digital

AlphaServer 2000, AlphaServer 2100, and AlphaServer 2100A

Technical Summary

ALPHA GENERATION ™

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AlphaServer 2000 and AlphaServer 2100/2100A Systems

The AlphaServer™ 2000 and AlphaServer 2100/2100A products were developed to support today's competitive, rapidly changing business climate. Users demand quick response times, fast application processing, and uninterrupted service. IT and system managers demand a computing environment that can expand incrementally and cost effectively as the business grows, while preserving current investments.

The AlphaServer 2000 and AlphaServer 2100/2100A products are scalable, dependable, open systems that deliver high productivity for business operations, cost-effective solutions to computing challenges, and safety for valuable business information. As high-capacity database servers, high-performance application servers, Network File System (NFS) servers, or enhanced PC LAN servers, the AlphaServer 2000 and AlphaServer 2100/2100A products deliver exceptional value, choice, and investment protection.

Alpha Open Systems

The 64-bit, Alpha RISC architecture at the heart of the AlphaServer 2000 and AlphaServer 2100/2100A products provides fast processing and quick response for today's applications, and will run the advanced applications of tomorrow. You can choose from three popular operating environments—the Digital UNIX, Windows NT, and OpenVMS operating systems—as well as thousands of available applications. These servers integrate into your current operating environment and anticipate future needs with built-in upgrade features.

Flexible System Packages

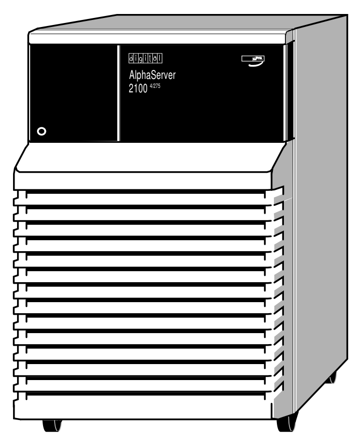
AlphaServer 2000 and AlphaServer 2100/2100A systems are available in flexible packages to suit a wide range of computing needs.

AlphaServer 2100/2100A Pedestal Systems

Powerful symmetric multiprocessing (SMP) servers, AlphaServer 2100/2100A systems offer departmental computing power and capabilities in a pedestal package at an affordable price. The systems are designed for office environments where a compact footprint and medium disk storage capacities are required. They support up to four CPUs, providing SMP, industry-standard PCI and EISA I/O, up to 2 gigabytes of ECC-protected memory, and up to 68.8 gigabytes of in-cabinet storage (up to 4 terabytes, total).

The AlphaServer 2100/2100A pedestal systems are available in several models that offer successively higher performance: models 4/275, 5/250, and 5/300.

AlphaServer 2100/2100A Pedestal System

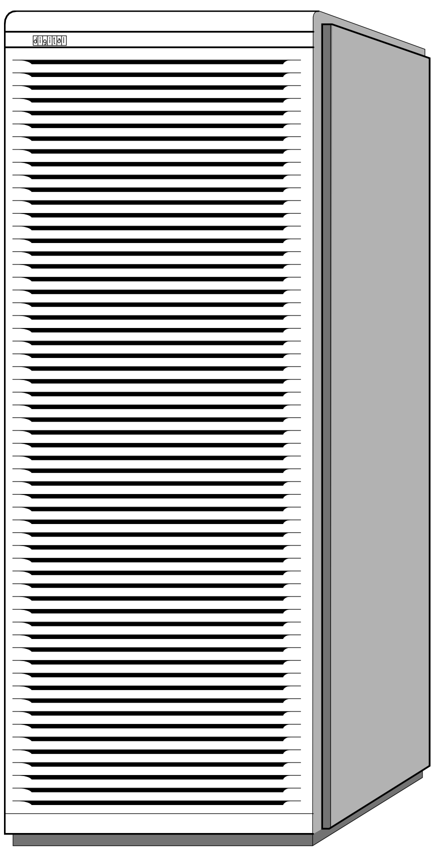


AlphaServer 2100/2100A CAB Systems

The CAB systems are based on the AlphaServer 2100/2100A RM system—a rackmountable system integrated in a 19-inch- wide, industry-standard cabinet—and have many of the same features as the pedestal system. The AlphaServer 2100/2100A CAB system has expanded storage capability, allowing a single AlphaServer 2100/2100A rackmount system to be configured in a 67-inch cabinet with up to 172 GB of fixed disk storage, using 2 GB StorageWorks drives.

