ftServer W Series 2300
Technical Service Guide

Revision 1 – 10/28/04

Revision History

10/28/04 – Added 160-GB disk drive to Sections 1 and 5.

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Manual Name: *ftServer W Series 2300 Technical Service Guide*
Revision1, October 2004
Services Technical Communications Department

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Preface

The *ftServer W Series 2300 Technical Service Guide* contains technical information pertinent to ftServer systems operating under the Windows 2003 operating system.

This document is organized as follows:

Section 1 - Introduction

Section 2 -Operation and Troubleshooting Procedures

Section 3 - CRU Removal and Replacement Procedures

Section 4 – FRU and DRU Removal and Replacement Procedures

Section 5 - Part Numbers

Section 6 - Theory of Operation

Section 7 – Related Documentation

Audience

This guide is intended for authorized service personnel who install and maintain Stratus systems, and who have completed Stratus field-service training courses.

1. Introduction

This section describes the requirements, components, configurations, and specifications for the Stratus ftServer W Series 2300 system. It covers the following topics:

- Overview
- Operating system requirements
- Hardware components
- System configurations
- System specifications

1.1 Overview

ftServer W Series 2300 systems are distributed servers on a fault-tolerant hardware architecture. Stratus customizes the software, providing fault-hardened device drivers, enhancements to the operating system, and application reliability and availability, to promote fault tolerance.

The ftServer 2300 is based on Intel® IA32 architecture using Intel's Xeon Prestonia processor in a dual modular redundancy (DMR) configuration.

A single 16 x 20 inch motherboard contains all of the logic required for a complete DMR system. Along with the motherboard, the chassis also contains dual 350-Watt power supplies, dual Serial Advanced Technology Attachment (SATA) backplanes and four PCI slots. With the exception of one USB port, all of the power and I/O cables are located at the rear of the system. LEDs located at the front and rear of the system are used to indicate the status of the system and peripheral components. The system contains cooling fans that draw air through the front of the system, over the internal components and exhaust the heated air to the rear.

Each ftServer 2300 system has two CPU elements and two I/O elements combined on the motherboard in a 4U (7-inch) standard 19-inch rack-mountable unit (can be converted to a pedestal system by purchasing a pedestal kit). The CPU element is configured to support a front side bus (FSB) of 533 MHz with a CPU speed of 3.06 GHz.

Each I/O element has two user configurable 33-Mhz/64-bit PCI slots. Optional Virtual Technician Modules (VTMs) may be installed in the system to enhance the system's remote management functionality. They supply the system with in-band (while the operating system is functioning) as well as out-of-band (the operating system is not functioning) capabilities. Operating on independent power and network connections, the VTMs allow remote communication with Stratus' ActiveService regardless of the system's state.

This VTM is a PCI adapter that is installed in a 168-pin DIMM connector. It uses a dedicated serial port.

The embedded features include a 10/100/1000 Mbit PCI Ethernet controller, a PCI Video controller, and a PCI SATA controller.

The standard ftServer 2300 power configuration is AC inlet power by country-specific external power cords. This is the required configuration for pedestal systems. Rack mounted systems can be powered via optional power distribution units.

Other features include the following:

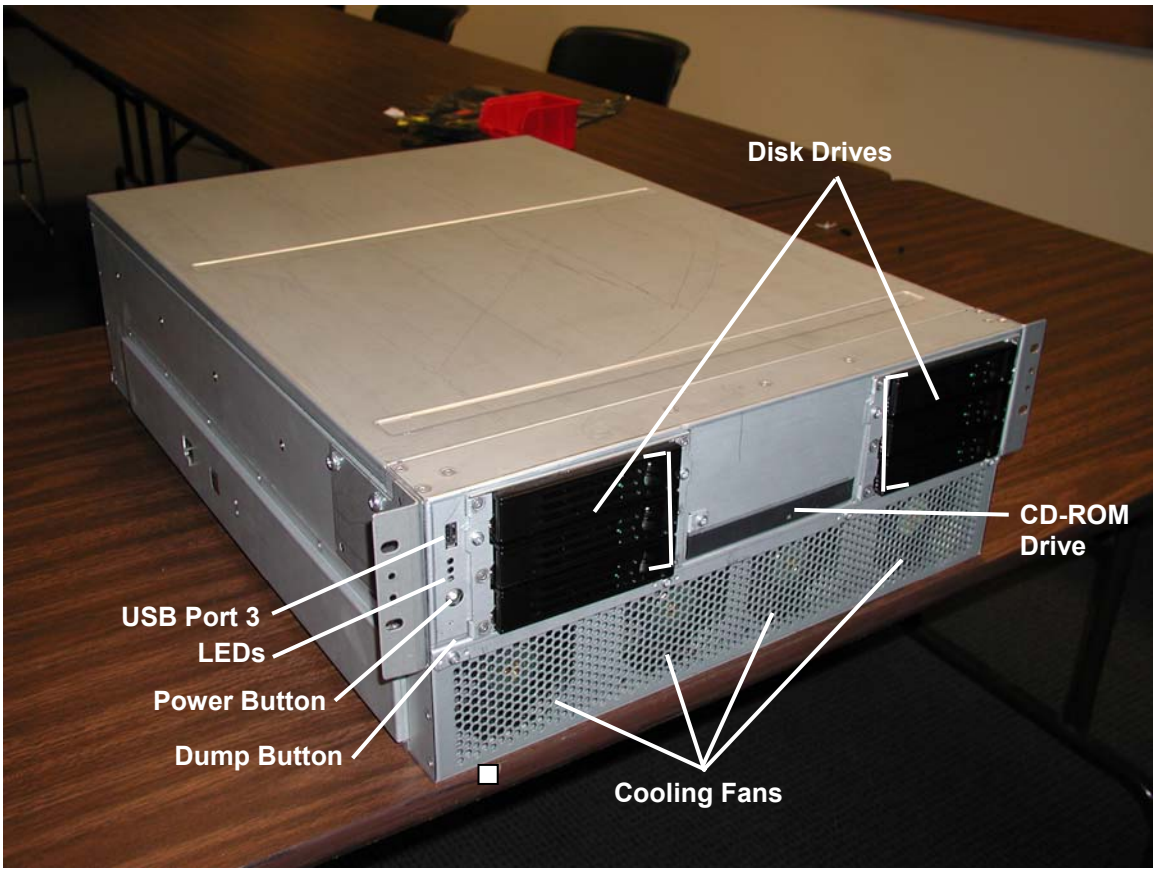
- 4 DIMM slots/CPU element
- 6 hot plug SATA Disks (3 Pairs)
- 2 serial ports
- 3 USB ports
- 1 optical device
- 1 video port
- Embedded SMM controller (Stratus BMC)

The ftServer 2300 system consists of the following boards:

- ftServer 2300 main motherboard – Contains 2 CPU elements and 2 I/O elements
- 2 SATA backplane boards - Each supports up to 3 hot pluggable SATA Disks (80GB capacity only @ RTM)
- Common IDE board - Supports CDROM or DVD/CDROM
- Front Panel (LED) board - Contains status LEDs, power button, dump button (recessed) and one USB 1.1 Port

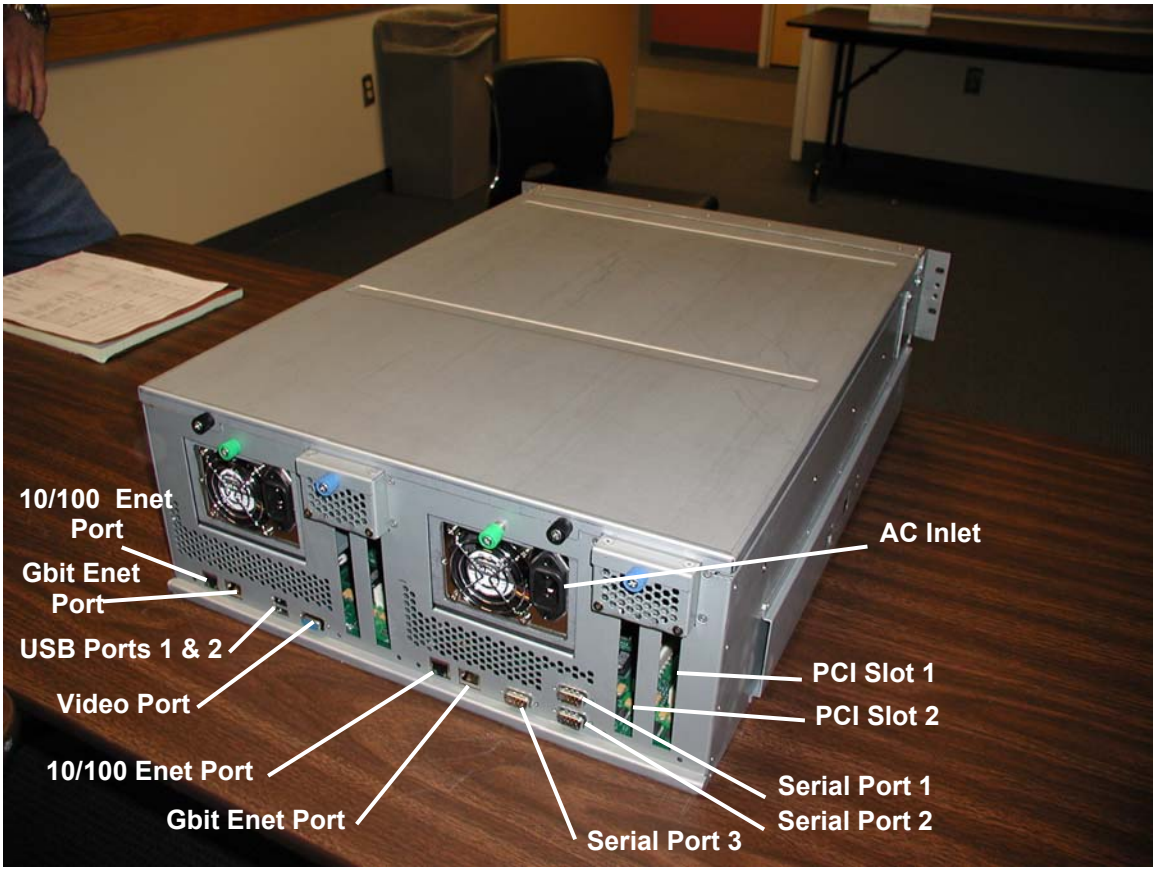
The following figure is a view of the front of the ftServer 2300 system.

Figure 1-1. Front View



The following figure is a view of the rear of the ftServer 2300 system.

Figure 1-2. Rear View



The following components reside on a power domain that is powered by both power supply units

- System clock
- GSYNC Termination
- IDE Interface
- Video / USB Multiplexor
- Inter BMC signals
- Comm Ports
- System ID Prom

1.2 Operating System Requirements

The ftServer 2300 system is currently supported by the following operating systems:

- Microsoft Windows Server 2003 Standard Edition
- ftServer System Software (ftSSS) Release 3.1 (minimum)

1.3 Hardware Components

As stated previously, the main hardware components in the ftServer 2300 system are the following:

- ftServer 2300 main motherboard
- 2 SATA backplane boards
- Common IDE board
- LED board

1.3.1 System Motherboard

The system motherboard is located at the base of the chassis, it is separated from the disks/power supplies by a removable partition. The motherboard contains two CPU Elements and two I/O Elements.

1.3.1.1 CPU Element

Each CPU element contains:

- 1 processor
- 4 DIMM slots

The following table lists the memory modules currently supported in ftServer 2300 systems.

Model Number	Description	Minimum # per CPU Enclosure	Maximum # per CPU Enclosure
M228	512-MB DDR DIMM	2	4
M229	1-GB DDR DIMM	2	4

The following table shows the possible memory configurations.

Total Memory in Each Element	Slot 1	Slot 2	Slot 3	Slot 4
1 GB	M228 DIMM	M228 DIMM		
2 GB	M228 DIMM	M228 DIMM	M228 DIMM	M228 DIMM
2 GB	M229 DIMM	M229 DIMM		
4 GB	M229 DIMM	M229 DIMM	M229 DIMM	M229 DIMM

1.3.1.2 I/O Element

Each I/O element contains an embedded four-channel SATA controller supporting up to 3 SATA disks (located in the disk carrier at the front of the system). Channels 0-2 are connected to the SATA backplane and channel 3 is terminated (not used).

Each I/O element also contains two user PCI slots (64bit/33MHz) and a dedicated VTM slot. The VTM module has dedicated 10/100 Enet, and serial (COMM3) ports.

1.3.1.2.1 PCI Adapters

The ftServer 2300 has two user configurable slots per I/O element. All ftServer 2300 adapters supplied by Stratus, are 2.1 PCI compliant or above. The PCI adapters configured in vertical orientation.

The following table describes the specific adapters that can be configured in ftServer 2300 systems. The table also includes the minimum and maximum number of adapters supported.

Model	Description	Min/Max No.
U574-LC	**2-port Pro/1000BaseSx Fiber Ethernet PCI adapter**	**0/4**
U574-LC-SC	**2-port Pro/1000BaseSx Fiber Ethernet PCI adapter with LC-to-SC conversion kit**	**0/4**
U575	**2-port Pro/1000Base-T Copper Ethernet PCI adapter**	**0/4**
AK415	**EMC SAN Attach Kit – (Contains 2 U525 Optical Fibre Channel adapters)**	**0/2**
U320-P	**Ultra320 PCI adapter for tape drives**	**0/2**

1.3.1.2.2 PCI Slot Assignments

For consistency of manufacturing, the default is to configure adapters in the order shown in the following table unless otherwise specified within special instructions.

Adapter	PCI Slot 1	PCI Slot 2
U527	**O**	**R**
U525	**R**	**O**
U574	**R**	**O**
U575	**R**	**O**

Key:

O The corresponding PCI adapter has the option to be installed in this slot
R The corresponding PCI adapter is recommended to be installed in this slot

1.3.2 SATA Backplane Board

1.3.2.1 Disk Drives

The ftServer 2300 system contains two SATA backplane assemblies, one per I/O element. Each backplane can hold up to three SATA compliant drives.

A minimum of two internal disk drives is required. Different types of disk drives can be used concurrently in the same ftServer 2300 system, but only disks of the same capacity can mirror each other. Disk drives are mirrored to the corresponding drive bay of the partner IO element.

The following table lists the disk drive supported in ftServer 2300 systems.

Model	Description
D641	**80-GB, 3.5”, 7200 RPM, SATA Disk Drive**
D642	**160-GB, 3.5”, 7200 RPM, SATA Disk Drive**

The boot disk should be the smallest size available. It is required that the boot disk be installed in the topmost drive bay (SATA channel 0).

The following table lists the internal disks and corresponding SATA-IDs.

SATA Channel 0	**DISK 0 (DXXX)**
SATA Channel 1	**DISK 1 (DXXX)**

SATA Channel 2	**DISK 2 (DXXX)**

When configuring mirrored internal disk drives, refer to the SATA channel numbers for the drives shown next to the disk drives in the table.

1.3.3 Common IDE Board

The IDE board supports the CDROM or DVD/CDROM drive. It's connected to the motherboard via a 40-pin flat ribbon cable.

1.3.4 Front Panel (LED) Board

The Front Panel board ontains the status LEDs, power button, dump button (recessed) and one USB 1.1 Port. It's connected to the motherboard via a 1X14-pin flat ribbon cable.

1.3.5 ASN Serial Modem

The C719, a 56K Data/Fax MultiTech ZBA modem, is the external serial modem used for the Stratus Service Network (ASN). The C719 is a Stratus certified and recommended external modem. It plugs into COMM 1 (COMM2 if no VTM is installed).

1.3.6 Optical Devices

The CD-ROM used with the ftServer 2300 can be either of the optical devices listed in the following table.

Mktg ID	Description
D551	**Slimline CD-ROM drive**
D552	**Rewriteable optical device**

1.3.7 EMC Attach Kits

The ftServer 2300 system supports an external connection to an EMC Symmetrix/Clarrion enclosure using a pair of U525 Fibre Channel PCI adapters contained in the AK415 Attach kit

1.3.8 Tape Drives

The ftServer 2300 system supports the four external tape drives listed in the following table. The tapes are connected to the U527 SCSI Adapter.

Mktg ID	Description
T511	**DDS-4 DAT tape drive**
T521	**SDLT600 (rack mount only)**

T522	**SDLT600 (rack mount only)**

1.3.9 Monitor, Keyboard, Mouse, and KVM

The following table lists the monitor, keyboard, mouse, and KVM components supported on the ftServer 2300 system.

Mktg ID	Description
V115	**USB keyboard/mouse**
N/A	**Customer supplied monitor**
V128	**Integrated rack mount KVM**
V129	**15" flat panel display (replaces V122)**
AK470	**4-Port USB KVM switch**

1.3.10 External USB Floppy Disk Drive

An AK438 USB Floppy Disk Drive is an option for the ftServer 2300. This device connects to an ftServer 2300 USB Port.

1.3.11 Other Hardware Features

- 2 10/100 Ethernet ports for VTM use only
- 3 serial ports: ports: one for VTM, one for debug, and one for external serial modem used by the BMC.
- 3 USB ports, one on the front of the system, two on the back
- 1 video port to embedded video
- 1 logical USB port for the VTM system management adapter
- 2 slots for system management adapter (VTM)
- Embedded SMM Controller (Stratus BMC)

1.3.12 Advanced ASN Attach Kit

An optional Sentinel RMP module provides added availability features to diagnose a system without power to the system, and the ability to power-cycle a system remotely; as well as additional system management features of Remote KVM, Remote CD/Floppy and access to the Stratus Service Network (ASN). The kit contains two RMP cards and requires an external modem.

1.3.13 Power Distribution Units (PDUs)

An optional power configuration for rack systems is internal power jumper cables connected to a pair of PDUs, mounted in the bottom or middle of the cabinet, which in turn is connected to AC inlets by external PDU power cords.

The ftServer 2300 system can contain a maximum of two pairs of PDUs.

1.4 System Configuration

Marketing ID	P3401R-1D
Chassis	**Rack Mount**
Processor	**DMR**
SMP	**1-way**
Processor speed	**3.06 GHz**
Cache size	**512 KB**
Front Side Bus Speed	**533 MHz**
No. CPU Elements	**2**
No. Physical Processors	**2**
No. DIMM Slots	**8 (4 per CPU element)**
No. I/O Elements	**2**
No. PCI Slots	**4**
No. Internal Disk Drives	**6 maximum**

1.5 System Specifications

1.5.1 Rack-Mount System

Power	
Output wattage	**A-side: 420W (AC)** **B-side: 420W (AC)**
Nominal input voltage	**100-240 VAC +/- 10%; 50/60 Hz**
Physical Dimensions	
Height	**6.5 in. (16.51 cm; 4U)**
Width	**17.75 in. (45 cm)**
Depth	**24 in. (60.96 cm)**
System weight	**63.9 lb. (29 kg)**
Environmental	
Operating temperature	**41° F to 95° F (5° C to 35° C)** **For every 800 ft (243.8 m) above 2000 ft (609.6 m), lower the maximum operating temperature (35°C) by 1°C.**
Maximum rate of temperature change during operation	**18° F/hr (10° C/hr) or 0.30° F/min (0.17° C/min)**
Relative humidity during operation	**20% to 80% (noncondensing)**
Relative humidity during storage	**8% to 80%**
Heat dissipation	**3500 BTUs per hour**

1.5.2 Pedestal System

Power	
Output wattage	**A-side: 420W (AC)** **B-side: 420W (AC)**
Nominal input voltage	**100-240 VAC +/- 10%; 50/60 Hz**
Physical Dimensions	
Height	**23.25 in. (59.05 cm.)**
Width	**8.62 in. (21.89 cm); 12.88 in. (32.72 cm) with skirt**
Depth	**31.38 in. (79.71 cm)**
System weight	**63.9 lb. (29 kg)**
Environmental	
Operating temperature	**41° F to 95° F (5° C to 35° C)** **For every 800 ft (243.8 m) above 2000 ft (609.6 m), lower the maximum operating temperature (35°C) by 1°C.**
Storage temperature	**-38° F to 140° F (-40° C to 60° C)**
Operating altitude	**0 ft to 10,000 ft (0m to 3,048m)**
Maximum rate of temperature change during operation	**18° F/hr (10° C/hr) or 0.30° F/min (0.17° C/min)**
Relative humidity during operation	**20% to 80% (noncondensing)**
Relative humidity during storage	**8% to 80%**
Heat dissipation	**3500 BTUs per hour**

2. Operation and Troubleshooting Procedures

This section describes procedures related to the ftServer W Series 2300 system operation and solving problems with the hardware components. It covers various topics, including the following:

- System Startup
- System Shutdown
- Troubleshooting Hardware Components
- Taking a Component Offline
- Bringing a Component Online

2.1 System Startup

Whenever the system is plugged into live AC outlets, low-level power is present in the ftServer system. This standby power enables the Baseboard Management Controller (BMC) to monitor the status of the system components, even when system power is off.

Perform the following procedure to startup an ftServer 2300 system.

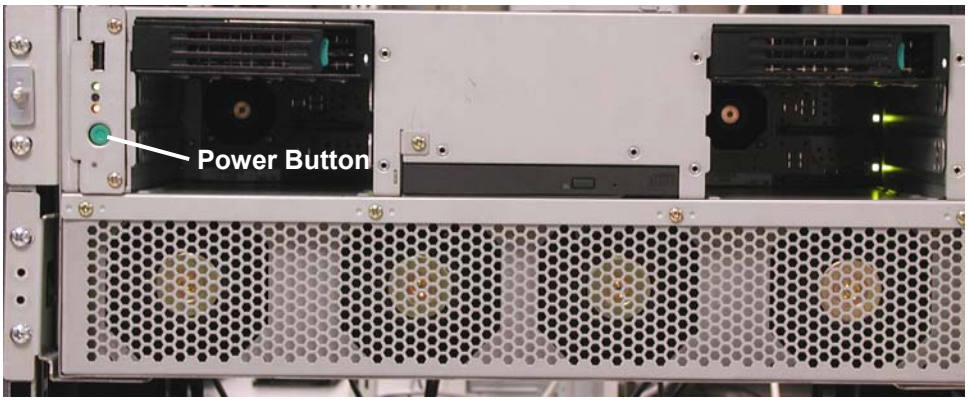
1. Ensure that the power cords are plugged into live AC power outlets.

   If the system is connected to power distribution units (PDUs), ensure that the PDUs are plugged into live AC power outlets and are turned on.

2. Turn on power to the monitor and any other peripheral devices.

3. Press the system power button on the front of the ftServer 2300 system.

Figure 2-1. Power Button



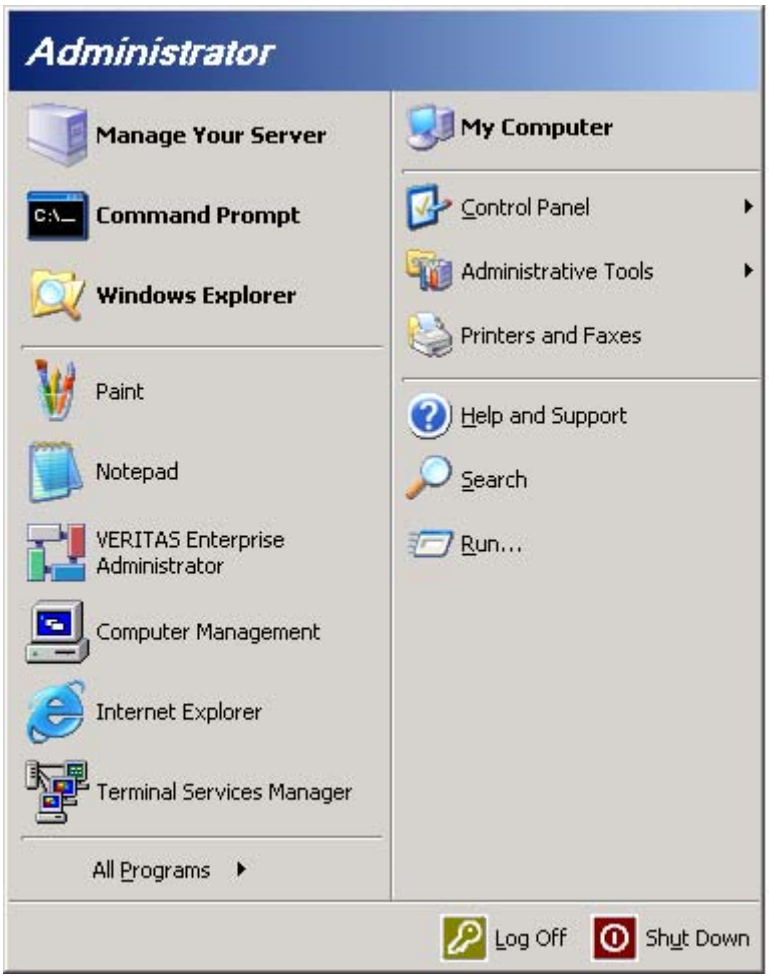
NOTE: The system makes up to six attempts to boot its self. Each time it tries to boot with a different combination of I/O elements and CPU elements. If there are failed components in the system, it might take longer for the sytem to boot or finish trying to boot. You can monitor the boot process on the screen or in a VTM session.

