFTHA, DWLMA, DWLAA, or DWLPA.

Table A–1 Summary of Console Commands (Continued)

Command	Description
cl[ear] ee[prom] <option>	Clears the selected EEPROM option. **<option> — diag_sdd**, **diag_tdd**, **symptom**, or **log**.
cl[ear] <envar>	Removes an environment variable. **<envar>** — name of the environment variable.
cl[ear] sc[reen]	Clears the terminal screen.
c[ontinue]	Resumes processing at the point where it was interrupted by Ctrl/P.
cra[sh]	Causes the operating system to restart and generates a memory dump.
cre[ate] <envar> [<value>]	Creates an environment variable. **<envar>** — environment variable name. **<value>** — optional variable value.
da[te] [<yyyymmddhhmm.ss>]	Sets or displays the system date and time. **yyyy** — year; **mm** — month; **dd** — day; **hh** — hour; **mm** — minutes; **ss** — seconds
d[eposit] [-{b,w,l,q,o,h}] [-{n val, s val}] [space:]<address> <data>	Stores data in the specified location. **space** — device name or address space of the device to access. **<address>** — offset within a device to which data is deposited.
e[xamine] [-{b,w,l,q,o,h}] [-{n val, s val}] [space:]<address>	Displays the contents of a memory location, register, or device. **space** — device name or address space of the device to access. **<address>** — a longword that specifies the first location to be examined.
he[lp] [<command>]	Provides infomation on console commands.
i[nitialize]	Performs a reset.

Table A–1 Summary of Console Commands (Continued)

Command	Description
run <program> [-d <device>] [-p <n>] [-s <parameter string>]	Runs one of four ARC utility programs: rcu (RAID Configuration Utility), swxcrfw, eepromcfg, util_cli. The **arc_enable** environment variable must be set. **<program>** — command option. **<device>** — console device containing the program (default is dva0). **<n>** — unit number of the PCI to configure. **<parameter string>** — optional parameters to pass to the utility (must be enclosed in quotes).
runecu	Invokes the EISA Configuration Utility.
se[t] ee[prom] <option>	Sets the selected EEPROM option. **<option>** — **field**, **halt**, **manufacturing**, **serial**, or **symptom**.
se[t] <envar> [value]	Modifies an environment variable. See Table A–2 for the values of **envar** and **value**. The command **set -d envar** resets the environment variable to its default.
se[t] h[ost] <device_adapter> or **se[t] h[ost] <-dup> <-bus b> node [task]**	Connects to another console or service. The **-dup** option invokes the DUP server on the selected node. The **set host** command can be issued only from the boot processor.
se[t] p[ower] -b <value> <option>	Configures the power regulators for battery backup. Used only on AlphaServer 8400 with three-phase power. **-b** — configure the system with batteries. **<value>** — number of batteries, **4** or **8**. **<option>** — cabinet containing the batteries, **main**, **left**, or **right**.
se[t] see[prom] <option> <device>	Sets the selected SEEPROM option. **<option>** — **field**, **manufacturing**, or **serial**. **<device>** — the device mnemonic.
sh[ow] c[onfiguration]	Displays the last configuration seen at system initialization.
sh[ow] cpu	Displays information on CPUs in the system.

Table A–1 Summary of Console Commands (Continued)

Command	Description
sh[ow] dev[ice] [<dev_name>]	Displays device information for any disk or tape adapter or group of adapters. **<dev_name>** — any adapter name; wild-carding is allowed. If blank, information is given for all devices in the system.
sh[ow] ee[prom] <option>	Displays selected EEPROM information. **<option> — diag_sdd**, **diag_tdd**, **field**, **halt**, **manufacturing**, **serial**, or **symptom**.
sh[ow] <envar> or **show ***	Displays the current state of the specified environment variable. **<envar>** — an environment variable name (see Table A–2).
sh[ow] m[emory]	Displays memory module information.
sh[ow] ne[twork]	Displays the names and physical addresses of all known network devices in the system.
sh[ow] p[ower] [-{h,s}] [option]	Gives the power status of an AlphaServer 8400 system with three-phase power. **-s** — current status (default). **-h** — history status (value of each parameter at the last system shutdown). **option** — cabinet (**main**, **right**, or **left**).
sh[ow] see[prom] <option> <device>	Displays selected SEEPROM information. **<option> — diag_sdd**, **diag_tdd**, **symptom**, **field**, **manufacturing**, or **serial**. **<device> — KFTHA** or **KFTIA**.
sh[ow] simm	Displays the location of any bad SIMMs or indicates that no SIMM errors were found.
s[tart] address	Begins execution of an instruction at the address specified. Does not initialize the system.
sto[p] <processor_number>	Halts a specified processor. Does not control the running of diagnostics and does not apply to adapters or memories. **<processor_number>** — the logical CPU number (displayed by the **show cpu** command).

Table A–1 Summary of Console Commands (Continued)

Command	Description
t[est] [-write] [-nowrite "list" [-omit "list"] [-t time] [-q] [<dev_arg>]	Tests the entire system (default), a subsystem, or a specific device. **-write** — selects writes to media as well as reads; applicable only to disk testing. **-nowrite "list"** — used with **-write** to prevent selected devices or groups of devices from being written to. **-omit "list"** — specifies devices not to test. **-t time** — run time in seconds, following system sizing and configuration; default is 600 seconds. **-q** — disables status messages. **<dev_arg>** — specifies the target device, group of devices, or subsystem.
# (comment)	Introduces a comment.