The CAB systems are designed for office, satellite equipment room, and shop floor installations where floor space is at a premium, where large disk storage arrays and other expansion are required, and where high availability is imperative. Ideal for high availability configurations, a single cabinet can house a 3-node, 12-CPU cluster.

AlphaServer 2100/2100A CAB System



The systems are designed to easily provide power redundancy. The base cabinet includes 2 power controllers, each of which has 10 outlets. You can add a second power supply in each rackmounted device—either the AlphaServer 2100/2100A RM system or StorageWorks shelves—so that each device has a redundant power path by using both of the 2 cabinet power controllers.

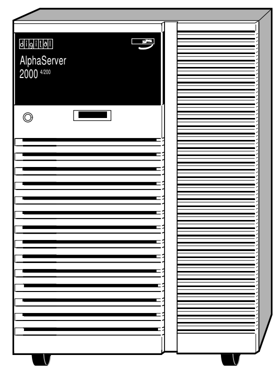
Additional features include superior cooling and shock and vibration ratings that are twice the industry standard. Short cable lengths are used for easy maintenance.

AlphaServer 2000 Pedestal System

A low-cost entry SMP server, the AlphaServer 2000 pedestal system is designed with a small footprint for the office environment. It is ideal for growing businesses that are ready to move up to a server that gives high productivity and cost-effective solutions. The system supports up to two CPUs providing SMP, industry-standard PCI and EISA I/O, up to 1 gigabyte of memory, and up to 34.4 gigabytes of in-cabinet storage (up to 4 terabytes total storage).

The AlphaServer 2000 pedestal system is available in several models that offer successively higher performance: models 4/275, 5/250, and 5/300.

AlphaServer 2000 Pedestal System



Features and Benefits

The AlphaServer 2000 and AlphaServer 2100/2100A products provide the following features to support quick response times, fast application processing, and uninterrupted service.

- **Performance and Price/ Performance**

A balanced system design provides large memory and storage capacity and high-performance industry-standard PCI I/O to complement scalable processor power and deliver leadership total system performance.

- **Exceptional Reliability and Availability**

AlphaServer 2000 and AlphaServer 2100/2100A products achieve an unparalleled level of reliability and availability through the careful application of technologies that balance redundancy, error correction, and fault management. The balance between simple error detection and error correction provides the highest possible availability for the lowest possible cost.

- **Ease of Installation and Repair**

The system hardware and the operating environments are designed for easy installation and repair. Modular hardware components allow quick swapping of parts. The UNIX and OpenVMS operating systems are factory installed to get you up and running fast.

- **Leadership warranty**

A three-year, on-site server hardware warranty is standard. The warranty provides on-site, next business day response time—the best hardware warranty in the industry.

Alpha Microprocessor

The AlphaServer 2000 and AlphaServer 2100/2100A products use an Alpha microprocessor on the CPU module. The microprocessor is a superscalar (dual or quad instruction issue), superpipelined implementation of the Alpha architecture, designed and manufactured using Digital's state-of-the-art CMOS process.

Several Alpha microprocessor implementations have been developed, including the 21064A and 21164, offering successively higher levels of performance. (Refer to Table 5 and Table 6 for performance information.) As computing requirements increase, earlier models can be upgraded with processors that contain the higher performing chips through a simple, cost-effective processor board swap.

General Alpha Microprocessor Features

Alpha microprocessors have the following general features:

- All instructions are 32 bits long and have a regular instruction format
- Floating-point unit, supports DEC and IEEE floating point data types
- 32 integer registers, 64 bits wide
- 32 floating-point registers, 64 bits wide
- On-chip, direct mapped, write-through physical data cache
- On-chip, direct mapped, read-only virtual instruction cache
- On-chip I-stream translation buffer
- On-chip D-stream translation buffer

Processor Module

The processor modules (CPUs) used in the AlphaServer 2000 and AlphaServer 2100/2100A systems have the following general features:

- Microprocessor based on the Alpha architecture
- 8 KB of serial ROM (SROM), which provides the CPU with its power-up code
- One or four megabytes of direct-mapped backup cache
- Power-up diagnostic microprocessor with serial bus communications with other system components
- Interface to the system bus
- System bus arbiter
- Numerous reliability/availability features

Processor Configuration

The AlphaServer 2000 systems support up to two CPUs and the AlphaServer 2100/2100A systems support up to four CPUs in a symmetric multiprocessing (SMP) configuration. The systems must have a CPU module installed in system bus slot CPU0.