2.2 System Shutdown

Perform the following procedure to gracefully shut down an ftServer system running Microsoft Windows Server 2003. Any Windows settings will be saved and the contents of memory are saved to disk. The operating system should always be shut down in this manner if at all possible.

1. Exit from all applications before shutting down the ftServer 2300 system.
2. Click **Start** on the Windows desktop, and then click **Shut Down**.

Figure 2-2. Start Menu



3. Select **Shut down** and click on the reason for shutting down the system from the menu.

Figure 2-3. Shut Down Menu Options

4. Click **OK**.

Figure 2-4. Shut Down

5. After the system shuts down, turn off power to the monitor and any other peripheral devices.

2.3 Troubleshooting Hardware Components

ftServer systems provide hardware- and software-based methods of troubleshooting system hardware. Hardware-based troubleshooting is implemented through light-emitting diodes (LEDs). Software-based troubleshooting is accomplished by means of the **ftServer Manager**.

This section provides general information and guidelines for troubleshooting hardware failures in the ftServer system. For more information about monitoring and troubleshooting the system, refer to the *Stratus ftServer: System Administrator's Guide (R014W)*

2.3.1 Hardware-Based Troubleshooting

ftServer 2300 systems signal hardware status through LEDs located on the front and rear of the system.

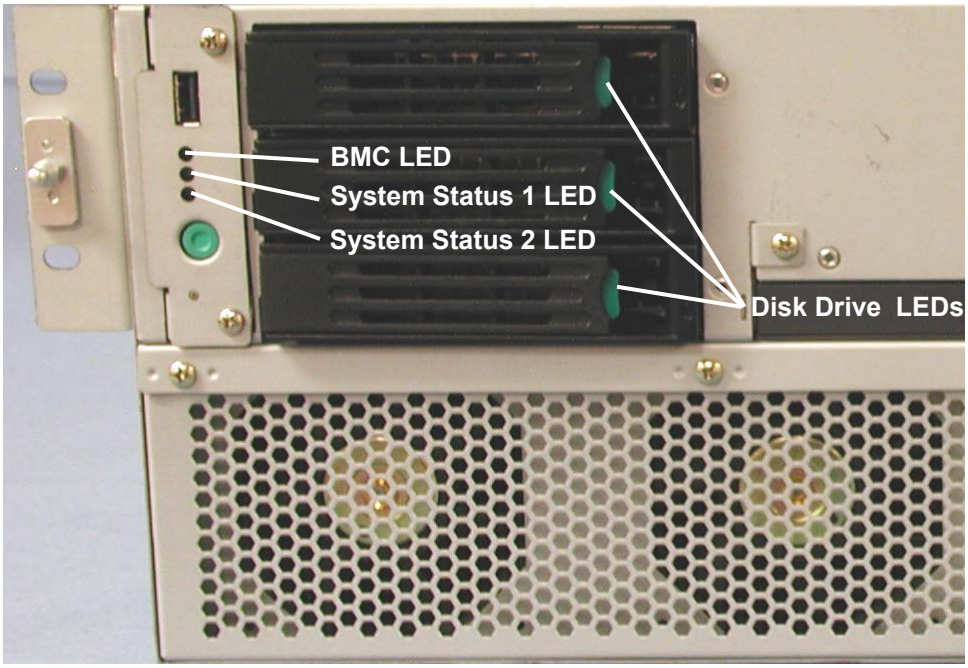
LEDs can display as either one color or two colors:

- One color LEDs are always red (one on the front panel).
- Two color LEDs can be green and amber, or green and red.

  N OT E: A green and red LED becomes amber when both LEDs are on.

The following figure shows the LEDs on the front of the ftServer 2300 system.

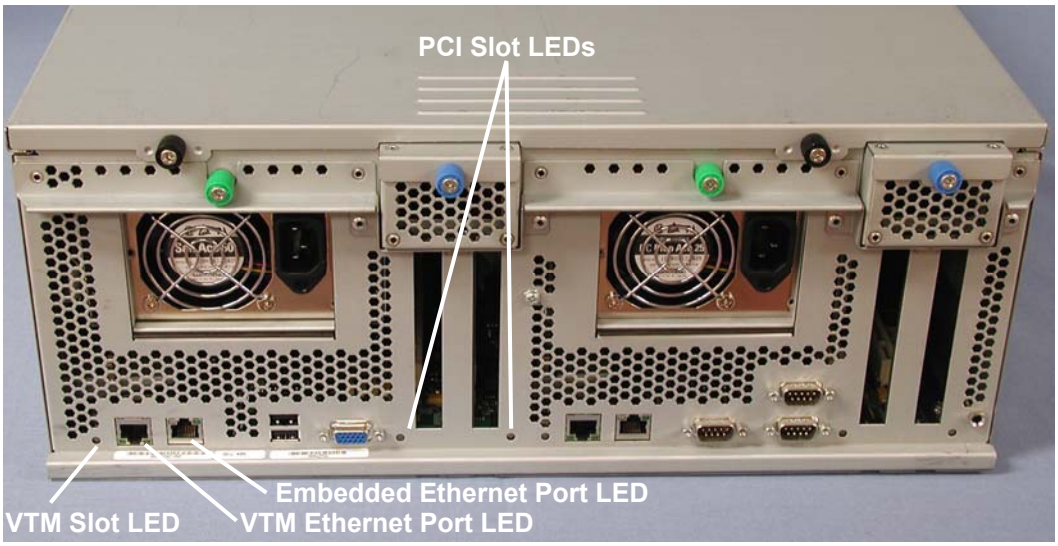
Figure 2-5. ftServer System Front Status LEDs



The following figure shows the LEDs on the rear of the ftServer 2300 system.

NOTE: Only the LEDs on one side are called out. The other side has the same LEDs.

Figure 2-6. ftServer System Rear Status LEDs



The following table lists the general meanings of each LED color.

LED State	Description and Action
Steady Red	**Not functioning.** **Action: Determine if the system or component is offline and return it to service.**
Steady Red and Green	**Testing.** **Action: Wait.**
Steady Amber	**Unsafe to remove (operating in simplex mode). If the LED is on a SATA drive, taking it offline will crash the system.** **Action: Return the offline component to service.**
Steady Green	**Unit is functioning in duplex mode. If the LED is on a SATA disk drive, it is safe to remove it.** **Action: None.**
Clear (unlit)	**No standby power.** **Action: Verify that AC power cords are connected at both ends. Verify that the system power connections are seated properly.**

2.3.1.1 Baseboard Management Controller (BMC) LED

The ftServer 2300 system has one two-color LED, which indicates the BMC status. A flashing BMC LED (green for the primary BMC in duplex mode or amber for a BMC in simplex mode) indicates a system or sensor warning or failure, which requires customer service attention. An amber LED means that both the Red and Green LEDs are enabled. The following table lists the BMC LED states with a description and action.

State	Description and Action
Red	**The BMC is not ready.** **Action: Wait.** **Error detected after initialization (five seconds).** **Action: Refer to the *ftServer Management Console (ftSMC)* for information about the failure. For help in interpreting the information displayed in ftSMC, see the Help for ftSMC and the *Stratus ftServer: Technical Reference Guide* (R550) to identify the critical condition and take actions to correct it within the operating system.**
Steady Amber	**BMC synchronization in progress.** **The first BMC is online or one BMC is operational (fifteen seconds after initialization).** **Action: Refer to the *ftServer Management Console (ftSMC)* for information about the failure. For help in interpreting the information displayed in ftSMC, see the Help for ftSMC and the *Stratus ftServer: Technical Reference Guide* (R550) to identify the critical condition and take actions to correct it within the operating system.**
Flashing Amber	**Sensor warning or failure** **Action:**
Steady Green	**The BMC is in duplex mode and both BMCs are operating normally.** **Action: None.**
Flashing Green	**Sensor warning or failure** **Action:**

2.3.1.2 System Status LEDs

The ftServer 2300 system has one red and one two-color LED, which indicates the operating mode of the system hardware. The following table lists the LED states with a description and action.

State	Description and Action
System Status 1 LEDs	
Red	**System is in standby mode.** **Action: Wait.** **Error detected.** **Action: Refer to the *ftServer Management Console (ftSMC)* for information about the failure. For help in interpreting the information displayed in ftSMC, see the Help for ftSMC and the *Stratus ftServer: Technical Reference Guide* (R550) to identify the critical condition and take actions to correct it within the operating system.**
Unlit	**No system error.**
System Status 2 LEDs	
Amber	**Not all hardware is duplex or some hardware failed.** **Action: Refer to the *ftServer Management Console (ftSMC)* for information about the failure. For help in interpreting the information displayed in ftSMC, see the Help for ftSMC and the *Stratus ftServer: Technical Reference Guide* (R550) to identify the critical condition and take actions to correct it within the operating system.**
Green	**The system is operating normally.** **Action: None.**
System Status 1 and 2 LEDs	
System Status 1 is Red and **System Status 2 is Green**	**The system is in diagnostic state.** **Action: None.**

2.3.1.3 Disk Drive LED

Each disk drive has one green or amber LED. This LED indicates the activity and state of the disk drive.

The following table describes the disk activity LED states.

State	Description
Steady Amber	**Unsafe to remove the disk.**
Flashing Amber	**Mirrored volumes are resynchronizing, creating a mirror, or the disk is unmirrored.** **Action: Do not remove.**
Steady Green	**– Disk and power are present.** **– Blank disk carrier present.**
Flashing Green	**Disks are mirrored and data is being written or read.** **Action: None. Safe to remove.**
Unlit	**No power.** **Action: Check the following:** **– AC power** **– PSU connector to the SATA backplane** **– System LEDs.**

2.3.1.4 VTM Slot LED

The VTM slots have a bicolor red or amber LED that indicates the VTM interface status. These LEDs are located on the rear panel below left of the VTM slot.

The following table describes the LED states for each VTM slot.

State	Meaning
Unlit	**Slot Empty or in Duplex mode** **Action: None**
Red	**VTM slot failed** **Action: Refer to the*ftServer Management Console (ftSMC)* for information about the failure. For help in interpreting the information displayed in ftSMC, see the Help for ftSMC and the *Stratus ftServer: Technical Reference Guide* (R550) to identify the critical condition and take actions to correct it within the operating system.**
Amber	**Slot is in Simplex mode** **Action: If your hardware is duplexed, ensure that the other slot is operating. Refer to the *ftServer Management Console (ftSMC)* for information about the failure. For help in interpreting the information displayed in ftSMC, see the Help for ftSMC and the *Stratus ftServer: Technical Reference Guide* (R550) to identify the critical condition and take actions to correct it within the operating system.**

2.3.1.5 VTM Ethernet Port LED

The ftServer 2300 system has two ports on the rear of the system dedicated for the VTM controller connections. Each port has two LEDs indicating the Ethernet activity and connection speed.

The following table describes the 10/100 Ethernet VTM states.

Location	Color	State
Left	**Unlit**	**No Connection**
	Steady Green	**10 Mbit Connection**
	Steady Amber	**100 Mbit Connection**
Right	**Unlit**	**Not present**
	Steady Green	**Link present**
	Flashing Green	**Ethernet activity**

2.3.1.6 Embedded Ethernet Port LED

The ftServer 2300 system has two ports on the rear of the system that are connected to the integrated system Ethernet controllers. Each port has two LEDs indicating the Ethernet activity and connection speed.

The following table describes the system Ethernet LED states.

Location	Color	State
Left	**Unlit**	**10 Mbit Connection**
	Steady Green	**100 Mbit Connection**
	Steady Amber	**1000 Mbit Connection**
Right	**Unlit**	**Not present**
	Steady Green	**Link present**
	Flashing Green	**Ethernet activity**

2.3.1.7 PCI Slot LEDs

The ftServer has four PCI slot status LEDs on the rear of the system, which indicate the state of the slot. These LEDs can display two colors: red or amber.

The following table describes the PCI slot status LEDs.

State	Description and Action
Unlit	**The PCI slot is operating duplexed, or is empty.** **Action: None**
Red	**The PCI slot has failed.** **Action: Refer to the *ftServer Management Console (ftSMC)* for information about the failure.** **For help in interpreting the information displayed in ftSMC, see the Help for ftSMC and the *Stratus ftServer: Technical Reference Guide* (R550) to identify the critical condition and take actions to correct it within the operating system.**
Amber	**Unsafe to remove PCI adapter (operating simplexed). Taking it offline will result in lost connectivity.** **Action: If your hardware is duplexed, ensure that the other slot is operating. Refer to the *ftServer Management Console (ftSMC)* for information about the failure. For help in interpreting the information displayed in ftSMC, see the Help for ftSMC and the *Stratus ftServer: Technical Reference Guide* (R550) to identify the critical condition and take actions to correct it within the operating system.**
	If the hardware is simplexed, no action is required.

2.3.2 Software-Based Troubleshooting

Hardware errors are detected by the system hardware and evaluated by the maintenance and diagnostics software. After a hardware error, the software directs the affected device to self-test. If the device fails the test, the error is called a *hard error* and the device is taken out of service. If the device passes the test, the error is called a *soft error*.

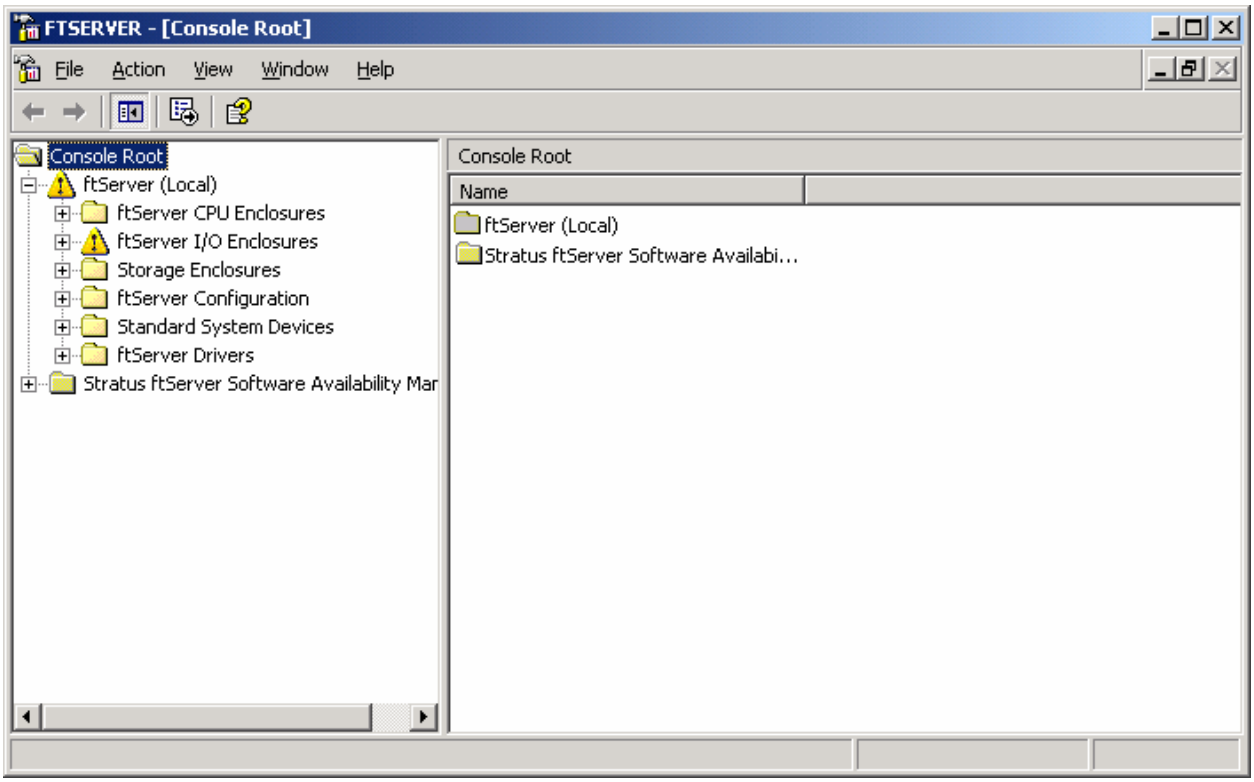
The ftServer System Inventory, which is accessible through the **ftServer Management Console (ftSMC)**, displays a tree-list of system components. Next to each component name is an icon that indicates the status of the component. A failed component is indicated by a white X in a red circle. This condition causes a warning icon (yellow triangle with !) to appear next to all parent nodes of the failed node. The error icon appears next to the SCSI slot that failed, and the warning icon appears in the three nodes that precede the failed node.

To determine that a component failed

1. On the **Desktop** double click on the **ftServer Management Tools** icon.

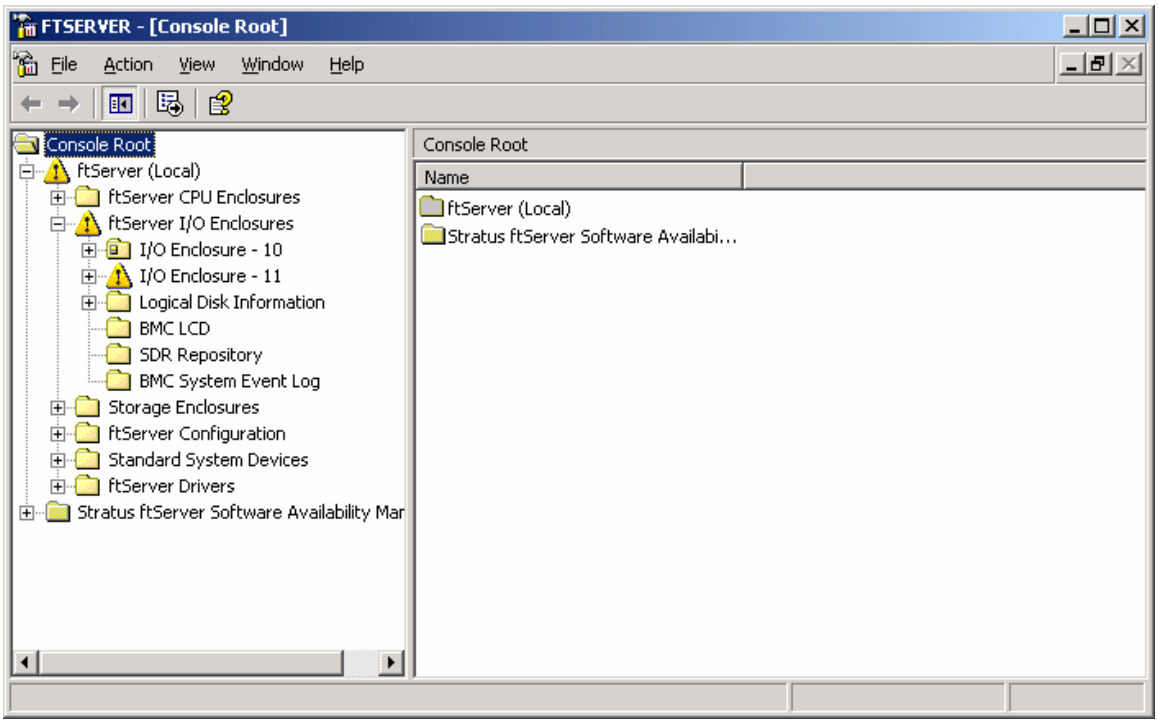
2. In the **Console Root** screen, click on the **ftServer (Local)** node.

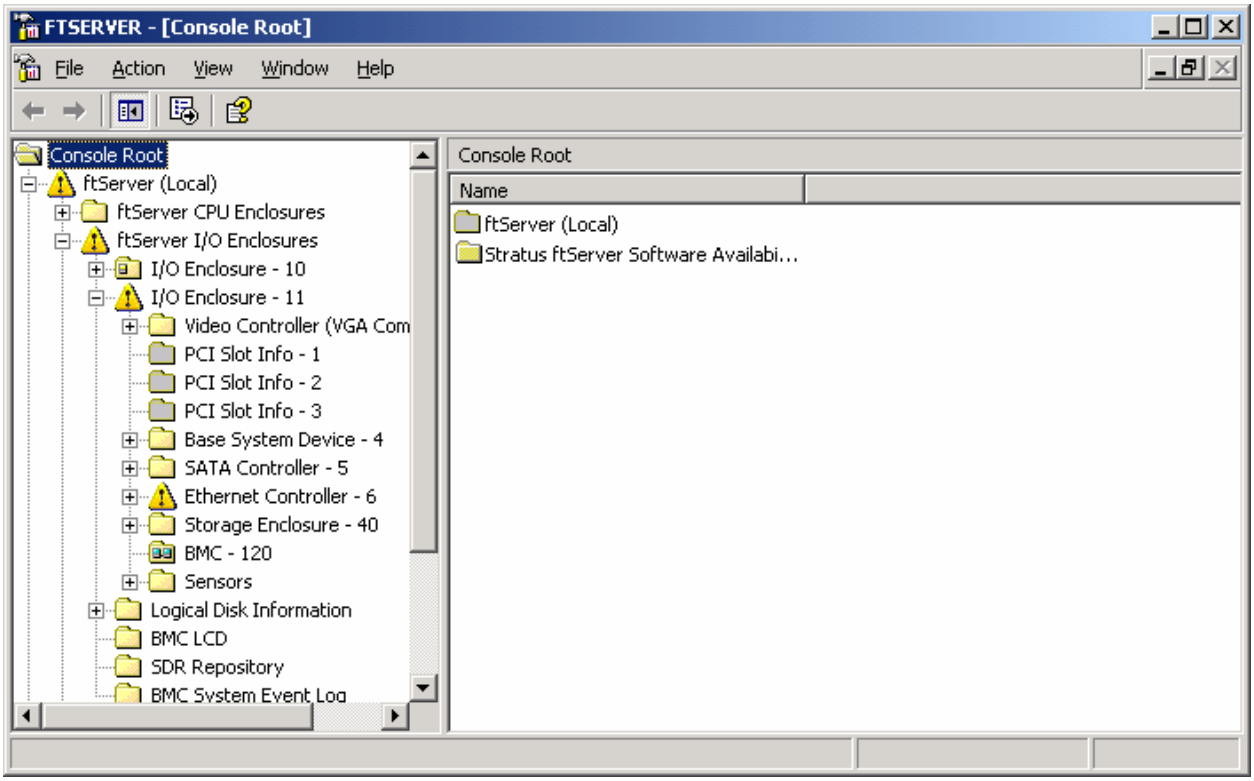
Figure 2-7. Consol Root Menu

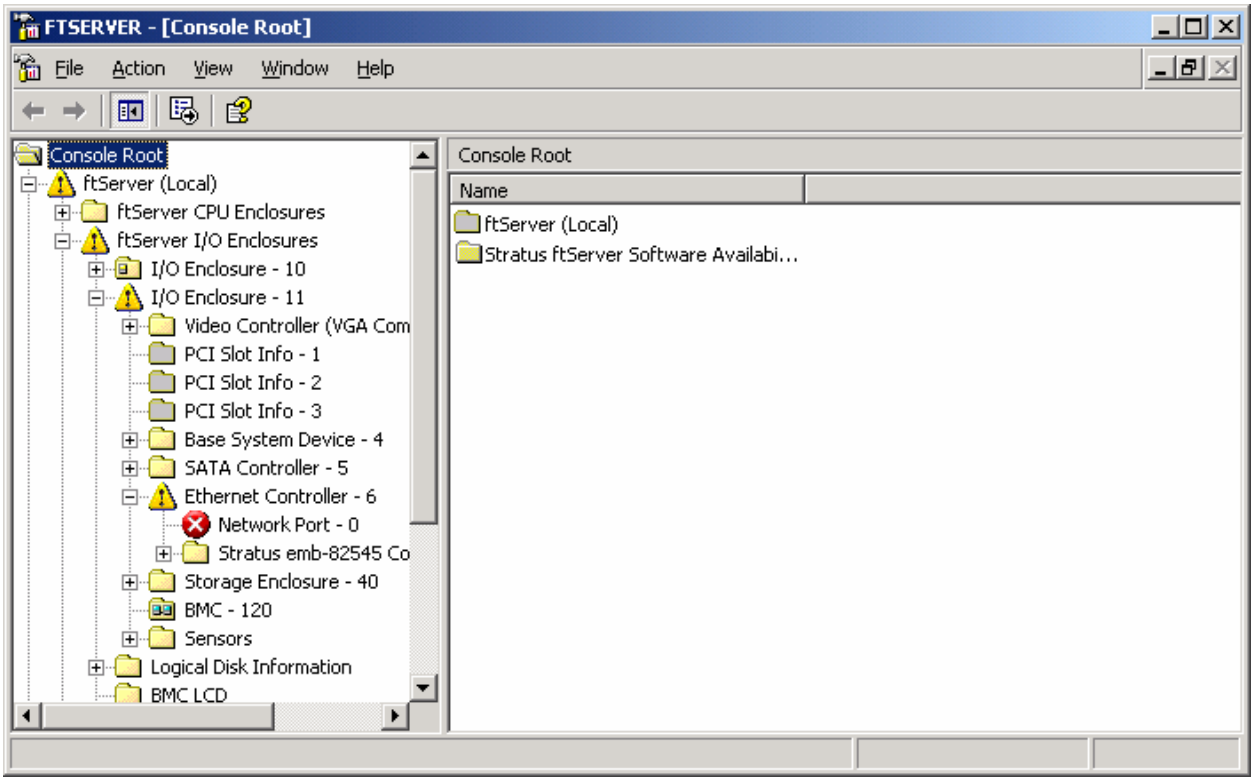


3. Look for **Warning** or **Error** icons. If you see a **Warning** icon, click the plus sign (+) in front of nodes that have a **Warning** icon until you see an **Error** icon indicating the component that has failed. The following three screens show the sequence for locating a failed network port.