A.2 Environment Variables

An environment variable is a name and value association maintained by the console program. The value associated with an environment variable is an ASCII string (up to 127 characters) or an integer. Some environment variables are typically modified by the user to tailor the recovery behavior of the system on power-up and after system failures. Volatile environment variables are initialized by a system reset; others are nonvolatile across system failures.

Environment variables are created, modified, displayed, and deleted using the create, set, show, and clear commands. A default value is associated with any variable that is stored in the EEPROM area.

Table A–2 lists console environment variables, their attributes, and their functions.

Table A–2 Environment Variables

Variable	Attribute	Function
arc_enable	Non-volatile	Enables the console ARC interface, allowing booting of ECU and other ARC utilities. Default value is **off**.
auto_action	Non-volatile	Specifies the action the system will take following an error halt. Values are: **restart -** Automatically restart. If restart fails, boot the operating system. **boot -** Automatically boot the operating system. **halt** (default) - Enter console mode.
bootdef_dev	Non-volatile	The default device or device list from which booting is attempted when no device name is specified by the **boot** command.
boot_file	Non-volatile	The default file name used for the primary bootstrap when no file name is specified by the **boot** command, if appropriate.
boot_osflags	Non-volatile	Additional parameters to be passed to the system software during booting if none are specified by the **boot** command with the **-flags** qualifier.
boot_reset	Non-volatile	Resets system and displays self-test results during booting. Default value is **off**.
console	Non-volatile	The type of terminal being used for the console, either **serial** (default) for a standard video terminal or **graphics** for a graphics display. If the terminal is a graphics display, the system must have a PCI with a standard I/O module and a TGA graphics controller. If that hardware is not available, the variable remains set to **serial**.
cpu	Volatile	Selects the current boot processor.
cpu_enabled	Non-volatile	A bitmask indicating which processors are enabled to run (leave console mode). Default is **0xffff**.

Table A–2 Environment Variables (Continued)

Variable	Attribute	Function
cpu_primary	Non-volatile	A bitmask indicating which processors are enabled to become the next boot processor, following the next reset. Default is **0xffff**.
d_harderr	Volatile	Determines action taken following a hard error. Values are **halt** (default) and **continue**. Applies only when using the **test** command.
d_report	Volatile	Determines level of information provided by the diagnostic reports. Values are **summary** and **full** (default). Applies only when using the **test** command.
d_softerr	Volatile	Determines action taken following a soft error. Values are **continue** (default) and **halt**. Applies only when using the **test** command.
dump_dev	Non-volatile	Device to which dump file is written if system crashes, if supported by the operating system.
enable_audit	Non-volatile	If set to **on** (default), enables the generation of audit trail messages. If set to **off**, audit trail messages are suppressed. Console initialization sets this to **on**.
graphics_switch	Non-volatile	Overrides the screen resolution setting. The variable is an integer from **0** to **15**, as described in Table A–3.
interleave	Non-volatile	The memory interleave specification. Value must be **default** (memory configuration algorithm that attempts to maximize memory interleaving is used), **none**, or an explicit interleave list.
language	Non-volatile	Determines whether system displays message numbers or message text. Default value is **36** (English).
simm_callout	Non-volatile	If set to **on**, enables pause-on-error mode (POEM) testing of faulty memories during power-up. Default is **off**.

Table A–2 Environment Variables (Continued)

Variable	Attribute	Function
sys_model_num	Non-volatile	The system model number, either **8200** or **8400**. Set in manufacturing.
sys_serial_num	Non-volatile	The system serial number. Set in manufacturing.
tta0_baud	Non-volatile	Sets the console terminal baud rate. Allowable values are **300**, **600**, **1200**, **2400**, **4800**, and **9600**.

Table A–3 Settings for the graphics_switch Environment Variable

Setting	Pixel Frequency (Mhz)	Monitor Resolution (Pixels)	Refresh Rate (Hz)
0	130	1280 x 1024	72
1	119	1280 x 1024	66
2	108	1280 x 1024	60
3	104	1152 x 900	72
4	93	1152 x 900	66
5	75	1024 x 768	70
6	74	1024 x 768	72
7	69	1024 x 864	60
8	65	1024 x 768	60
9	50	800 x 600	72
10	40	800 x 600	60
11	32	640 x 480	72
12	25	640 x 480	60
13	135	1280 x 1024	75
14	110	1280 x 1024	60
15	Reserved		

Appendix B

How to Find Option Information

The Digital Systems and Options Catalog describes all options for AlphaServer 8200 and AlphaServer 8400 systems. In addition, Digital maintains a list of the latest supported options on the Internet, which you can access as follows:

Using ftp, copy the file:

ftp.digital.com/pub/Digital/Alpha/systems/as8400/docs/8400-options.txt

Using a Worldwide Web browser (such as Mosaic or Netscape), follow links from URL:

http://www.service.digital.com/alpha/server/8400.html

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