Figure 2-8. Warning Icons







For more information about System Inventory, refer to the the *Stratus ftServer: System Administrator's Guide (R014W)*

2.4 Taking a Component Offline

In the **ftSMC** Console tree, select and right-click the failed component.

From the pop-up menu, select **Initiate Bring Dow**n. This results in shutting down the component.

> **N O T E:** If the failed component is a mirrored disk, break the mirror before shutting the failed disk down.

If you are going to remove a disk, first confirm that the disk's mirror is present and functioning. If the mirror is present, go to **Disk Management** and break the mirror. To break a mirror, right-click one of the disks and select **Break Mirro**r.

To determine what disks are mirrored, go to **Disk Management**. The logical disks that have the same drive letter are a mirrored pair. Replace the component and bring the replaced component back online. See the next subsection.

2.5 Bringing a Component Online

In the **ftSMC** Console tree, select and right-click the new component.

From the pop-up menu, click **Initiate Bring Up**. This results in bringing the component online.

3. CRU Hardware Removal and Replacement Procedures

This section lists the Customer Replaceable Units (CRUs) in the ftServer W Series 2300 system and describes the removal and replacement procedures for each one.

In most instances, CRUs are duplexed and can be removed and replaced without total removal of power. However, in some instances, the system must be shut down and both main power switches turned off prior to CRU removal and replacement.

3.1 List of CRUs

The following table lists the CRUs in the ftServer 2300 system.

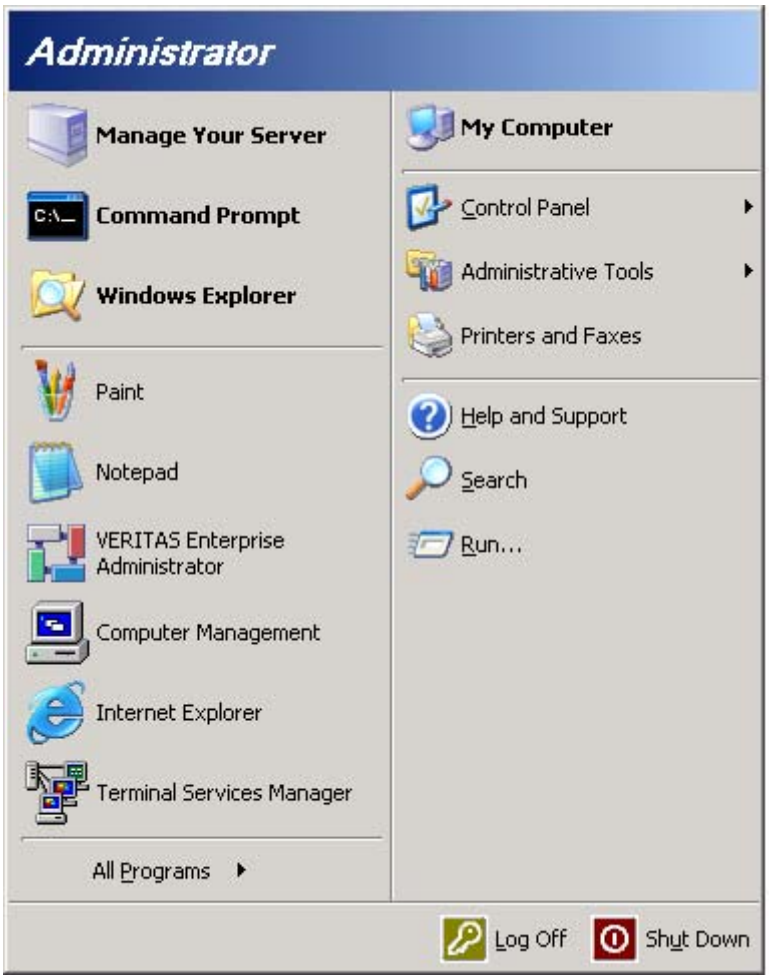
Description	Part Number
Power Supply Unit and Bracket	**AA000418**
CD-ROM or CD/DVD-RW drive	**AA-55100/AA-D55200**
SATA Disk Drive	**AA-D64100**
PCI Adapter	**AA-UXXXXX**
VTM Controller	**AA-U46300**
Front Panel	**AA-E93900**
ftServer 2300 System	**AA-G96100**

3.2 System Shut down and Power Removal

3.2.1 System Shut down

1. To shut down the ftServer system, click the **Start** button on the Windows desktop and click **Shut Down**.

Figure 3-1. Start Menu



2. Select **Shut down** and **Hardware: Maintenance (Planned).** Click **OK.**

Figure 3-2. Shut Down Menu

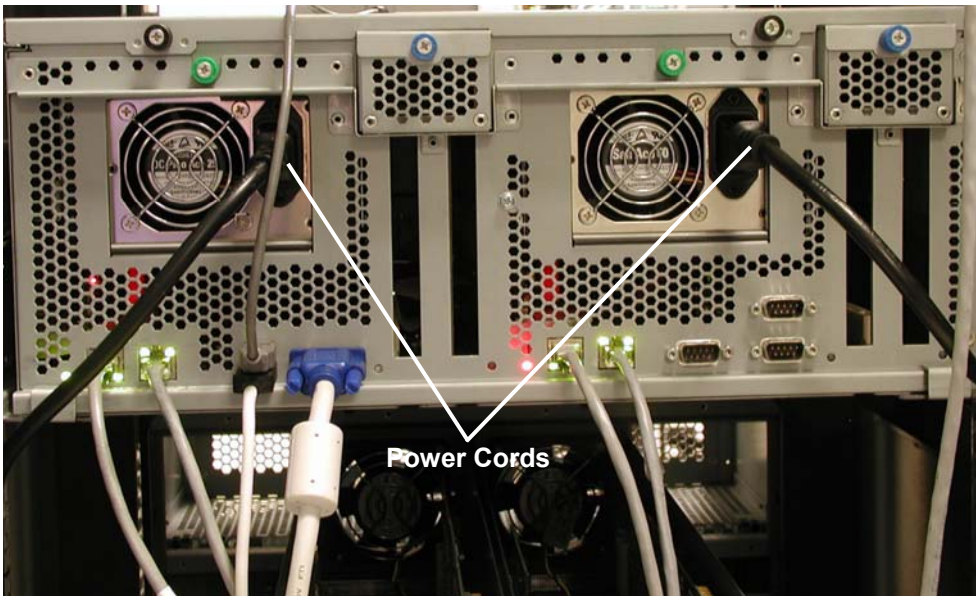
3. After the system shuts down, turn off power to the monitor and any other peripheral devices.

3.2.2 Power Removal

1. Shut down the system as described in Section 3.2.1.
2. Turn off power to the monitor and any peripheral devices.

3. At the back of the system, remove the two AC power cords connected to the backplane power outlets.

Figure 3-3. AC Power Cords



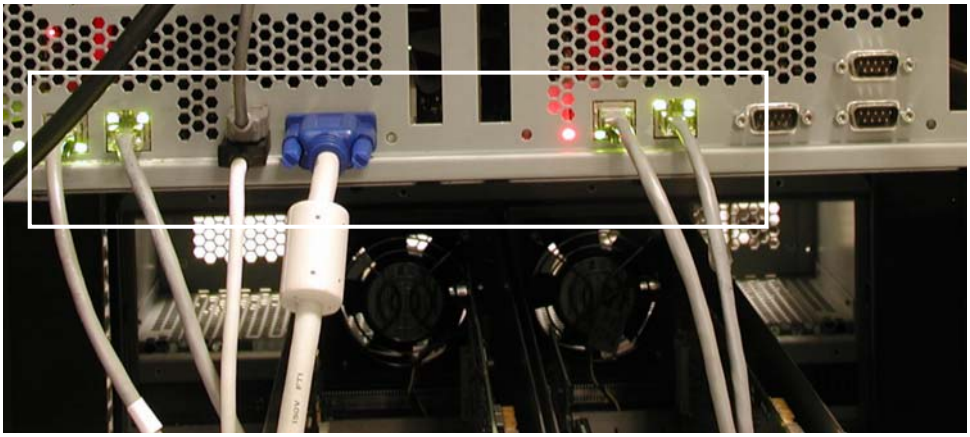
3.3 Removing the ftServer 2300 System from the Cabinet

Many of the procedures described in the following section require removal of the ftServer 2300 system from the cabinet.

To remove the system from the cabinet, perform the following procedure.

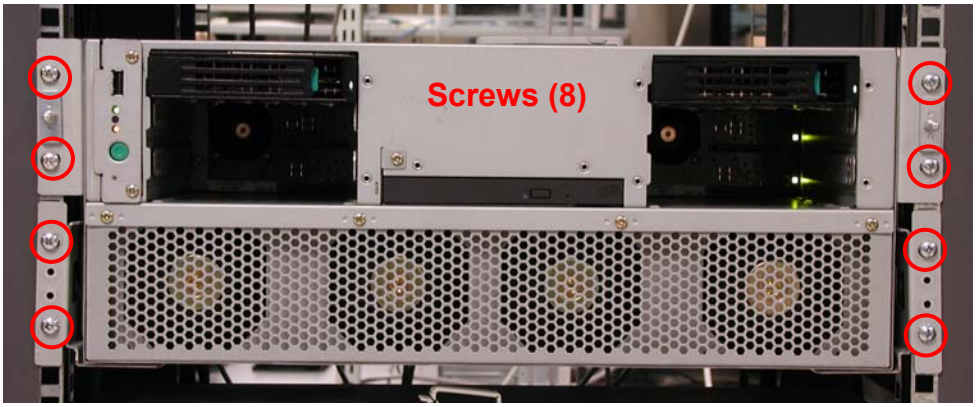
1. Shut down the system and remove power as described in Sections 3.2.1 and 3.2.2.
2. Disconnect all cables at the rear of the cabinet.

Figure 3-4. Cables at Rear of System



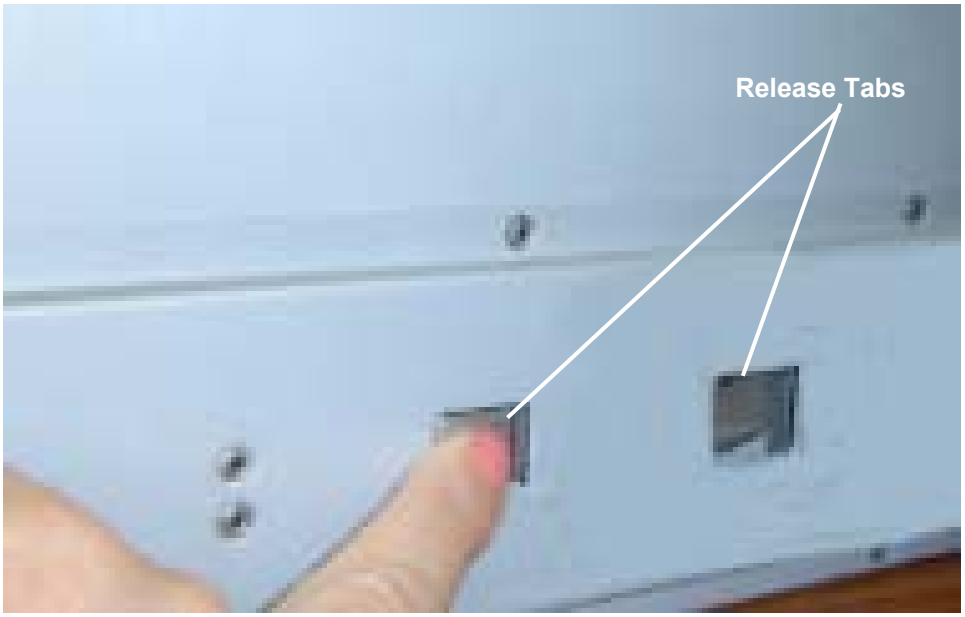
3. Remove the eight screws securing the system at the front of the cabinet.

Figure 3-5. System Chassis Screws



4. Slide the ftServer 2300 system out of the cabinet or case until it is stopped by the safety catch. Press the two release tabs on either side of the system to release it from the rails.

Figure 3-6. Safety Catch and Release Tab

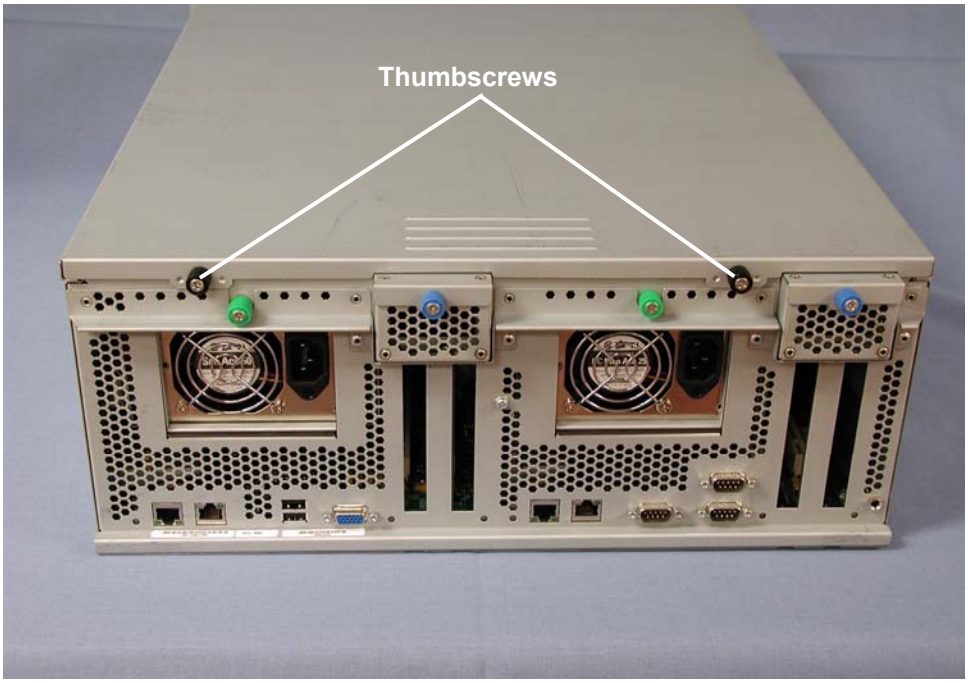


5. Remove the system and set it on a table or other work surface.

3.4 Removing the System Cover

1. At the rear of the system, loosen the two black thumbscrews securing the cover.

Figure 3-7. System Cover Screws



2. Slide the cover forward and lift it off the system.

3.5 Handling ESD Sensitive Parts

CAUTION: To avoid damaging ESD-sensitive components during handling, always take the following precautions.

- Ground yourself before working inside system. Put the grounding strap on your wrist and attach its other end to some suitable grounding point, such as a computer-system cabinet.
- Discharge static electricity by touching an unpainted portion of the system just before handling ESD-sensitive parts.
- Store PCI adapters and VTMs in their static-protective envelope until you are ready to install them in the system.
- Hold a PCI adapter or VTM by its edges.

3.6 Hardware Removal Procedures

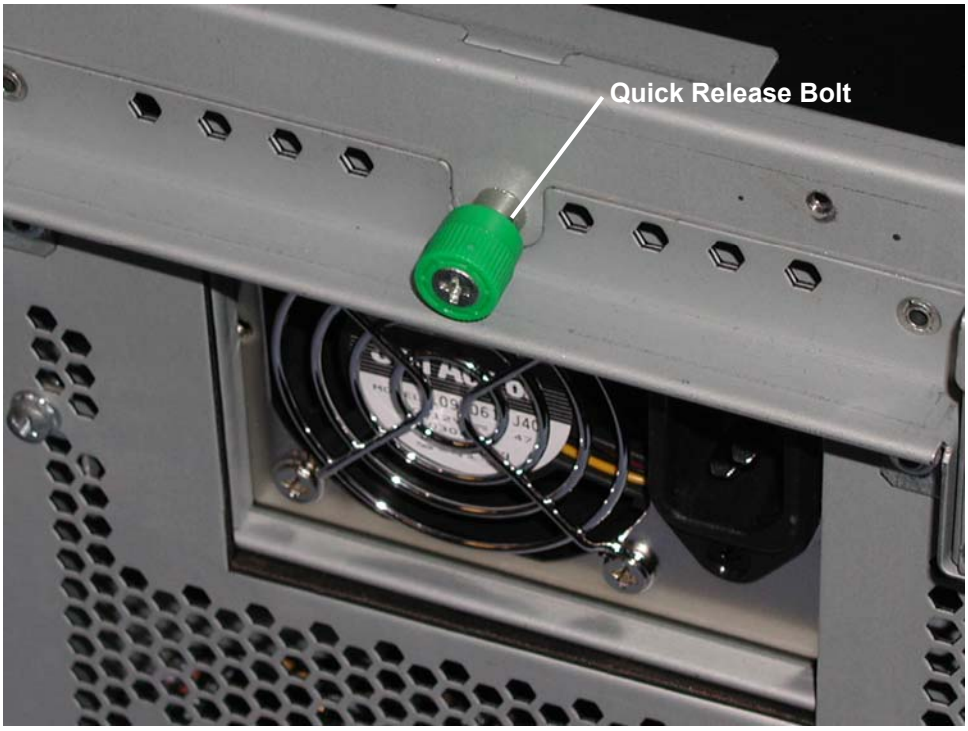
This section contains the removal procedures for the CRUs listed in the preceding table. Each of these procedures indicates any power removal requirements for the CRU.

To perform the replacement procedure for each CRU, reverse the removal procedure. If any special replacement considerations are necessary, a replacement note is included.

3.6.1 Power Supply Unit (PSU)

1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.
2. Remove the system cover as described in Section 3.4.
3. At the rear of the system, pull out on the green quick release bolt securing the power supply unit covering the front panel cable.

Figure 3-8. Power Supply Quick Release Bolt

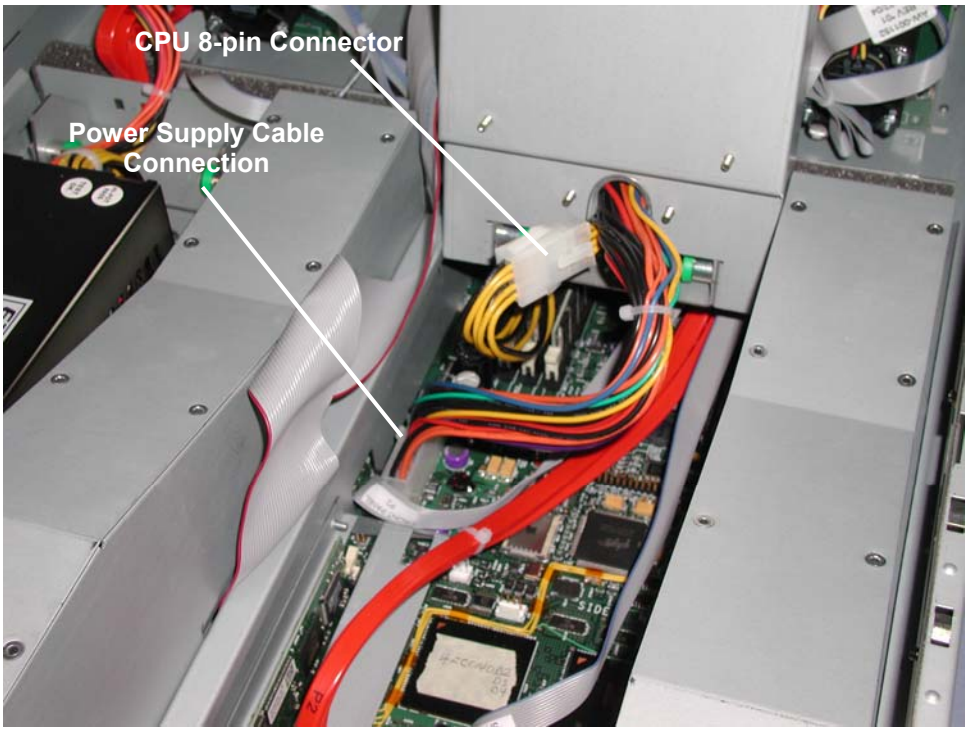


4. Swing the power supply unit upward as shown.

Figure 3-9. Power Supply in Servicing Position

5. Disconnect the power supply cable from the motherboard. Disconnect the CPU 8-pin connector.

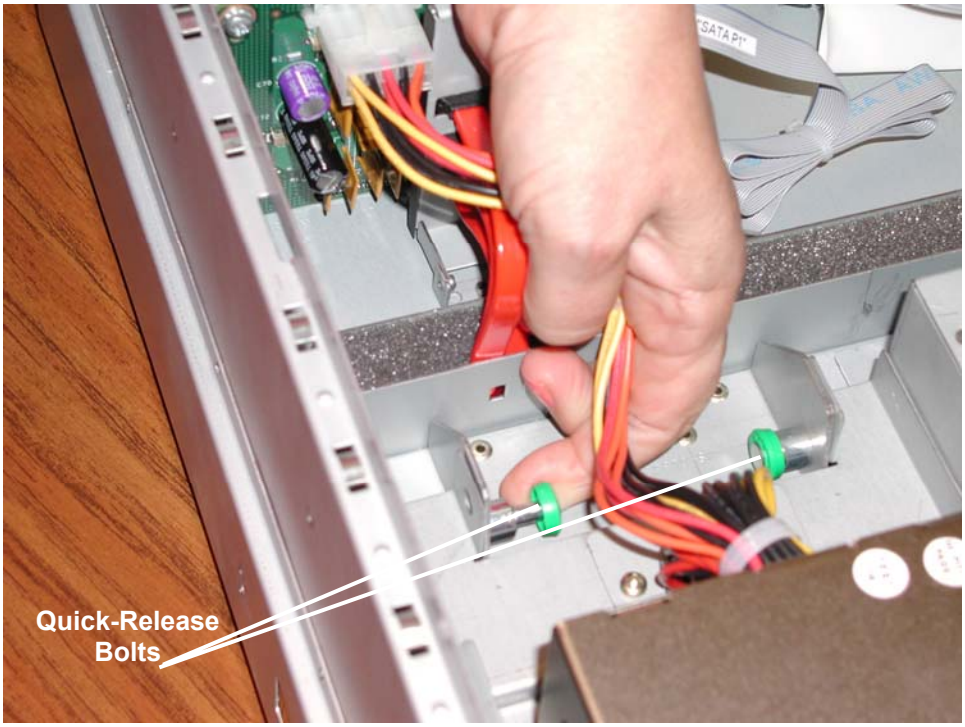
Figure 3-10. Power Supply Cable Connections at Motherboard



6. Release the power supply unit from the green quick-release bolts and lift it out.

   NOTE: This requires moving the power supply unit out of the servicing position.

Figure 3-11. Releasing the Power Supply from the Quick-Release Bolts



3.6.2 CD-ROM or CD/DVD-RW drive

1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.
2. Remove the system cover as described in Section 3.4.

3. At the front of the chassis remove the screw holding the CD-ROM or CD/DVD-RW. *Figure 3-12.*

4. Insert a screw driver into the slot in the back of the drive and gently twist to release it. Then pull the drive out from the front.

3.6.3 SATA Disk Drive

1. Press the green release button on the latch on the front of the disk.

Figure 3-13.

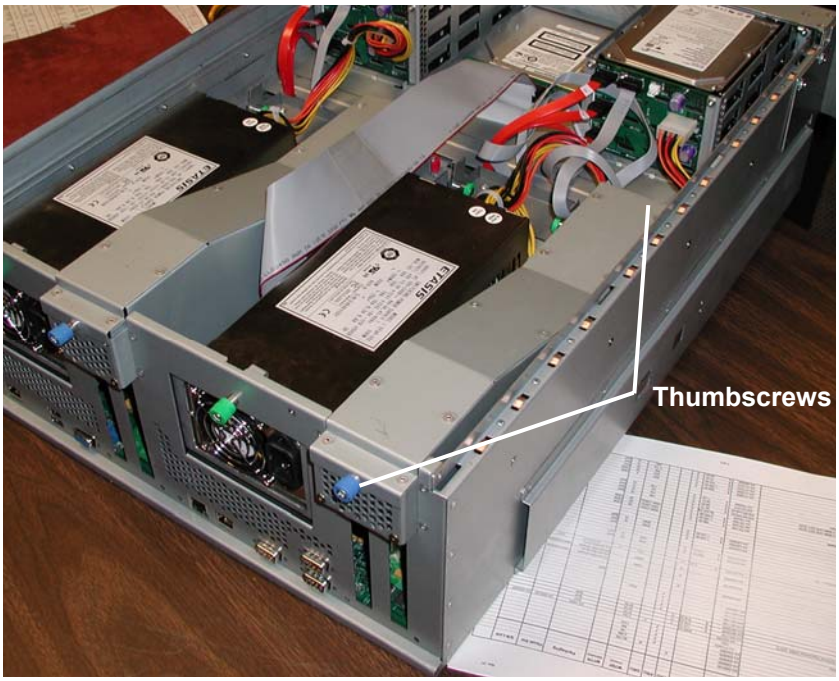
2. Pull the latch out and remove the disk

Figure 3-14.

3.6.4 PCI Adapter

1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.
2. Remove the system cover as described in Section 3.4.
3. Loosen the two blue thumbscrews that hold the PCI adapter cover in place (top and rear) and remove the cover

Figure 3-15.



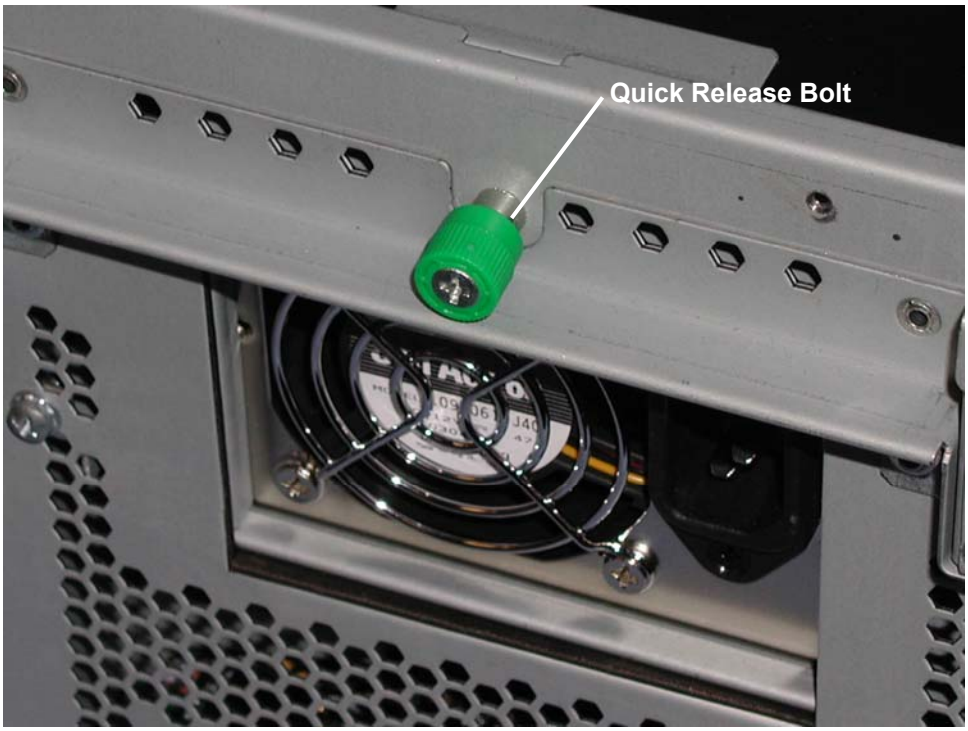
4. Remove the PCI adapter by gently pulling it straight up.

3.6.5 VTM Controller

1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.
2. Remove the system cover as described in Section 3.4.

3. At the rear of the system, pull out on the green quick release bolt securing the power supply unit covering the VTM.

Figure 3-16. Power Supply Quick Release Bolt

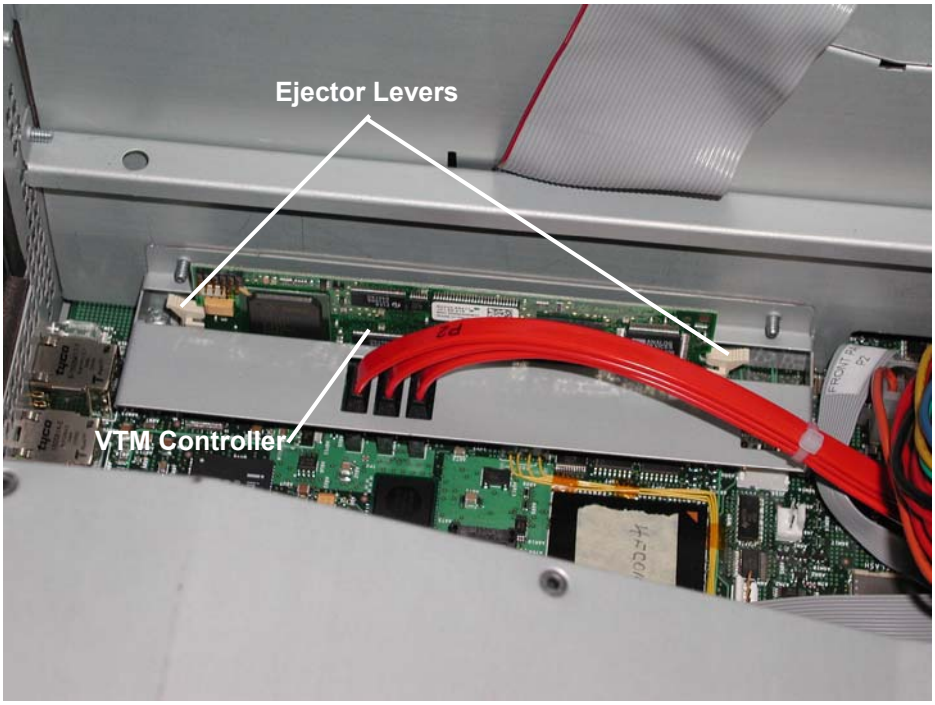


4. Swing the power supply unit upward as shown.

Figure 3-17. Power Supply in Servicing Position

5. Push down on the VTM's ejector levers and pull the VTM straight up from its connector.

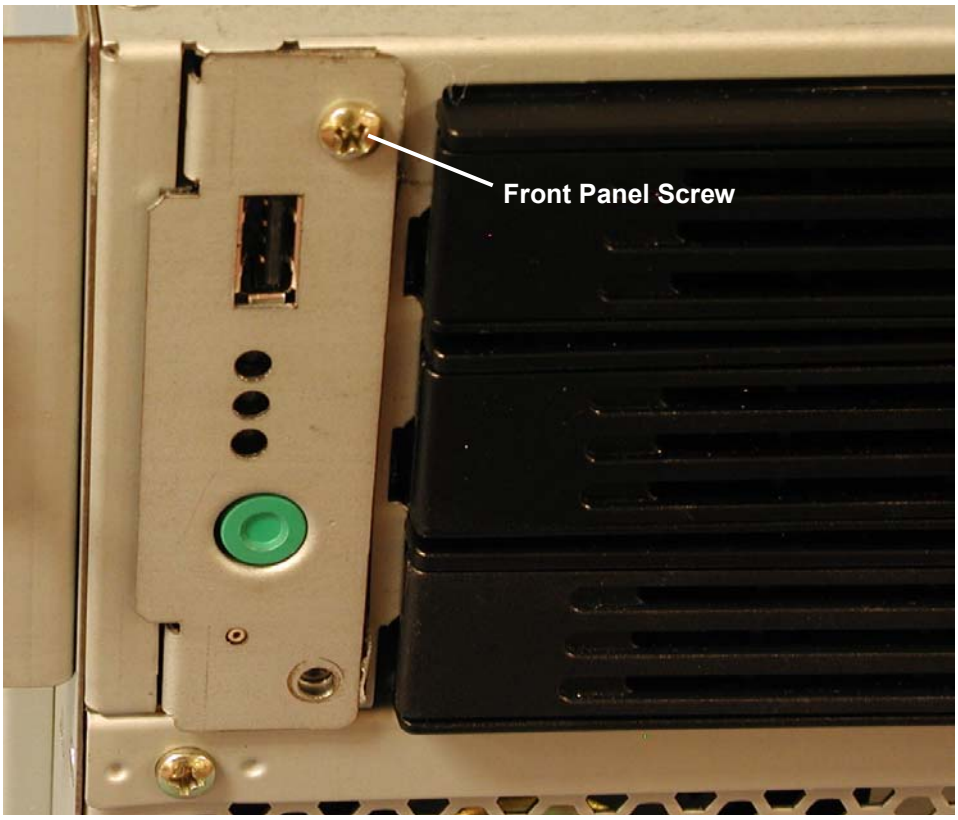
Figure 3-18. VTM Ejector Levers



3.6.6 Front Panel

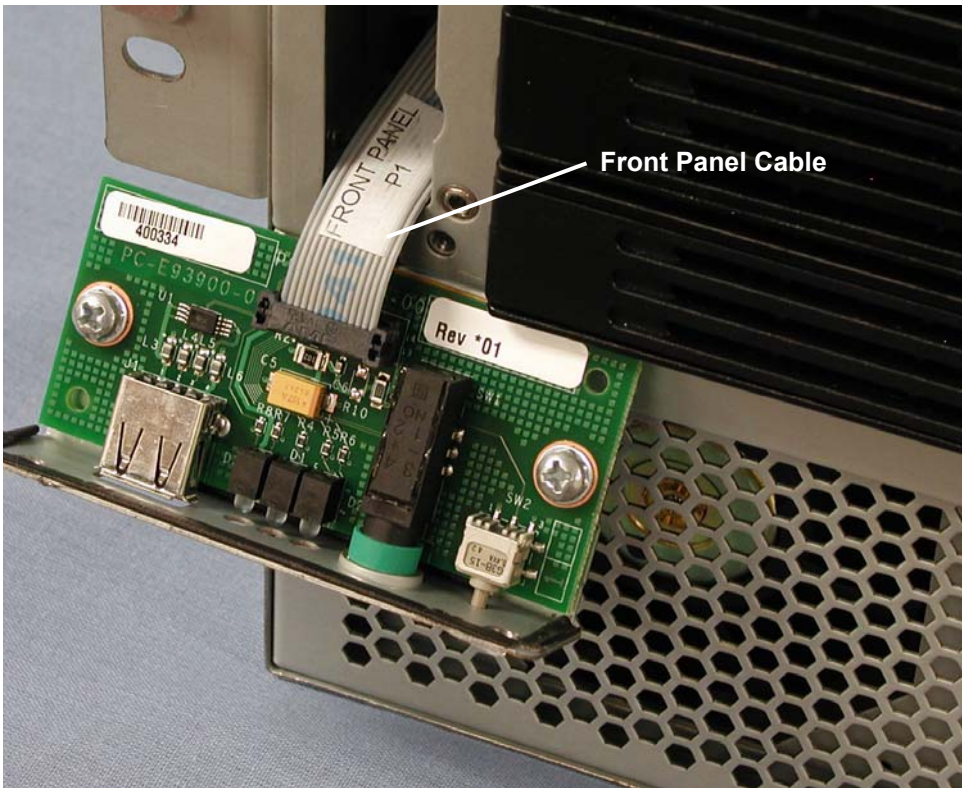
1. Shut down the ftServer system as described in Section 3.2.1.
2. At the front of the chassis, remove the screw securing the front panel to the chassis.

Figure 3-19. Front Panel Screw



3. Pull the front panel out from the chassis just enough to access the front panel cable. Disconnect the cable.

Figure 3-20. Front Panel Cable



4. FRU/DRU Hardware Removal/Replacement Procedures

This section lists the Field Replaceable Units (FRUs) and Distributor Replaceable Units (DRUs) in the ftServer W Series 2300 systems and describes the removal and replacement procedures for each one.

4.1 List of FRUs and DRUs

The following table lists the FRUs and DRUs in the ftServer 2300 system.

Description	FRU/DRU	Part Number
Memory Module (512-MB/1-GB DIMM)	**FRU**	**AA-M22808/M22900**
Fan Module	**FRU**	**MF-000046**
SATA Backplane	**FRU**	**AA-E92800**
CD-ROM Backplane	**FRU**	**AA-E92900**
SATA Data Cable	**FRU**	**AW-001149**
SATA LED Cable	**FRU**	**AW-001150**
Front Panel Cable	**FRU**	**AW-001152**
IDE Cable	**FRU**	**AW-001153**
CPU 3.06-GHzCPU & Heatsink Kit	**DRU**	**AK-000523**
Motherboard	**DRU**	**AA-G96000**

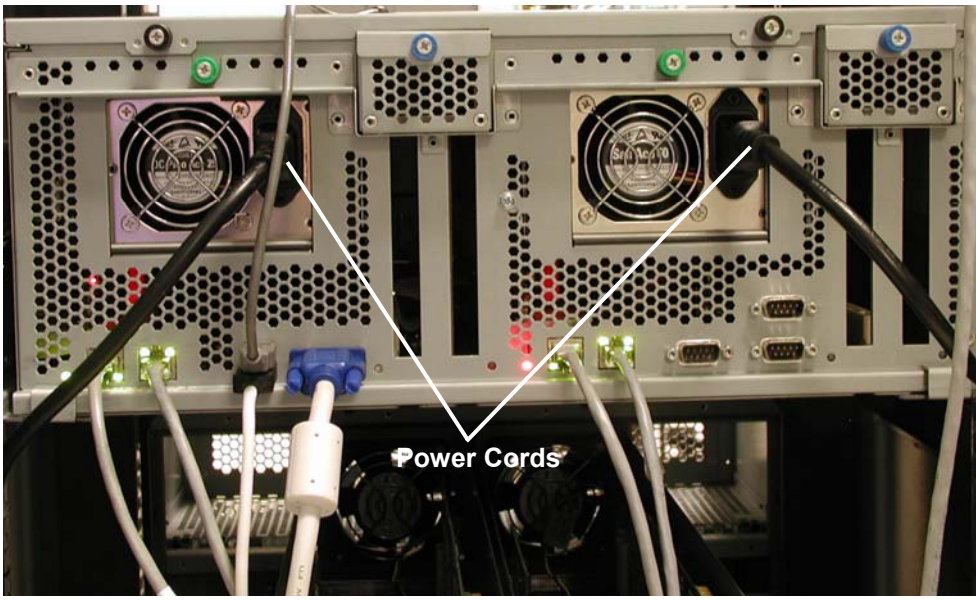
4.2 Power Removal

If total power removal is required, the system must be shut down prior to removing power and rebooted after the replacement unit is installed.

1. Shut down the operating system.
2. Turn off power to the monitor and any peripheral devices.

3. At the back of the system, remove the two AC power cords connected to the backplane power outlets.

Figure 4-1. AC Power Cords



4.3 Handling ESD Sensitive Parts

Clock cards and PCI adapters are particularly sensitive to damage from electrostatic discharge (ESD) because the electronic components are exposed when the device is not fully installed.

Caution: To avoid damaging these parts during handling, always take the following precautions.

- Always store cards and adapters in their static-protective envelope until you are ready to install them in the system.
- Always hold an adapter or card by its edges.
- Always ground yourself before handling a clock card or a PCI adapter, or before removing or replacing the I/O enclosure. Ground yourself by wearing a grounding strap.

4.4 Hardware Removal Procedures

This section contains the removal procedures for the FRUs and DRUs listed in the preceding table. Each of these procedures indicates any power removal requirements.

To perform the replacement procedure for each FRU or DRU, reverse the removable procedure. If any special replacement considerations are necessary, a replacement note is included.

4.4.1 Disk Enclosure Tray

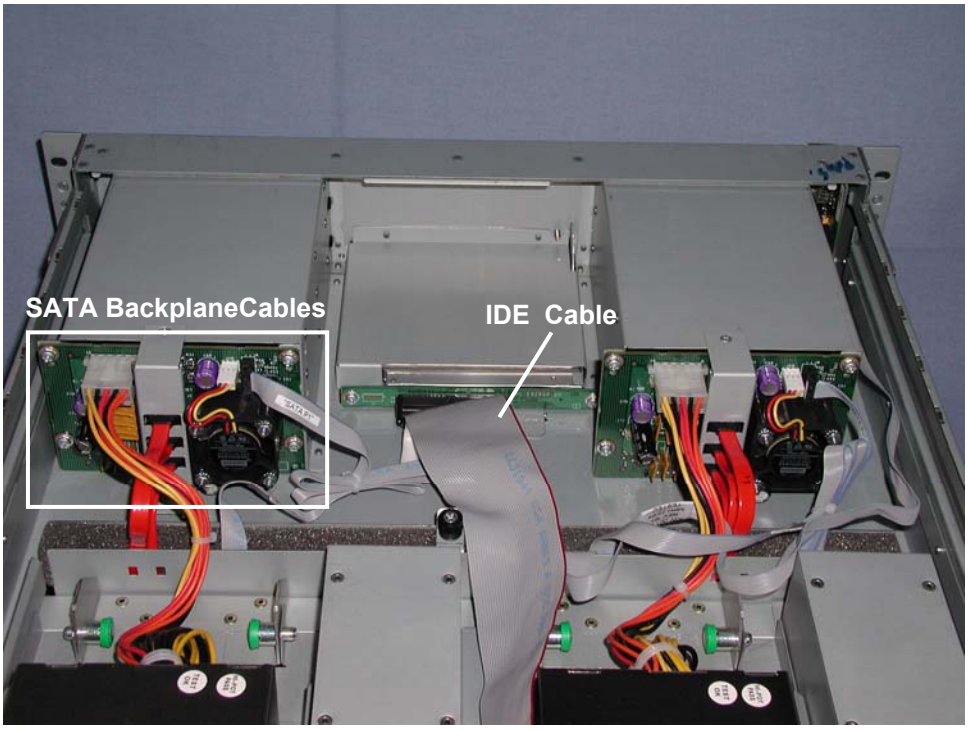
Removal of some of the FRUs and DRUs require removal of the disk enclosure tray.

To remove the disk enclosure tray, perform the following procedure.

1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.

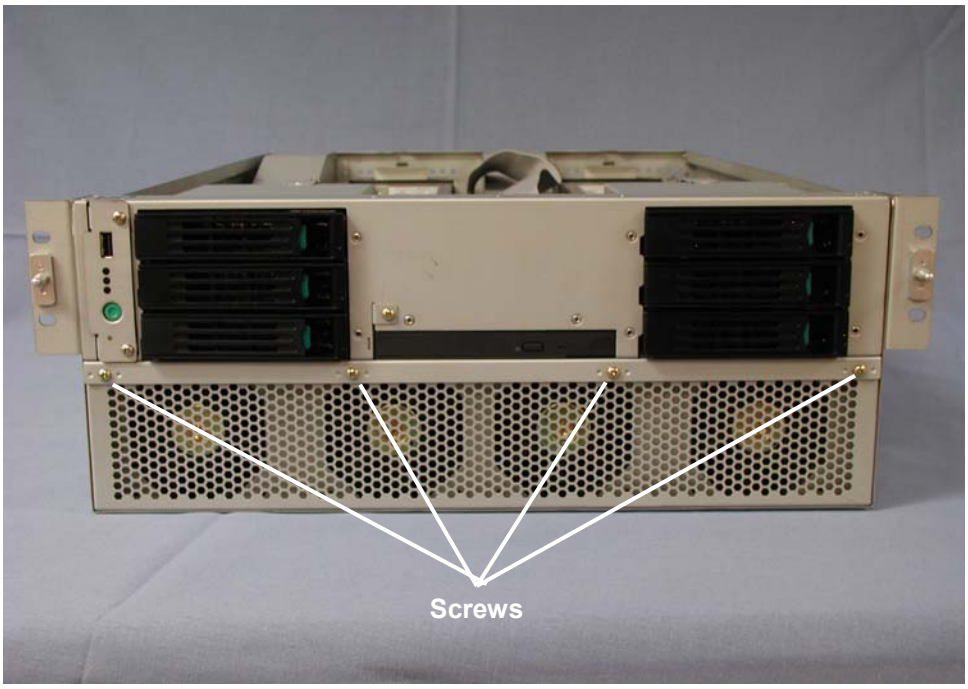
2. Remove the cover as described in Section 3.4.
3. Disconnect all cables from the SATA backplane and the IDE cable from the CD-ROM backplane.

Figure 4-2. SATA Backplane and IDE Cable Cable Connections



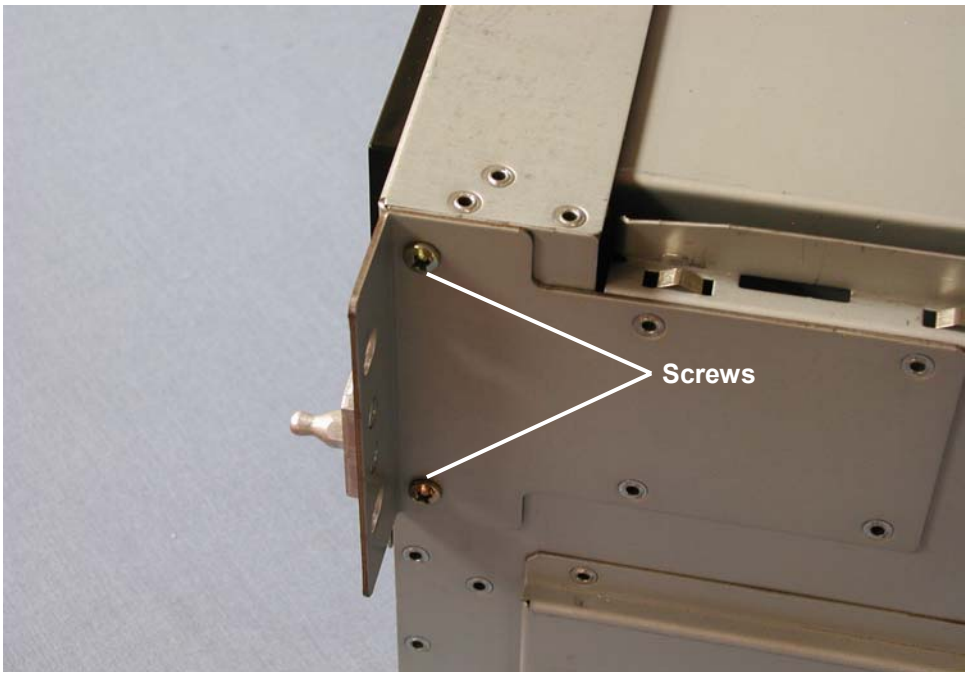
4. At the front of the chassis, remove the four screws securing the disk enclosure tray to the chassis.

Figure 4-3. Disk Enclosure Tray Front Screws



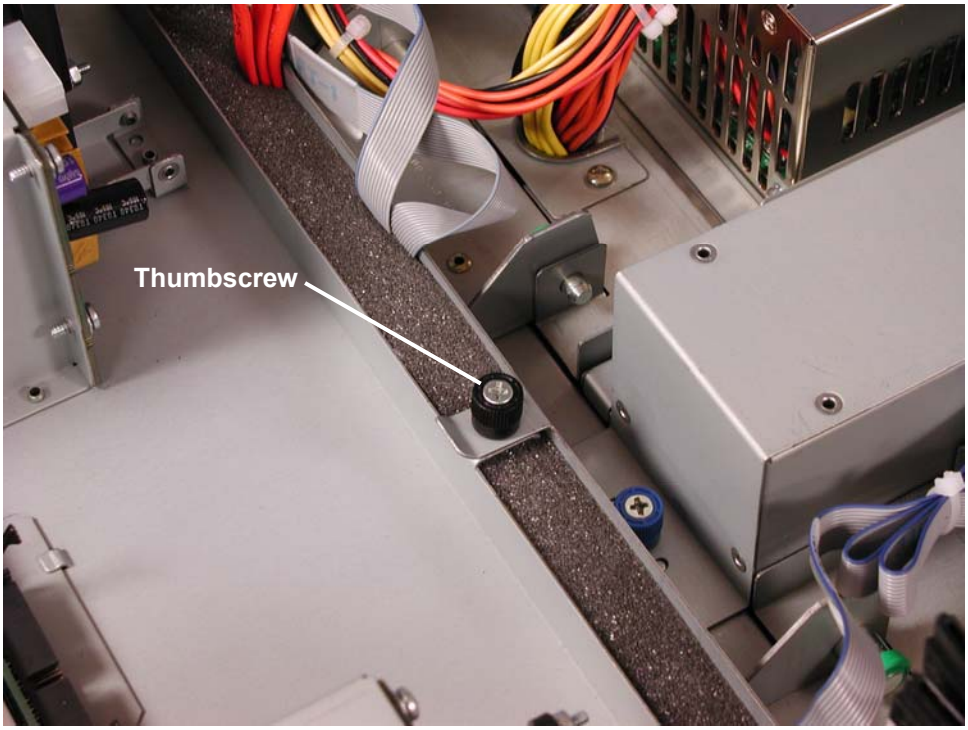
5. At the front of each side of the chassis, remove the two screws securing the disk enclosure tray.

Figure 4-4. Disk Enclosure Tray Side Screws



6. Loosen the black thumbscrew securing the disk enclosure tray to the center rail.

Figure 4-5. Thumbscrew Securing Disk Enclosure Tray



7. Slide the disk enclosure tray forward out of the chassis.

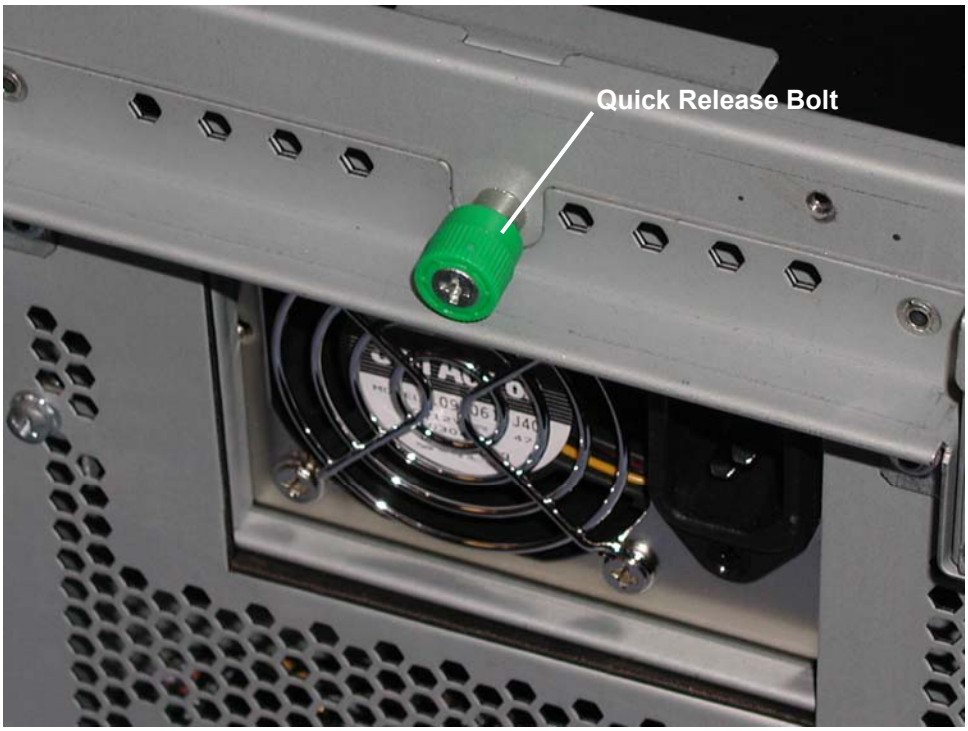
4.4.2 Memory Module (DIMM)

1. Follow the procedure for removing the disk enclosure tray as described in Section 4.4.1, but do not remove it entirely from the chassis. Slide it out of the chassis far enough to access the DIMMs.

Figure 4-6. Accessing DIMMs

2. At the rear of the system, pull out on the green quick release bolt securing each power supply unit.

Figure 4-7. Power Supply Quick Release Bolt

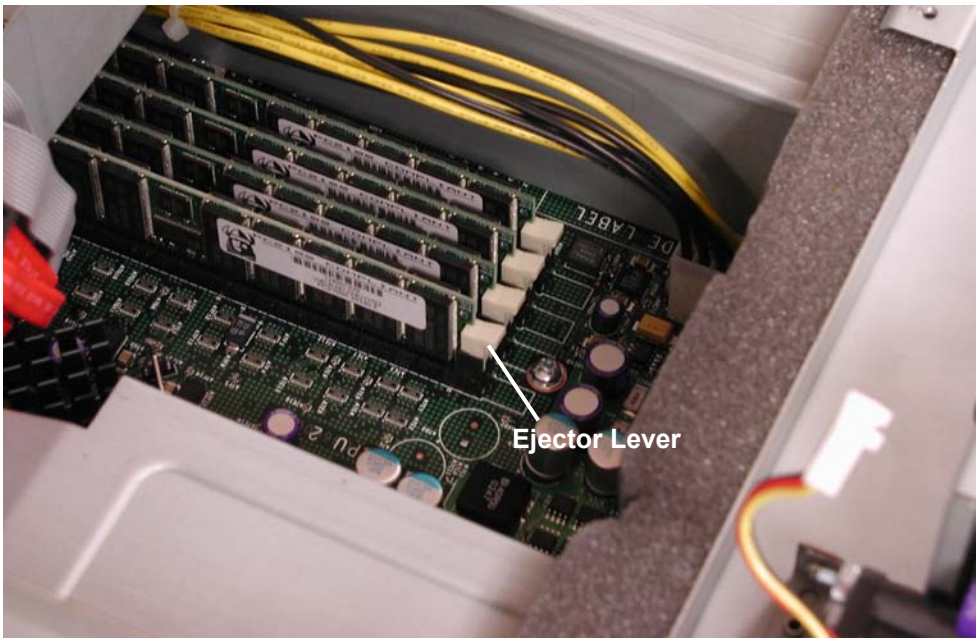


3. Swing each power supply unit upward as shown. This will provide more access to the DIMMs.

Figure 4-8. Power Supply in Servicing Position

4. Remove each DIMM by opening its ejector levers and pull the DIMM straight up out of the slot.

Figure 4-9. Ejector Levers



4.4.3 Fan Module

1. Remove the disk enclosure tray as described in Section 4.4.1.
2. Remove the two screws securing the fan and disconnect the two fan cables at the motherboard.

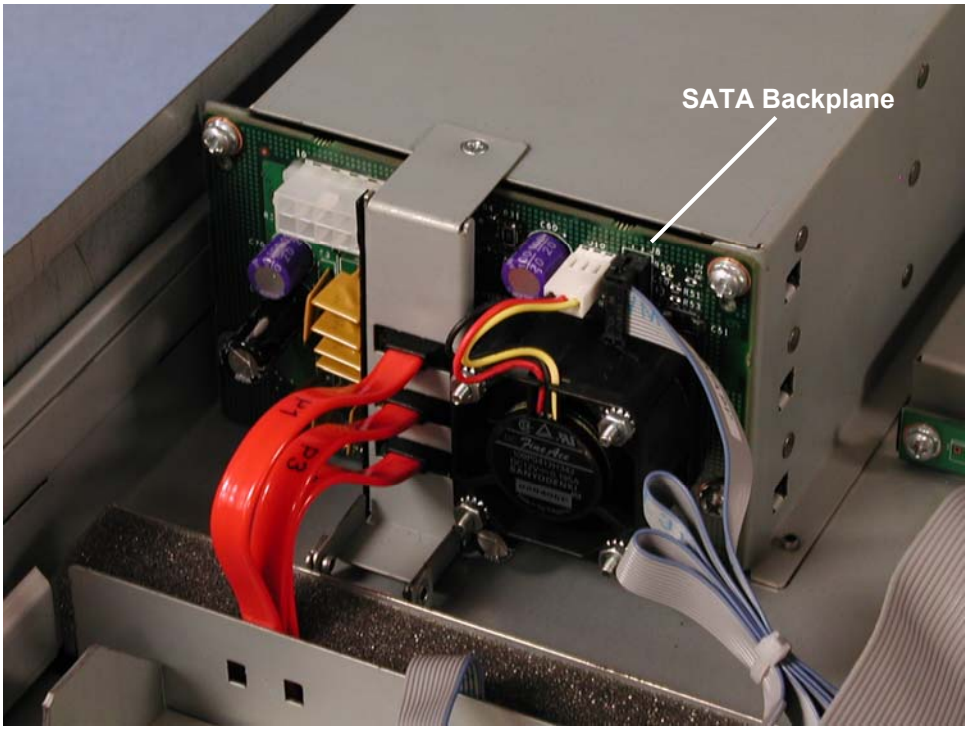
Figure 4-10. Fan Module Screws

4.4.4 SATA Backplane

1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.
2. Remove the cover as described in Section 3.4.

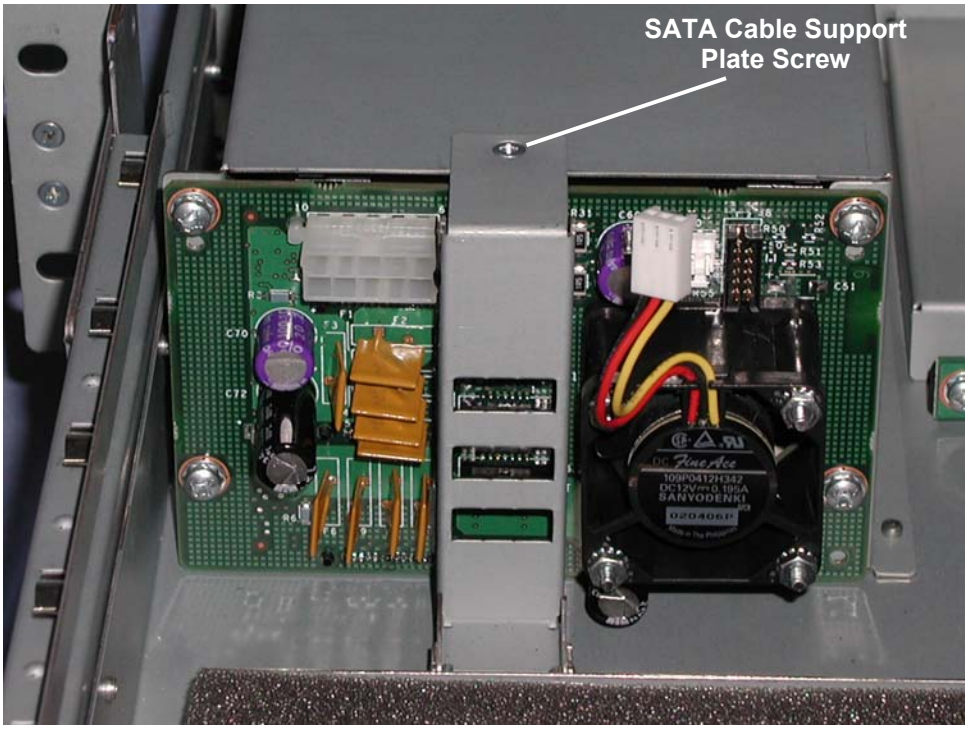
3. Disconnect all cables from the SATA backplane.

Figure 4-11. SATA Backplane Cables



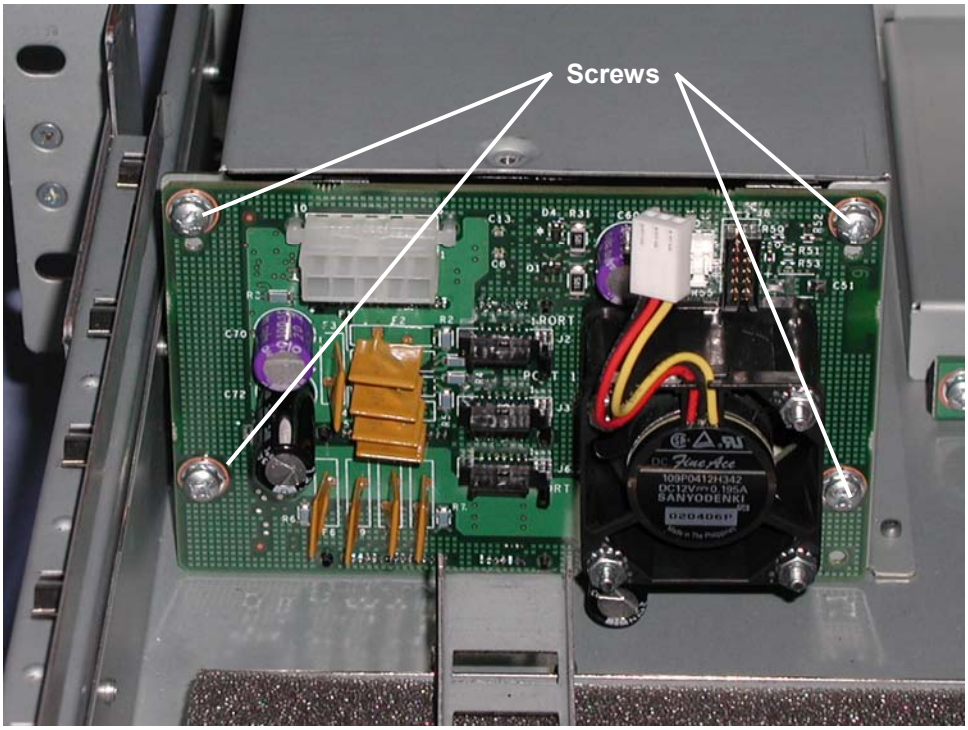
4. Remove the screw securing the SATA cable support plate attached to the SATA backplane.

Figure 4-12. SATA Cable Support Plate Screw



5. Remove the four screws securing the SATA backplane and lift it out.

Figure 4-13. SATA Backplane Screws

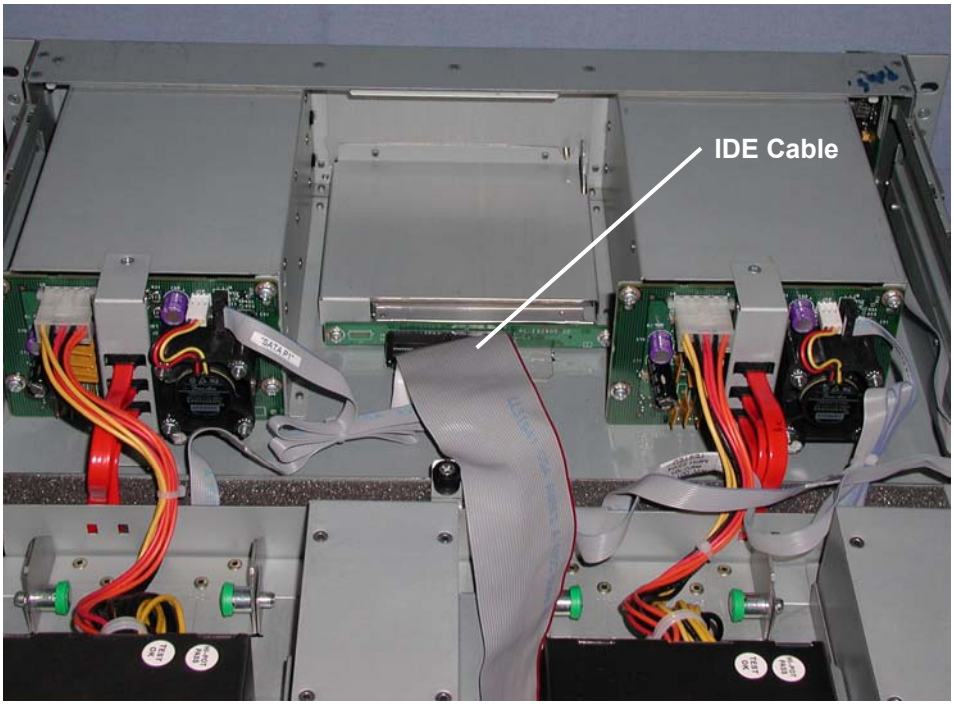


4.4.5 CD-ROM Backplane

1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.
2. Remove the cover as described in Section 3.4.

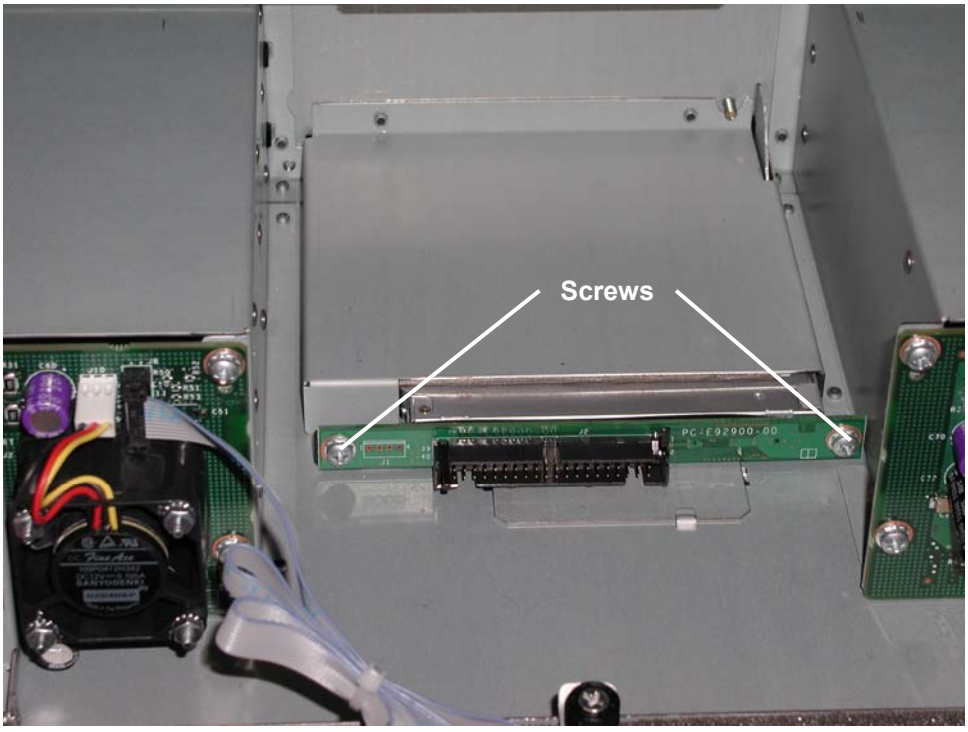
3. Disconnect the IDE cable from the CD-ROM backplane.

Figure 4-14. IDE Cable Connections at CD-ROM Backplane



4. Remove the two screws securing the CD-ROM backplane and pull it out horizontally to disconnect it from the CD-ROM drive.

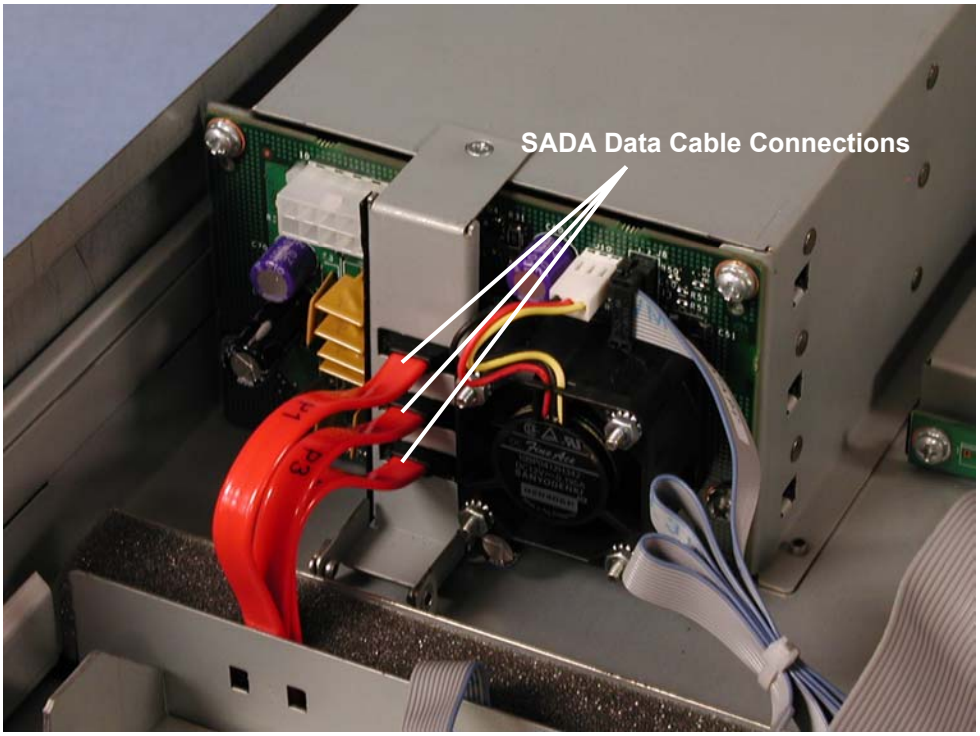
Figure 4-15. CD-ROM Backplane Screws



4.4.6 SATA Data Cable

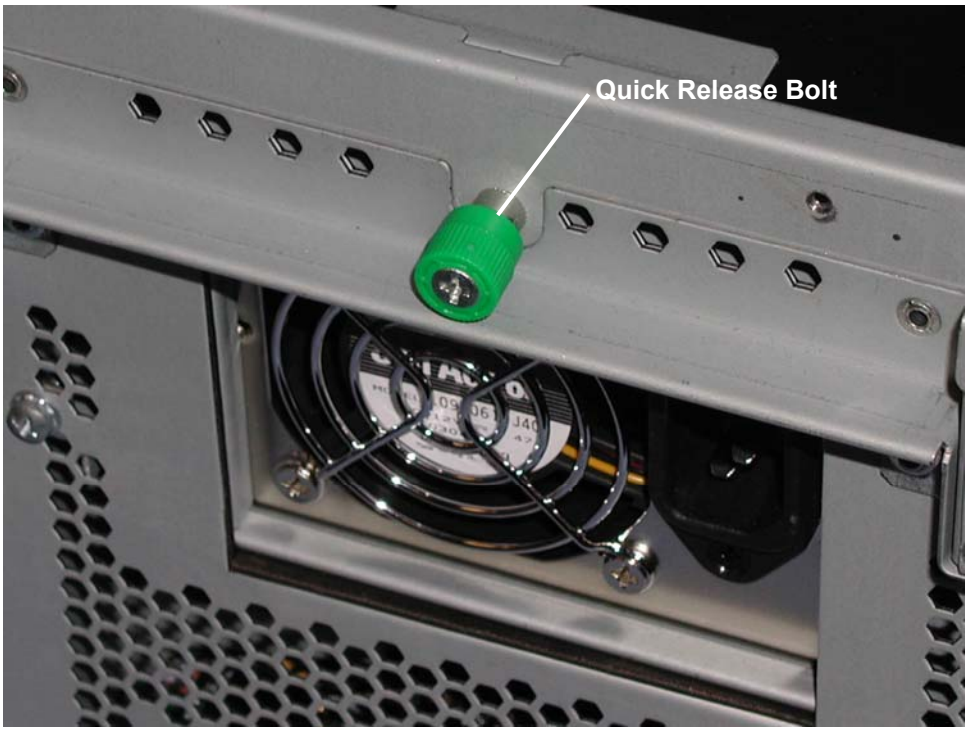
1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.
2. Remove the cover as described in Section 3.4.
3. Disconnect the SATA data cable (3 places) from the SATA backplane.

Figure 4-16. SATA Data Cable Connections at SATA Backplane



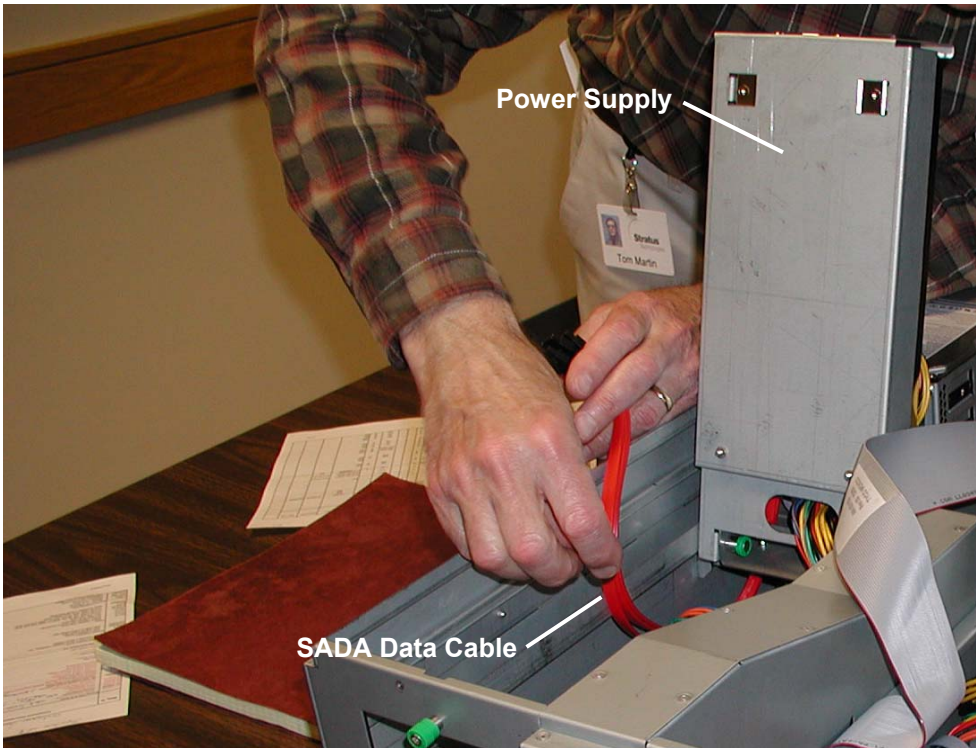
4. At the rear of the system, pull out on the green quick release bolt securing the power supply unit over the failed SATA data cable.

Figure 4-17. Power Supply Quick Release Bolt



5. Swing the power supply upward as shown.

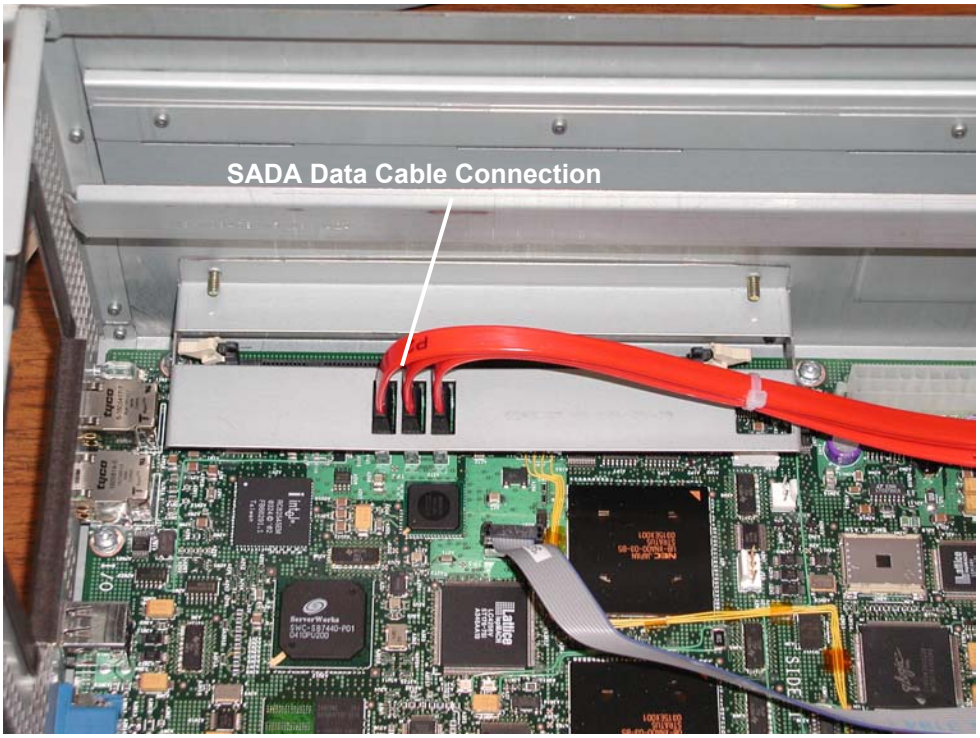
Figure 4-18. Power Supply in Servicing Position



6. Release the tie-wraps securing the SATA data cable to the center rail.

7. Disconnect the SATA cable from the motherboard and remove it from the system.

Figure 4-19. SATA Data Cable Connection at Motherboard

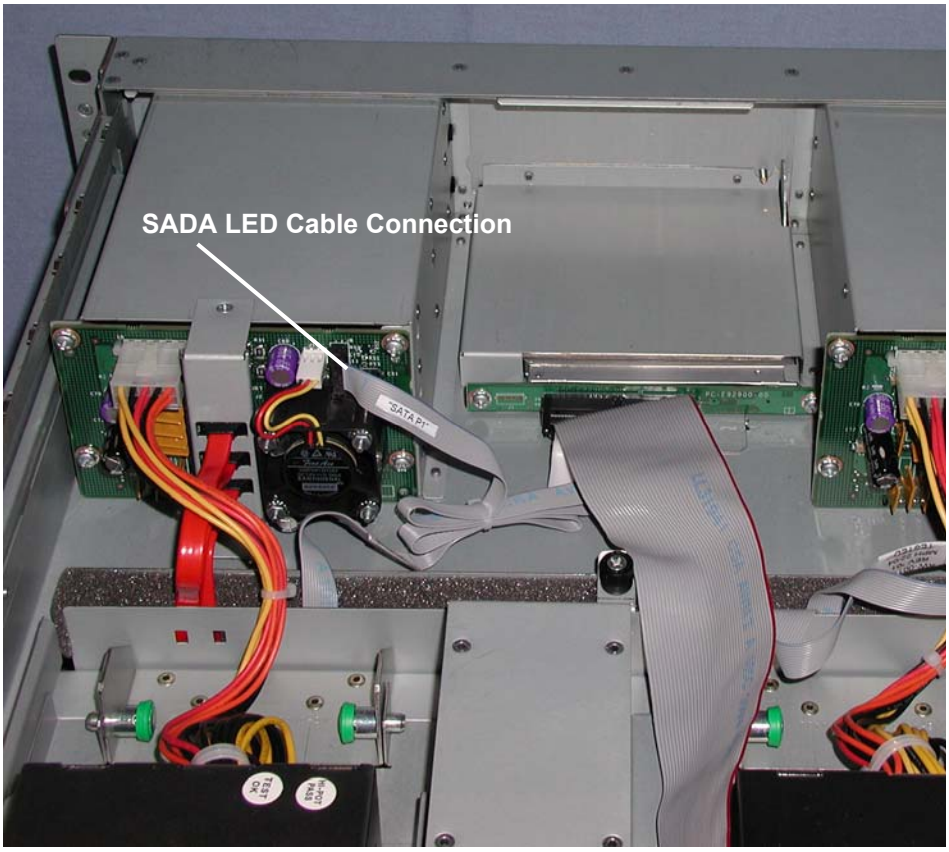


4.4.7 SATA LED Cable

1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.
2. Remove the cover as described in Section 3.4.

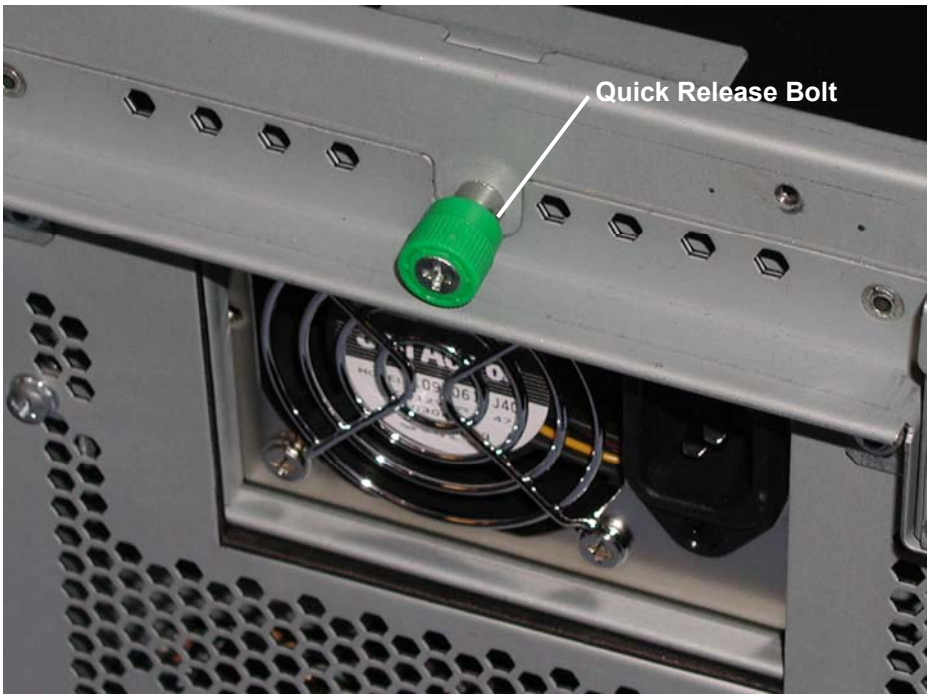
3. Disconnect the SATA LED cable from the SATA backplane.

Figure 4-20. SATA LED Cable Connection at SATA Backplane



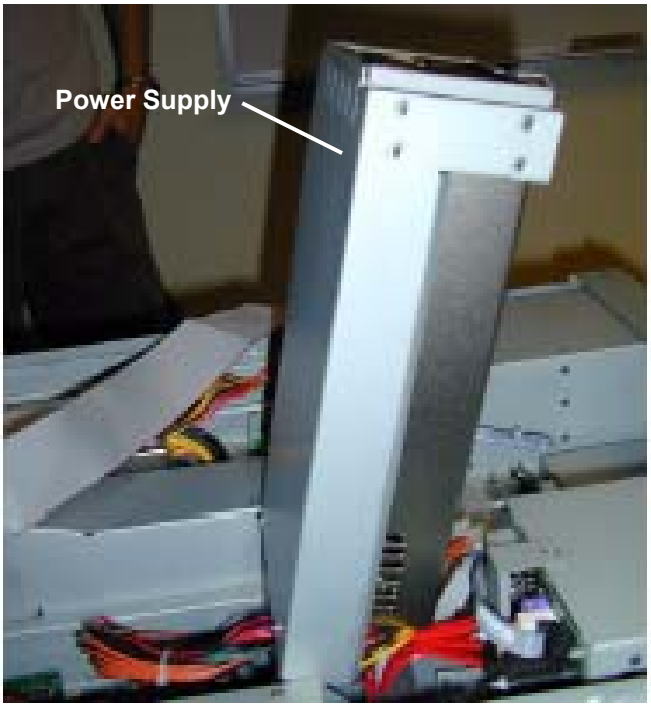
4. At the rear of the system, pull out on the green quick release bolt securing the power supply unit covering the failed LED cable.

Figure 4-21. Power Supply Quick Release Bolt



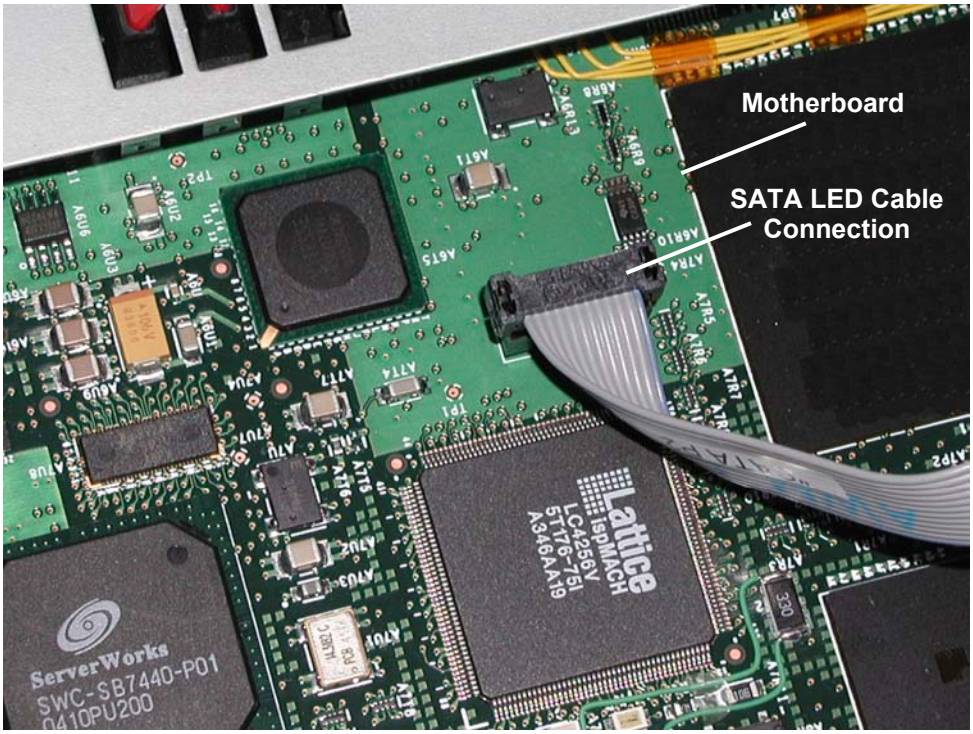
5. Swing the power supply unit upward as shown. This will provide access to the LED cable.

Figure 4-22. Power Supply in Servicing Position



6. Disconnect the SATA LED cable from the motherboard.

Figure 4-23. SATA LED Cable Connection at Motherboard

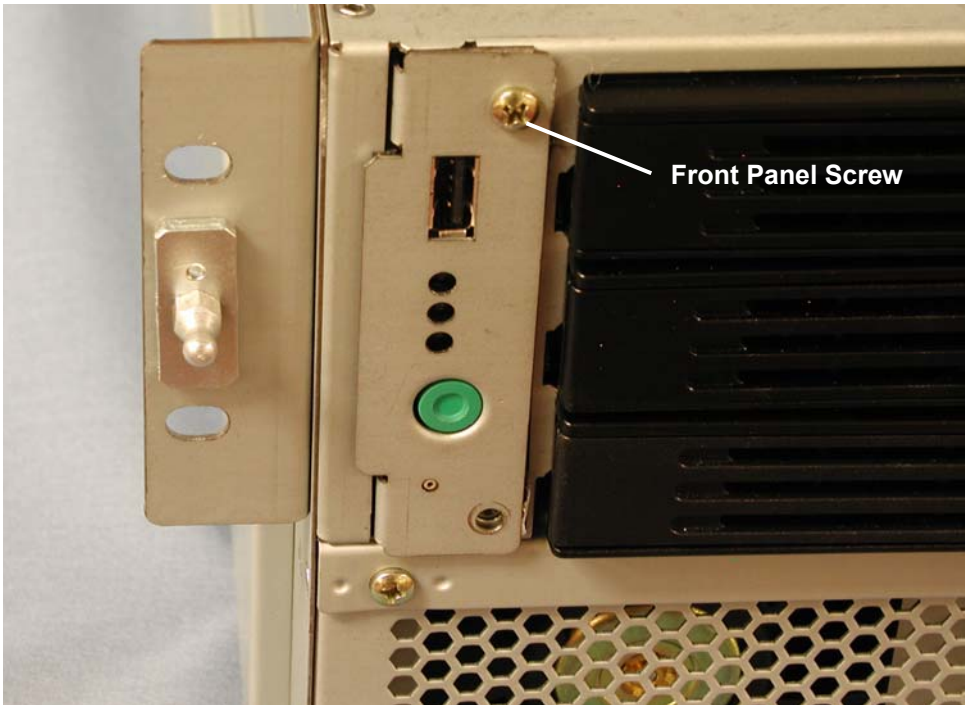


4.4.8 Front Panel Cable

1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.
2. Remove the cover as described in Section 3.4.

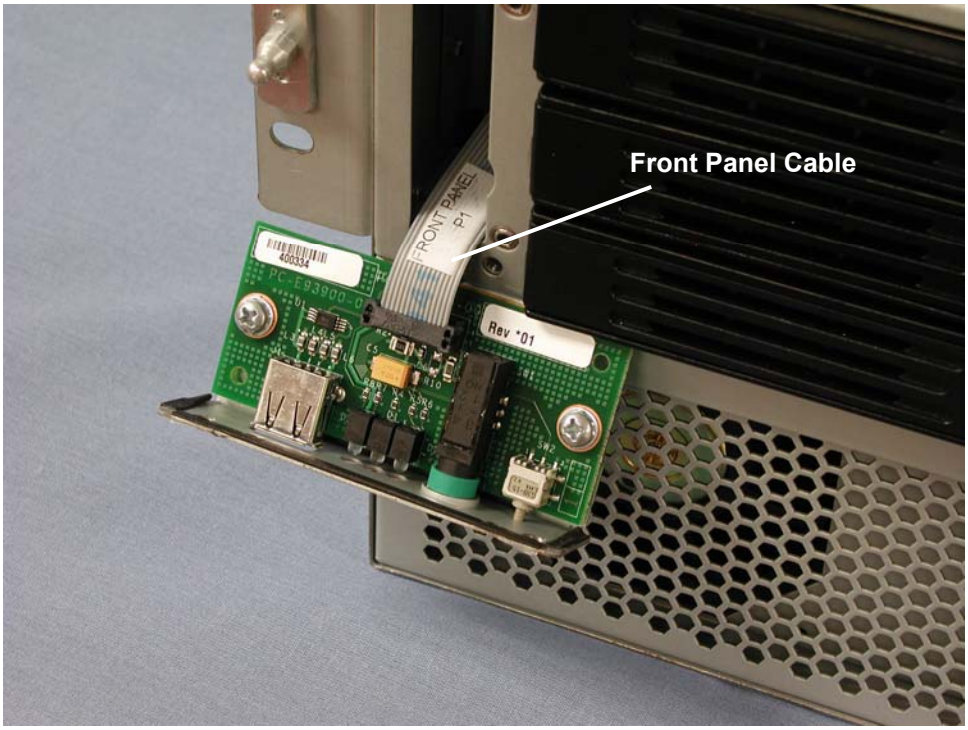
3. At the front of the chassis, remove the screw securing the front panel to the chassis.

Figure 4-24. Front Panel Screw



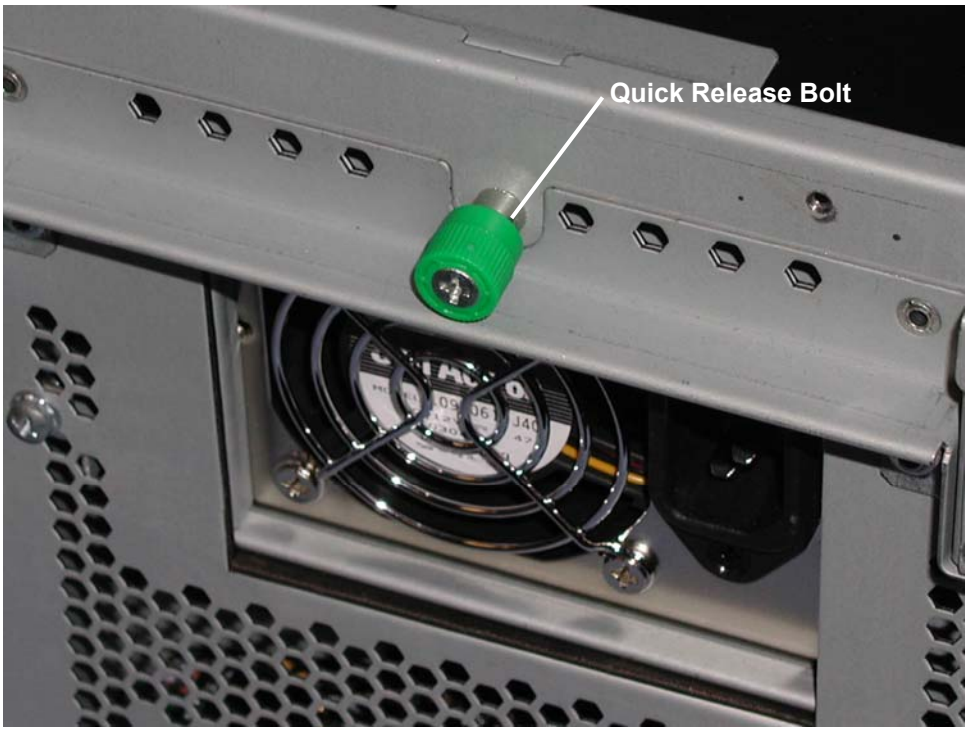
4. Pull the front panel out from the chassis just enough to access the front panel cable. Disconnect the cable.

Figure 4-25. Front Panel Cable



5. At the rear of the system, pull out on the green quick release bolt securing the power supply unit covering the front panel cable.

Figure 4-26. Power Supply Quick Release Bolt

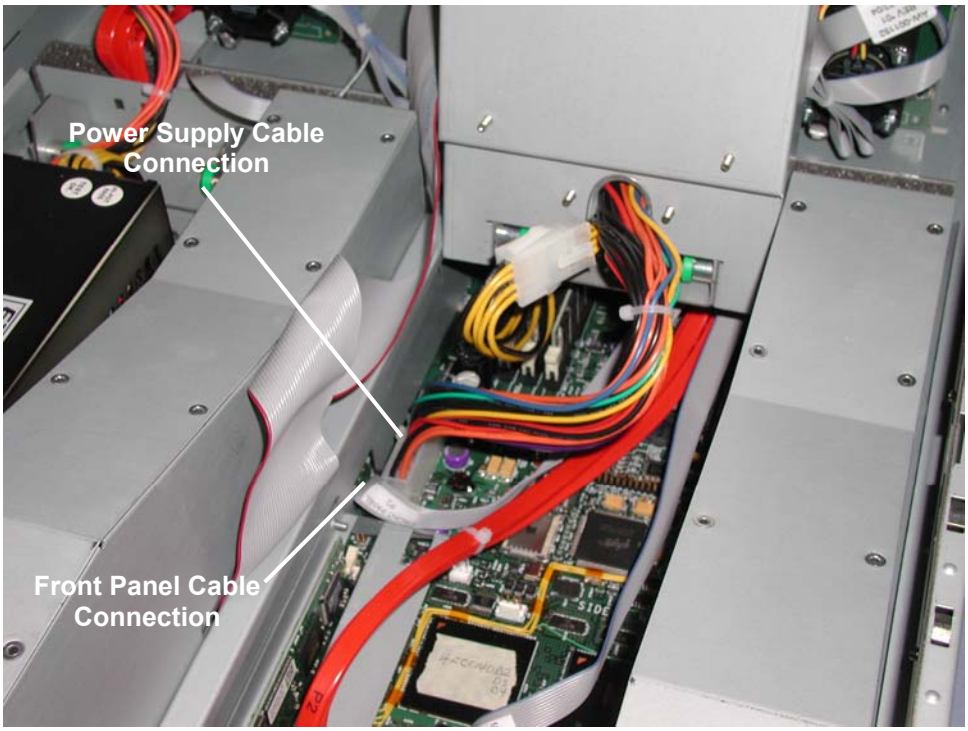


6. Swing the power supply unit upward as shown. This will provide access to the front panel cable.

Figure 4-27. Power Supply in Servicing Position

7. Disconnect the power supply cable and then disconnect the front panel cable from the motherboard. Remove the cable from the system.

Figure 4-28. Power Supply Cable and Front Panel Cable Connections at Motherboard

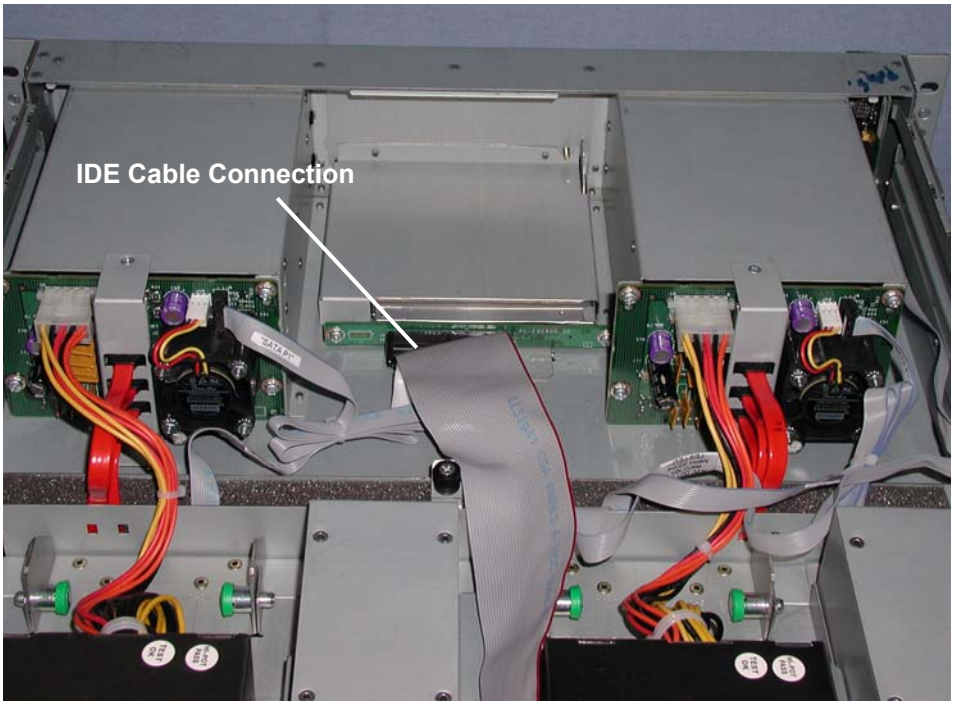


4.4.9 IDE Cable

1. Remove the ftServer 2300 system from the cabinet as described in Section 3.3.
2. Remove the cover as described in Section 3.4.

3. Disconnect the IDE cable from the CD-ROM backplane.

Figure 4-29. IDE Cable Connection at CD-ROM Backplane



4. Remove the two screws securing the PCI adapter cover over the IDE cable and lift it off.

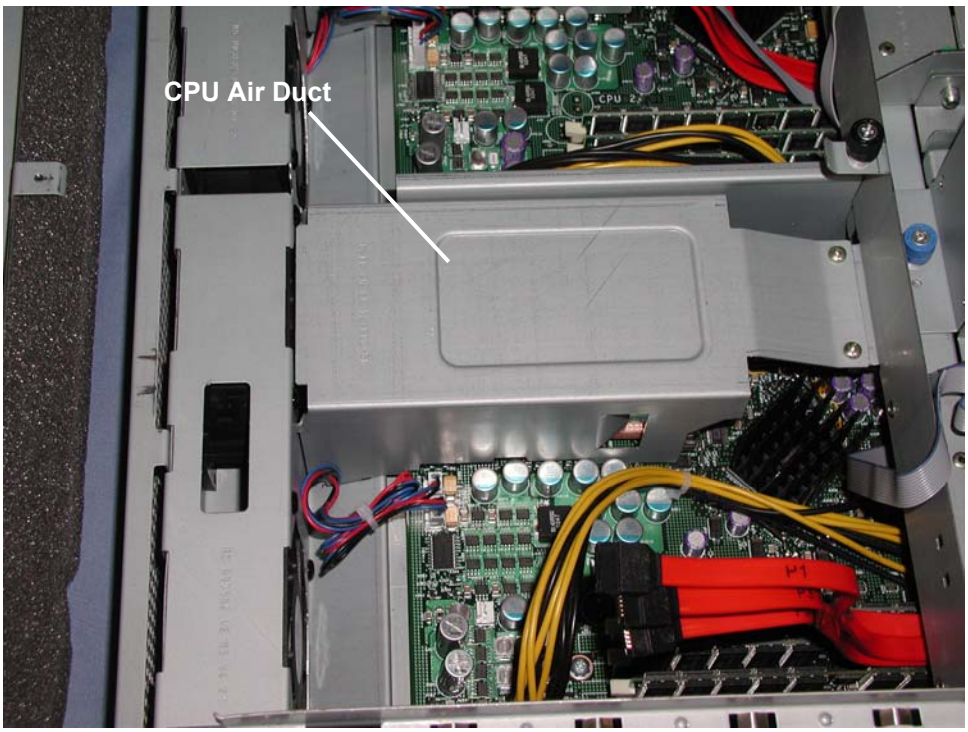
5. Disconnect the IDE cable from the motherboard. Remove the cable from the system.

Figure 4-30. IDE Cable Connection at Motherboard

4.4.10 CPU 3.06-GHzCPU & Heatsink Kit

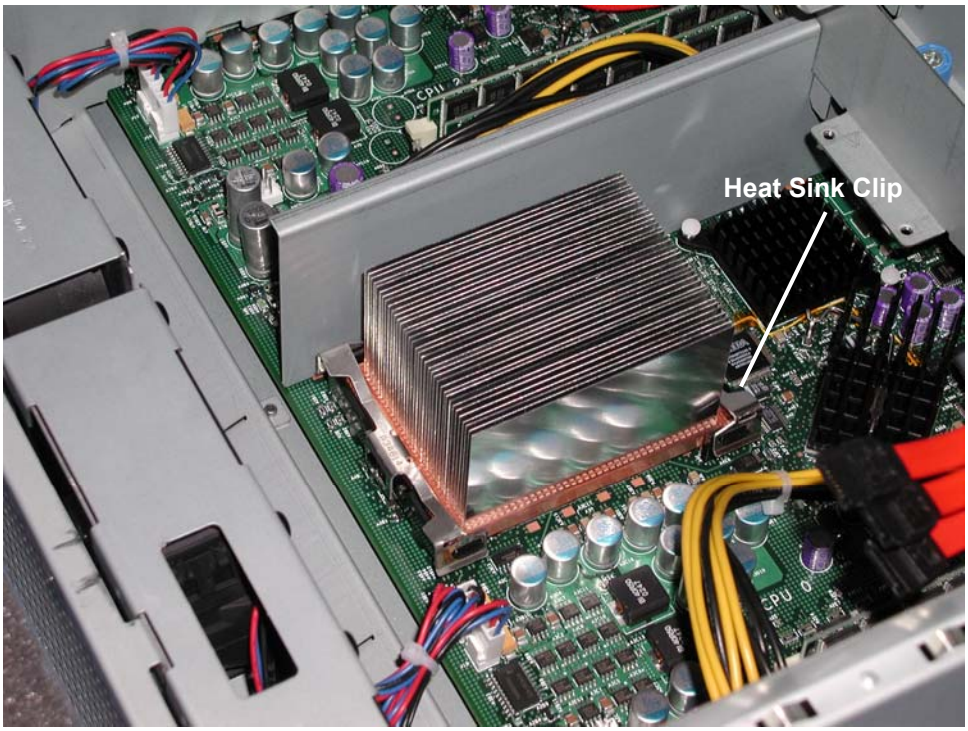
1. Remove the disk enclosure as described in Section 4.4.1.
2. Remove the two screws securing the CPU air duct and lift it off.

Figure 4-31. CPU Air Duct



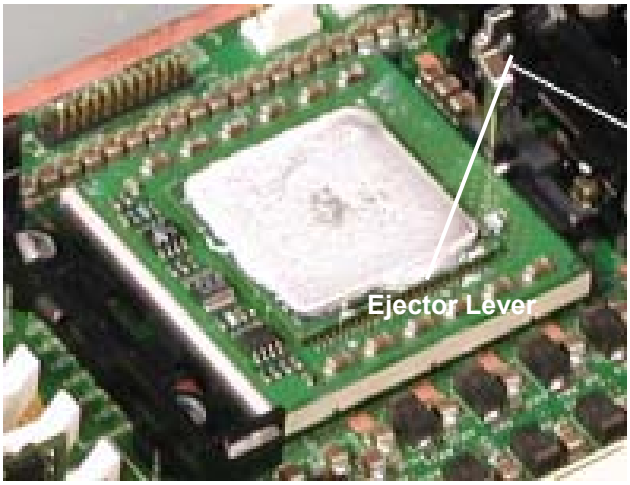
3. Push down on the heat sink clip with one hand and snap it off the bracket with the other. The heat sink must then be heated with a heat gun to allow it to be removed from the processor.

Figure 4-32. Removing Heat Sink



4. Release the processor's ejector levers and pull the processor straight up and out from the connector.

Figure 4-33. Processor Ejector Lever

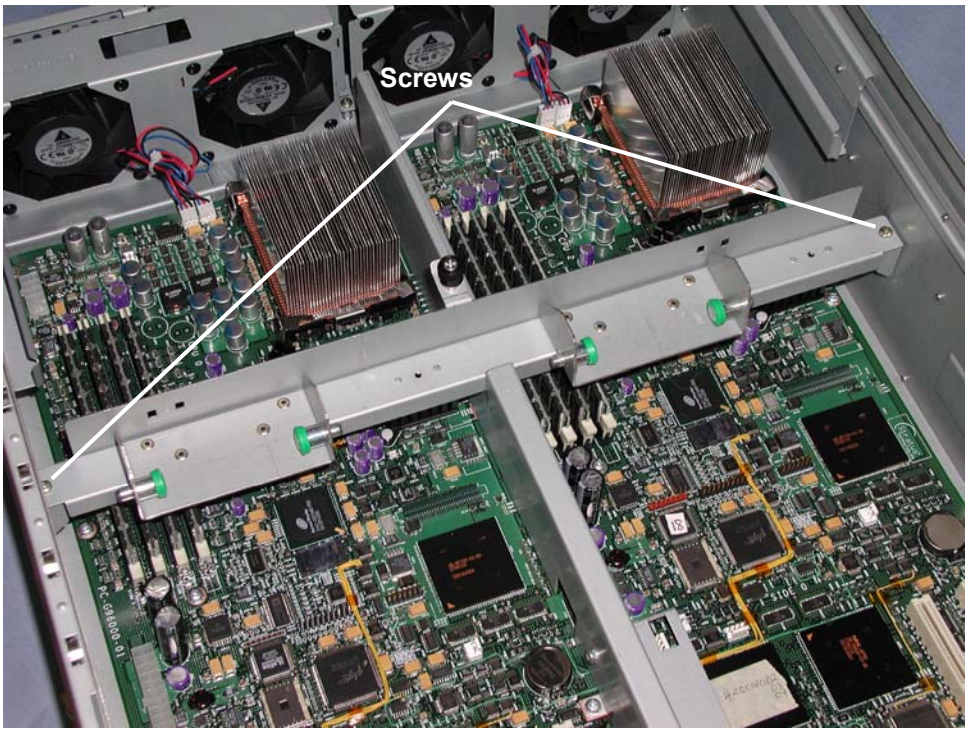


REPLACEMENT NOTE: Use the thermal grease included in the processor heat sink kit to install the new heat sink on the processor.

4.4.11 Motherboard

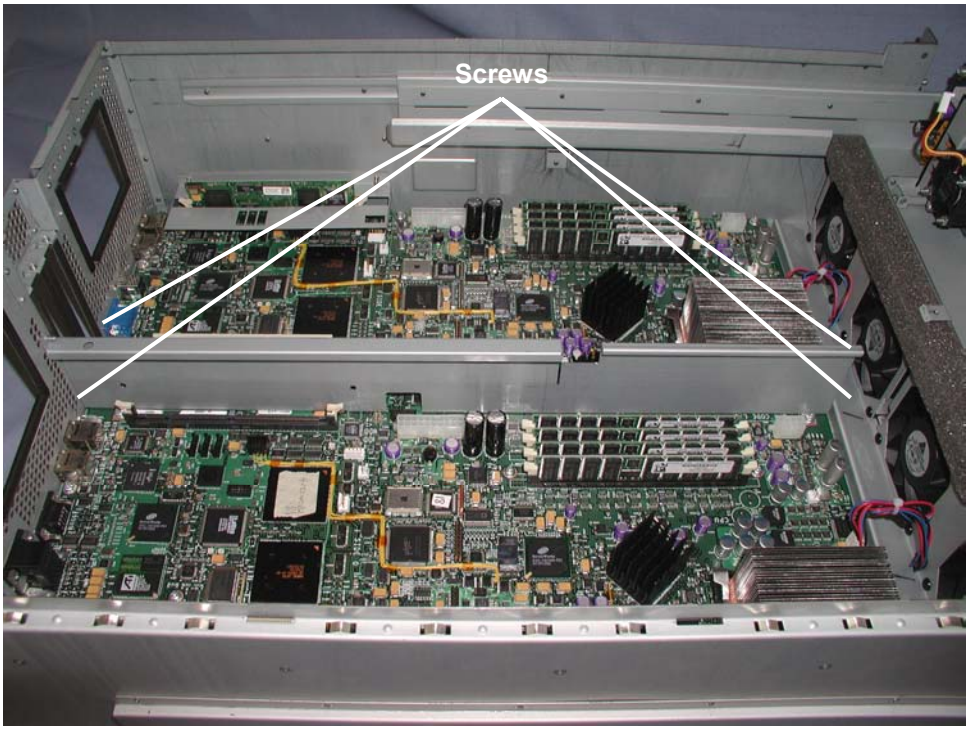
1. Remove the disk enclosure as described in Section 4.4.1.
2. Remove each power supply unit as described in Section XX.
3. Remove the two screws securing the center rail and lift it out.

Figure 4-34. Center Rail Screws



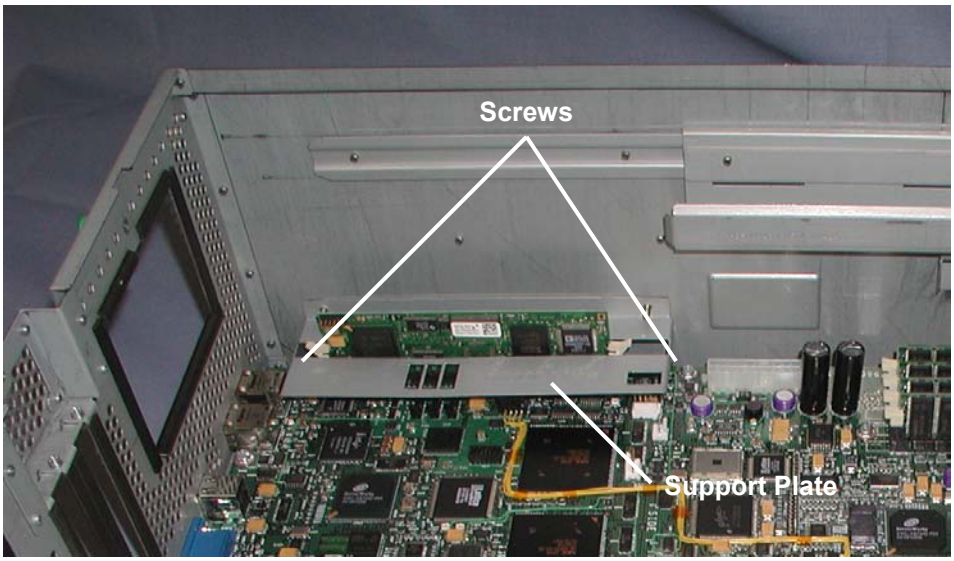
4. Remove the four screws securing the airflow divider and lift it out.

Figure 4-35. Airflow Divider Screws



5. Remove the processors as described in Section 4.4.9.
6. Disconnect all remaining cables from the motherboard.
7. Remove the two screws securing the SATA cable support plate and lift it out.

Figure 4-36. SATA Cable Support Plate Screws



8. Remove the 27 screws retaining the board (includes eight on the processor heatsink retention).

5. Part Numbers

The tables in the following subsections list the part numbers for the Customer Replaceable Units (CRUs), Field Replaceable Units (FRUs), and Distributor Replaceable Units (DRUs) in ftServer 2300 systems.

Description	CRU/FRU/DRU	Part Number
ftServer 2300 System	**CRU**	**AA-G96100**
Motherboard	**DRU**	**AA-G96000**
Front Panel	**CRU**	**AA-E93900**
SATA Backpanel	**FRU**	**AA-E92800**
CD-ROM Backplane	**FRU**	**AA-E92900**
Power Supply Unit (PSU) and Bracket	**CRU**	**AA-000418**
3.06-GHzCPU & Heatsink Kit	**DRU**	**AK-000523**
512-MB Memory Module	**FRU**	**AA-M22808**
1-GB Memory Module	**FRU**	**AA-M22900**
SATA Data Cable	**FRU**	**AW-001149**
SATA LEDs Cable	**FRU**	**AW-001150**
Front Panel Cable	**FRU**	**AW-001152**
IDE Cable	**FRU**	**AW-001153**
Fan Module	**FRU**	**MF-000046**
VTM Controller	**CRU**	**AA-U46300**
SATA 80-GB Disk Drive	**CRU**	**AA-D64100**
SATA 160-GB Disk Drive	**CRU**	**AA-D64200**
2-port Pro/1000BaseSx Fiber Ethernet PCI adapter	**CRU**	**AA-U57400**
2-port Pro/1000BaseSx Fiber Ethernet PCI adapter with LC-to-SC conversion kit	**CRU**	**AK-000528**
2-port Pro/1000Base-T Copper Ethernet PCI adapter	**CRU**	**AA-U57500**
EMC SAN Attach Kit – (Contains 2 U525 Optical Fibre Channel	**CRU**	**AK-415000**
Ultra320 PCI Adapter (for tape drives)	**CRU**	**AA-U52700**

Slimline CD-ROM Drive	**CRU**	**AA-D55100**
Rewriteable Optical Device	**CRU**	**AA-D55200**
DDS-4 DAT Tape Drive	**CRU**	**AA-T51100**
SDLT600 Tape Drive (rack mount only)	**CRU**	**AA-T52100**
SDLT600 Tape Drive (rack mount only)	**CRU**	**AA-T52200**
UL/CSA Cable, 10ft 68 Pos, SCSI to 0.8MM VHD EXT SCSI	**CRU**	**AW-001046-01**
UL/CSA Cable, 30ft 68 Pos, SCSI to 0.8MM VHD EXT SCSI	**CRU**	**AW-001046-02**
UL/CSA SCSI Tape Daisy Chain Cable	**CRU**	**AW-001072**
Monitor, 15" Flat Panel	**CRU**	**AA-V12900**
Monitor, 1U for ftServer	**CRU**	**AA-V12800**
USB Keyboard/Mouse	**CRU**	**AA-V11520**
USB Floppy Disk Drive	**CRU**	**AA-000400**
Intellimouse Microsoft Optical	**CRU**	**AA-V11610**
1U 4-Port KVM Switch Kit	**CRU**	**AA-V13000**
Switch to Display Cable, 10ft.	**CRU**	**AW-B40500-10**
Switch to Server Cable. 6ft.	**CRU**	**AW-B40501-06**
USB Extender Cable A-A, 6ft Long	**CRU**	**AW-B20247-06**
UL/CSA Cable 6 ft VGA Cable	**CRU**	**AW-B20240**
6 ft USB Cable	**CRU**	**AW-B51100**
ftServer Ground Leakage Cable	**CRU**	**AW-002000**
Grey Power Jumper Cord C13 to C14 10A 250V 2.0 Meters	**CRU**	**AW-B50502-**
Black Power Jumper Cord C13 to C14 10A 250V 2.0 Meters	**CRU**	**AW-B50503-**
V.90/56K Data Modem	**CRU**	**AA-C71900**

9. Remove the eight D-Connector posts.
10. Raise the motherboard at the front and pull it forward by one quarter inch to release the ear connectors from the panel and lift up and out.

6. Theory of Operation

This section contains an overview of the theory of operation for the ftServer 2300 systems. It provides information on how the system operates and includes a description of each of the following major assemblies/subsystems.

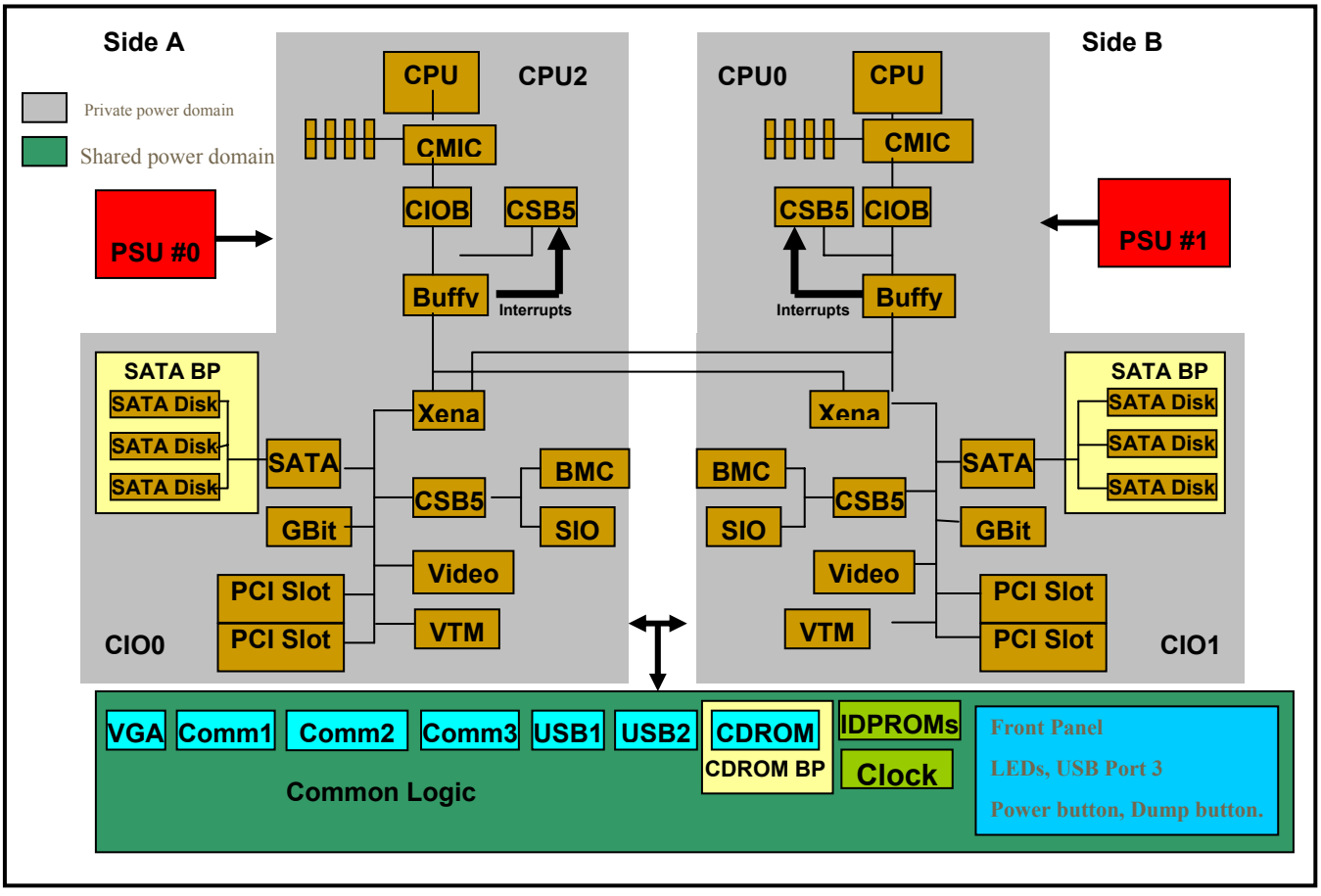
- CPU Element
- I/O Element
- Virtual Technician Module (VTM)
- SATA Backplane
- IDE Board
- Front Panel Board
- Cooling Subsystem
- Power Subsystem

6.1 Overview

The ftServer 2300 system consists of two CPU elements and two I/O elements in a 4U standard 19-inch rack mounted chassis.

The following figure is a system block diagram of the ftServer 2300.

Figure 7-1. System Block Diagram



6.1 CPU Element

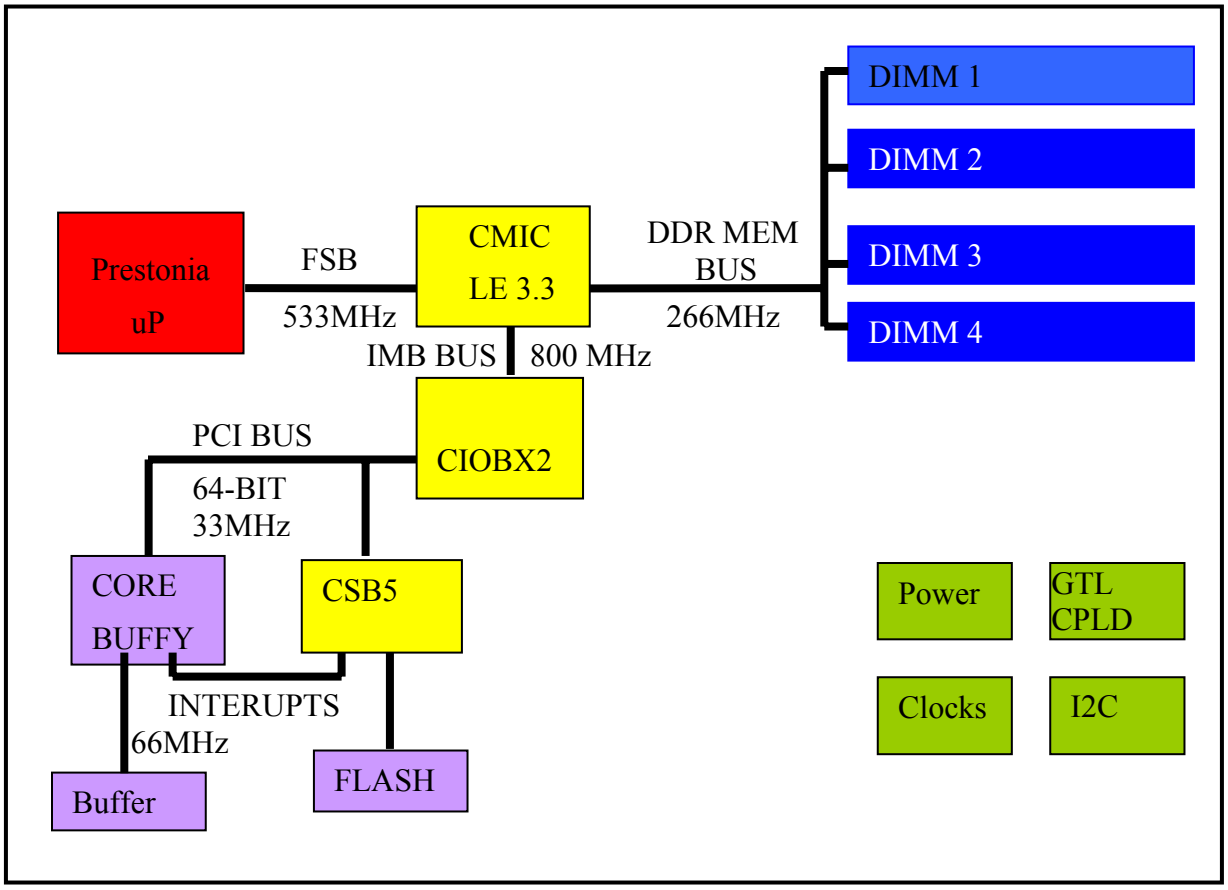
The ftServer CPU element is a uni-processor design operating at 3.06-GHz with a 533-MHz front side bus with the ServerWorks CMIC LE 3.3 chipset. It has four DIMM slots with a maximum configuration of 4 GB.

Other features of the CPU element.

- 266-MHz DDR SDRAM
- 800-MHz IMB
- FSB to IO sub-system bus
- 33-MHz/64-bit PCI Bus
- Debug LEDs
- Processor VRD: powered from 12 Volts.
- Memory VRD: powered from 5 Volts

The following figure is a block diagram of the CPU element.

Figure 7-2. CPU Block Diagram



The chipset from ServerWorks is the interface between the processors, memory and Stratus Chipset.

The CMIC-LE Rev A3.3 chip is the interface between the processor, memory and IMB bus. In the CPU element design, only four DIMM slots are used and the maximum configuration is

limited to 4 GB. The memory subsystem supports 1, 2 or 4 DIMMs of sizes 512-MB & 1-GB. Configuration registers in the CMIC LE3.3 control the arbitration on the front side bus (FSB), the memory and IO configuration and error reporting. During device initialisation hardware strappings are used to configure the CMIC.

The CIOB-X2 connects the PCI bus, on which the Buffy ASIC resides, to the IMB bus. The IMB bus consists of two 16-bit uni-directional busses, which connect the CMIC and the CIOB-X2. The PCI bus is configured as 64-bit, 33-MHz for the Core Buffy.

The following are functions that the CSB5 performs on the CPU element.

- Interfaces to the flash device that houses the BIOS via the X Bus. The flash device is 8 MB in size in a 40-pin TSOP package
- Interrupts are received from Buffy, translated to PCI interrupt packets and transferred to the FSB.

The memory interface can operate in interleaved or non-interleaved mode. During initialization the CMIC detects what memory configuration is present and operates the memory interface in the appropriate mode. If a single DIMM is detected then non-interleaved mode is selected. If two or four DIMMs are installed, then interleaved mode is selected. Full ECC protection is provided in the memory system while sustaining a peak memory bandwidth of 4.3 GB/sec.

The Buffy ASIC is the PCI to XBOW interface component. The ftServer 2300 has a core Buffy ASIC. The legacy I/O functions are south of the Core Buffy and reside on an I/O element.

Across the system, a common 8-MHz clock is driven to each CPU and I/O element. The common clock is used to generate in phase clocks on each element.

There are six main busses on the CPU Board. The FSB is the processor's bus and interfaces between the processors and the CMIC LE 3.0. The DDR or memory bus is the interface between the DIMMs and CMIC. The IMB bus is a proprietary ServerWorks bus. It connects the main bridge CMIC LE 3.0 to the IO bridge CIOB-X2. The PCI buses allow the CPU board to gain access to the I/O subsystem.

The power is monitored using the ispPAC 1208 power monitor from Lattice. This device contains programmable analogue comparators and digital logic, significantly reducing the discrete logic for voltage monitoring and logic reset sequencing. Level translation between the FSB's GTL + signalling and the boards 3_3V TTL is achieved using an Altera 7064B. This GTL CPLD also monitors the FSB error signals, in order to generate the reason_to_shoot_me[0,2] signals, and controls the enabling of the CPU's VRD.

6.2 I/O Element

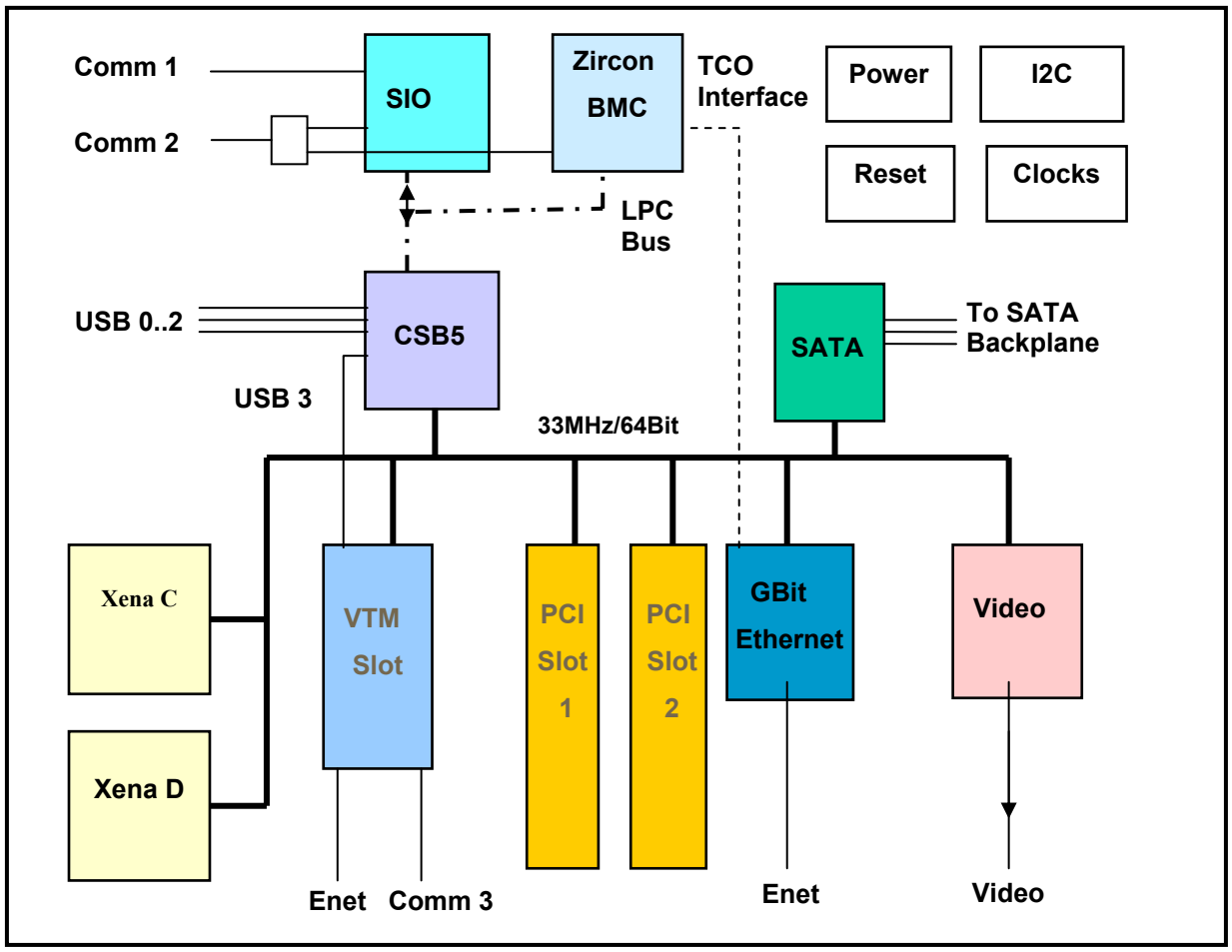
The following components are present on each IO element.

- Embedded Intel PCI 10/100/1000-Mbit Ethernet Controller
- Embedded PCI SATA Controller
- Embedded Zircon BMC Controller
- Embedded PCI Video Controller
- ServerWorks Champion South Bridge, CSB5
- LPC Server I/O device

- 2 x 64-bit / 33-MHz 3.3V User PCI Slots
- 1 x 168-pin DIMM connector for VTM
- 3 x 7-pin SATA connectors to SATA Backplane
- 14-pin connector to Front Panel LED Board.
- 1 x 24- and 1 x 8-pin connector to Power Supply
- 1 x RJ-45 10/100/1000-Mbit Ethernet port
- 1 x RJ-45 100-Mbit Ethernet port (VTM use only)
- USB, IDE, Serial & Video I/O of each IO element are multiplexed in hardware.
- One USB port is connected to the LED board
- Front Panel LEDs
- 3 x Rear Panel LEDs, one LED for each PCI slot and one for the VTM slot
- 2 Fans, 1 Temperature Sensor
- 12-pin connector to SATA backplane for SATA LEDs, disk drive cooling fan power and I2C interface to the scratch IDPROM.

The following figure is a block diagram of the IO element.

Figure 7-3. I/O Element Block Diagram



The embedded Intel 82545EM Ethernet controller is a single chip device with integrated MAC and PHY layer functions. The device can support connection speeds of 10/100/1000Mbit with half and full duplex data transmission. It has a 64-bit, 33/66-MHz PCI interface, which is compliant with PCI Local Bus Specification Rev. 2.2 as well as being PCI-X compliant. The 82545EM has a Total Cost of Ownership (TCO) interface. This interface enables remote system management over the Gbit Ethernet connection. An I2C bus is used to transfer TCO packets between the 82545EM's TCO interface and the Zircon controller. This interface connects to the onboard Zircon BMC controller to allow remote system management. The device has a 4-wire serial EEPROM interface that is connected to a 93C46 EEPROM. This EEPROM is used to store configuration data for the device.

Connection to the Ethernet controller is through an RJ45 connector located to the rear of the system. These connectors contain integrated magnetic components, which are required for electrical isolation. They also contain two LEDs to indicate port connection and connection speed. The green/yellow bi-colour LED located to the left of the connector indicates connection speed, unlit indicates 10-Mbit, green indicates 100-Mbit, yellow indicates 1000-Mbit connection speed. The green LED to the right of the connector is lit to indicate a link has been established and flashes to indicate activity.

The ftServer 2300 uses the VSC-7174 embedded SATA controller from Vitesse. The VSC-7174 is a single chip, with a 64-bit, 33/66-MHz PCI interface, which is PCI 2.2 and PCI-X compliant. It can control up to four SATA channels with a maximum throughput of 1.5 Gbit/second per channel. The ftServer 2300 uses three of the four available SATA channels.

An embedded Mobility-M video controller from ATI is used to provide the system video. The Mobility-M is a single chip with a 32-bit, 33/66-MHz PCI 2.1 compatible device. The device contains 4 MB of internal video RAM.

The ftServer 2300 contains four customer configurable I/O slots, two per I/O element. Although the slots can be individually configured, the slot configurations should be mirrored across the I/O elements to provide a duplex pair. The slots are 33-MHz, 64-bit and can host 3.3V and universal I/O signalling PCI adapters. The user PCI slots are not hot-pluggable. To insert or remove a PCI card the system must be powered down.

A 168-pin slot is provided on the I/O Element for a VTM controller. The VTM is described in detail in the next section.

6.3 VTM

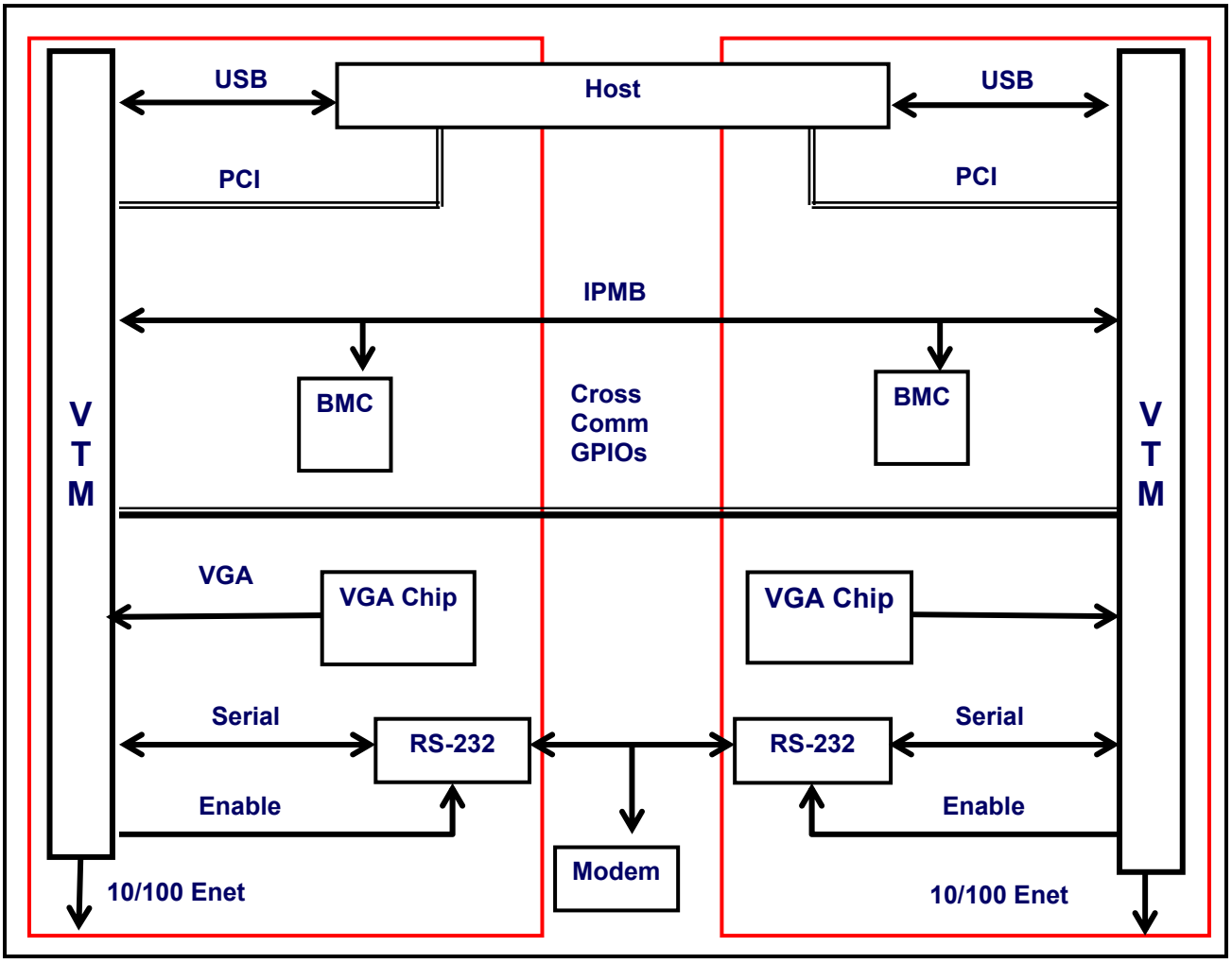
The VTM provides an extension of the system features provided by the Zircon BMC controller. It allows a user to remotely log into the system and seamlessly operate the system over an IP connection.

The VTM has the following features:

- Remote Keyboard, Video, Mouse, USB & Disk.
- Integrated 10/100Mbit Ethernet controller for remote management.
- 2 x RS-232 comm port interface (1 external, 1 debug).
- Out Of Band system management

The diagram on the following page shows how the VTM functions within the system.

Figure 7-4. VTM Hardware Interfaces



The VTM is based on Agilent eKVM hardware. It snoops the analogue RGB output from the ATI video chip to allow the remote user to see the system video.

Serial port 3 on the rear panel and the 10/100-Mbit ports are under exclusive control of the VTM. They cannot be accessed by the host system. Both ports are powered by standby power and can be used as an interface to the system through an externally attached modem even when the main system power is off. A Maxim MAX-3243 RS-232 level shifter interfaces the VTM's serial port to serial port 3.

The motherboard contains a bi-colour red/green LED to indicate the state of each of the VTMs. These LEDs are for debug only and are visible through the rear panel.

The VTM does not contain an integrated PHY controller for the Ethernet port. This is provided externally on the motherboard using an AMD 79C874 PHY controller. The RJ45 socket for the 10/100Mbit port contains integrated magnetics for electrical isolation and LEDs to indicate connection status.

6.4 SATA Backplane

The system contains two SATA backplane assemblies, one per I/O element. Each backplane can hold up to three SATA compliant drives.

Each SATA backplane supports the following devices.

- 1-3 Hot Plug SATA disks
- 3x7-pin SATA connectors to the motherboard
- 10-pin connector with two pins each for 5V, 3V3, 12V and four GND pins
- 3 x 22-pin connectors for each SATA drive, 7 pins for data, 15 pins for power
- System scratch EEPROM
- Fan connector for optional cooling fan
- 12-pin connector from the motherboard for SATA LEDs, scratch IDPROM interface and fan power control

The backplanes are single initiated; therefore, a failure of one of the I/O elements will cause all the disks controlled by the failing I/O element to go offline and all the disks controlled by the other I/O element to become simplexed. Similarly, the disks cannot go duplexed across the SATA backplanes until both of the I/O elements are online.

Power is supplied to each of the backplanes through a 10-pin connector. Each of the power supply units supplies power to one of the backplanes with the voltages required by the SATA disks.

The backplane connects to the motherboard through a cable assembly, which consists of three individual 7-pin SATA compliant data cables. These cables are marked 0, 1 and 2 to ensure the correct SATA channel from the controller is connected to the correct drive. The disks are numbered 0 through 2 from the top down.

Each SATA backplane contains a serial PROM which can be read from and written to using the I2C interface. The PROMs are used as scratch PROMs to which system specific data such as MAC addresses, failure information and system ID can be written. Although there are two physical PROMs they are seen by firmware as a single logical PROM.

The SATA disk drives have the following features:

- 7200 RPM spindle speed
- 8.5 milliseconds average seek time
- 8 MB buffer
- 150 MB per second burst data rate
- 13 watts operating power (typical)
- 60° C maximum operating temperature (ambient)
- 350 Gs non-operating shock
- 50,000 contact start-stop cycles

- 1 per 10E14 bits non-recoverable read error rate
- 600,000 MTBF

SATA has three busses with one target each. The disk device paths IDs are shown in the following table.

I/O 10	I/O 11
10/5/0/0	11/5/0/0
10/5/1/0	11/5/1/0
10/5/2/0	11/5/2/0

The SATA Controller on each side provides an activity LED for each disk, while three I/O expander bits are used to indicate whether each drive is in a simplex or a duplex state. These control three bi-colour green/yellow LEDs, one for each SATA drive. Each disk carrier incorporates a light pipe which allows the LED to be visible from the front of the system. A 12-pin cable from each IO Element contains all of the control signals to drive the LEDs located on its associated SATA backplane.

A scratch EEPROM is located on each of the two SATA backplanes. It contain the default system information

6.5 IDE Board

Features of the IDE board include:

- 40 pin IDE Interface to Encore Motherboard.
- 5V power for the slimline CDROM drive
- Optional 4-pin power connector
- 50-pin interface to slimline CDROM drive

The CD-ROM drive connects to the IDE backplane through a 50-pin miniature connector. A standard 40-conductor IDE cable connects the IDE backplane to the motherboard. Only one I/O element can access the CDROM at any time. To ensure this, the I/O Elements contain FET isolation to ensure only the active ISA I/O element can access the IDE interface to the CD-ROM. Logic has been incorporated to allow the active ISA I/O element to issue a reset to the IDE device.

The IDE backplane supplies +5V power to the CDROM drive through unused pins (pins 20, 32 and 39) of the IDE cable connected to the motherboard. There is a maximum peak current of 1.5A available to power the CDROM drive.

By default the CDROM drive is defined as the master IDE device. This is achieved by tying the cable select line of the IDE interface to ground on the motherboard.

6.6 Front Panel LED Board

The front panel board located contains three LEDs indicate the BMC and system hardware status. It also contains the system power switch, the dump switch and a USB 1.1 port.

Front panel LED board features include the following:

- 14-pin interface to motherboard
- LEDs for system broken/simplex/diagnostics/duplex status
- LEDs for BMC status
- 1 USB port
- Power button interface
- Dump button

A single power switch is located on the board. When in the powered down state, pressing the button will power on the system. Once powered on, the effect of pressing the power button will depend on the system state as described below.

- ***Legacy Mode*** (During BIOS): The system will power off immediately.

- ***ACPI Mode*** (OS Running): Pressing the power button will cause the system to do a graceful shutdown and power off.

- ***Powerfail Override***: If the power button is held for greater than four seconds the system will power off immediately, regardless of the system state.

Along with the system power switch, the LED board also contains a recessed dump switch to prevent accidental pressing of the dump button. Pressing the dump switch causes the system to halt and restart. Once a dump has been initiated the contents of memory are saved to disk.

A bi-colour green/red LED is used to indicate the BMC status. A bi-colour green/ yellow LED and a red LED are used to indicate the hardware simplex/duplex status.

6.7 Cooling Subsystem

The motherboard contains 4 80mm fans to cool the motherboard. These fans draw air through vents at the front of the system, over the motherboard and exhaust the air to the rear. To comply with the environmental requirements, the noise level of the system at room temperature must be below 55dB. To achieve this, the ADT7463 hardware monitor monitors the ambient temperature using an external temperature sensor. As the temperature varies, the ADT7463 hardware monitor will ramp the fan speed. The fans will initially default to high speed.

The system also contains air guides to provide sufficient cooling for the internal PCI cards. The guides are inserted over the PCI slots and the PCI adapters. Each air guide provides cooling for two PCI adapters; therefore, two guides are required per system. In addition to the forced air cooling, certain components on the motherboard such as the CPU, CIOB, CMIC and power regulators require heatsinks to aid heat dissipation.

SATA disks drives are cooled with air drawn through the system by a 40mm fan attached to the rear of each of the SATA backplanes. There is circuitry present on the SATA backplane to enable the ADT7463 to monitor and control the speed of operation of these fans.

6.8 Power Subsystem

The main power for the ftServer 2300 system is from two identical 350W AC power supplies, each feeding into one side of the system. Each supply has six output voltages: 5V Standby, 3.3V, 5V, two 12V and –12V. One 12V source supplies the VRD for the processor while the other supplies the PCI and SATA disk drives. The 5V supply supplies the memory power converter, the PCI slots, the CD drive and the SATA disks. On-board voltage regulators are used to generate the remaining voltages required.

The power from each supply is distributed through a loom with three cables ending in one 24-pin, one 8-pin and one 10-pin connector respectively, to deliver power to the motherboard (24-pin and 8-pin) and the SATA back plane (10-pin).

The power supply generates the VCC5SBY voltage as soon as AC is applied. This stand-by power is used to generate the on-board VCC3_3SBY, VCC2_5SBY. The standby voltages supply power for the I2C, Power Fault circuitry, the Gigabit controller and the System Management interface as well as the common power to the JTAG, ID Prom and System clock.

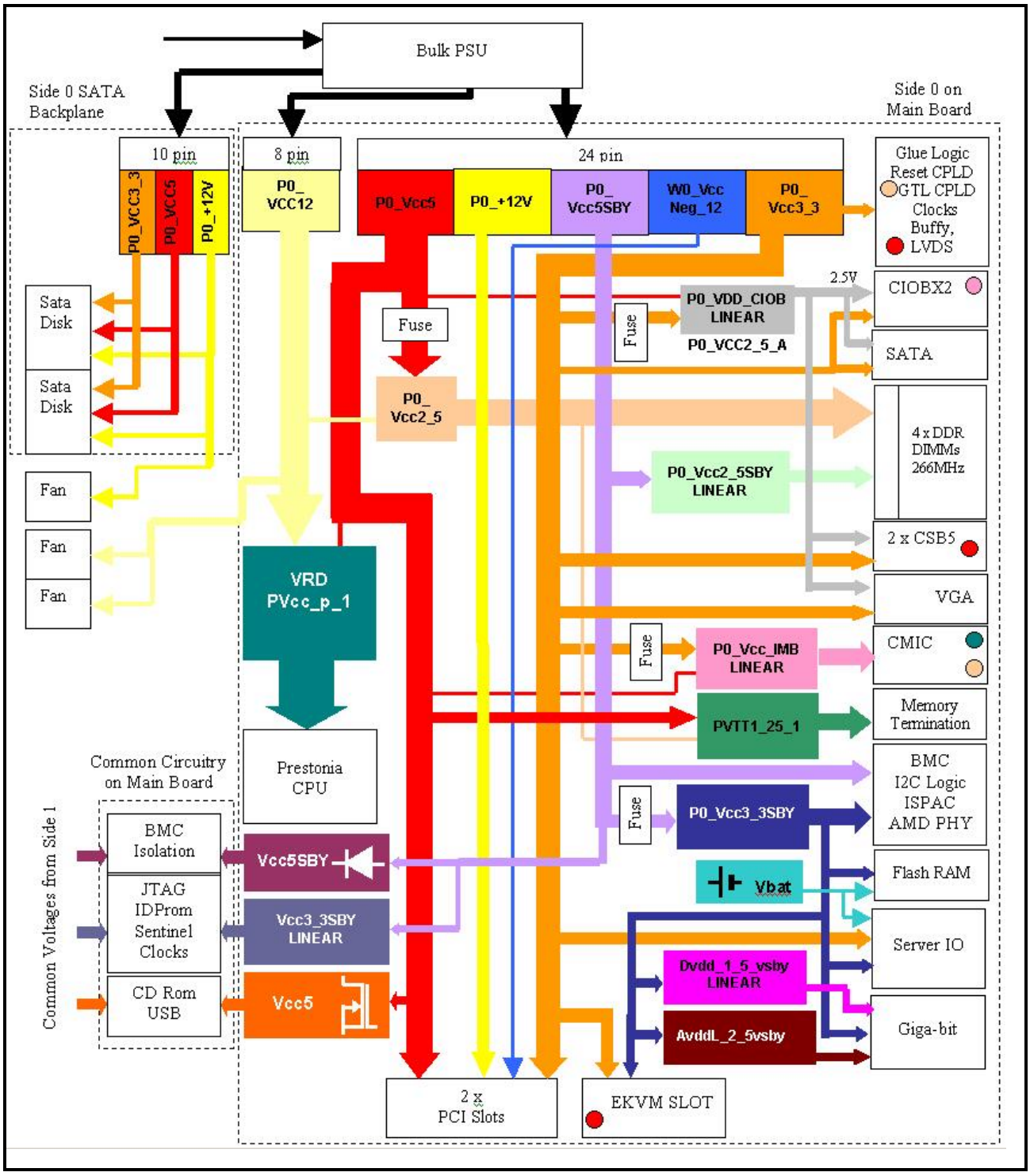
Each output of the power supply is protected from an over current condition by current limiting provided. In the event of an over current fault the power supply may be latched off. To reset the power supply, the BMC must power cycle (OFF/ON) the supply for more than 1 second.

The DC output voltages are shown in the following table.

Output Voltage	Voltage Range		Output Current	Minimum Load
	Min	Max		
VCC5SBY	4.75 V	5.25 V	3A max.	0A
VCC5	4.75 V	5.25 V	30A max.	1 A
VCC3_3	3.20 V	3.465 V	30A max.	0A
+12V (12V1)	11.40 V	12.60 V	18A max	0.5 A
VCC12 (12V2)	11.40 V	12.60 V	18A max	0.5 A
VCCNEG_12	-13.20 V	-10.8 V	0.8A max.	0 A
-5V	0.3A max. (not used)			0 A

The figure on the following page illustrates the power distribution in the ftServer 2300 system.

Figure 7-5. Power Distribution Diagram



7. Related Documentation

The following Stratus customer documents contain related information pertaining to ftServer 2300 systems.

Part No.	Title
R562	**Stratus ftServer 2300: Site Planning Guide**
R563	**Stratus ftServer 2300: Operation and Maintenance Guide**
R564	**Stratus ftServer 2300: Installation Guide**
R002W	**Stratus ftServer Software Installation and Configuration Guide**
R004W	**Release Notes: Stratus ftServer System Software**
R013W	**Stratus ftServer: ActiveService Network Configuration Guide**
R014W	**Stratus ftServer System Administrator's Guide**