Processor Variants

AlphaServer 2000 and AlphaServer 2100/2100A 4/275 entry-level systems use a processor containing an Alpha 21064A microprocessor running at 275 MHz, with a 1-megabyte secondary cache.

Offering a higher level of performance and scaling are AlphaServer 2000 and AlphaServer 2100/2100A 5/250 systems. These models use a processor containing an Alpha 21164 microprocessor running at 250 MHz with a 4-megabyte secondary cache.

AlphaServer 2000 and AlphaServer 2100/2100A 5/300 systems use the highest performing Alpha processor module to date. These models are based on the Alpha 21164 microprocessor running at 291 MHz with a 4-megabyte secondary cache.

Model 5/250 and 5/300 Processor Description

The processor module contains one Alpha 21164 microprocessor, a 4-megabyte third-level cache; a snooping system bus interface that implements a write invalidate coherence protocol; synchronous clocking circuitry; system bus arbitration controller; a duplicate tag of the 4-megabyte third-level cache; and a serial control bus subsystem. Each Alpha 21164 microprocessor has its own independent data and address path and its own independent caches.

The processor in 5/250 and 5/300 systems derives its performance excellence from architectural improvements provided by the Alpha 21164 microprocessor, the synchronous design of the third-level cache and system interface, implementation of a duplicate tag of the third-level cache, and the implementation of a write invalidate cache coherence protocol for the multiprocessing system bus.

Features such as read miss pipelining, system bus grant parking, hidden coherence transactions to the duplicate tag, and Alpha 21164 microprocessor write to the system bus back-off and replay also combine to boost performance.

Additional features:

- Quad instruction issue. The Alpha 21164 can issue four Alpha instructions in a single cycle, thereby minimizing the average cycles per instruction so that applications are able to run faster.

- 96 K-bytes of 3-way set associative write-back second-level cache combined with a 4-megabyte onboard cache provide increased read and write bandwidth.

System Bus

The system bus is the primary interconnect between CPU, memory, and the I/O subsystem. It is a limited-length, nonpended, synchronous, 128-bit wide multiplexed address and data bus with central arbitration. The bus is protected with longword parity. Performance is enhanced by allowing overlapping arbitration and data transfers. The bus protocol is designed to ensure data coherence throughout the system. All bus transfers are 32 bytes in length. The bus delivers a peak data transfer bandwidth of 666 MB/sec.

System Bus Configurations

- Table 1 shows the system bus slot allocation on the AlphaServer 2100/2100A pedestal system.
- Table 2 shows the bus slot allocation on the AlphaServer 2100/2100A RM and AlphaServer 2100/2100A CAB systems.
- Table 3 shows the bus slot utilization in the AlphaServer 2000 system.

Table 1 AlphaServer 2100/2100A Pedestal System Bus Slots

Slot Number	1 CPU Config.	2 CPU Config	3 CPU Config.	4 CPU Config.
Slot 1			CPU2	CPU2
Slot 2	CPU0	CPU0	CPU0	CPU0
Slot 3		CPU1	CPU1	CPU1
Slot 4	MEM0	MEM0	MEM0	
Slot 5	MEM1	MEM1	MEM1	CPU3
Slot 6	MEM2	MEM2	MEM2	MEM0
Slot 7	MEM3	MEM3	MEM3	MEM1

Table 2 AlphaServer 2100/2100A RM and CAB System Bus Slots

Slot Number	1 CPU Config	2 CPU Config	3 CPU Config.	4 CPU Config.
Slot 1			CPU2	CPU2
Slot 2	CPU0	CPU0	CPU0	CPU0
Slot 3		CPU1	CPU1	CPU1
Slot 4	MEM0	MEM0	MEM0	MEM0
Slot 5	MEM1	MEM1	MEM1	CPU3
Slot 6	MEM2	MEM2	MEM2	
Slot 7	MEM3	MEM3	MEM3	MEM1

Table 3 AlphaServer 2000 System Bus Slots

Slot Number	1 CPU Config.	2 CPU Config.
Slot 1	MEM1	MEM1
Slot 2	MEM0	MEM0
Slot 3	CPU0	CPU0
Slot 4		CPU1

Memory Modules

The memory subsystem is tightly integrated with the system architecture to deliver high performance.

Memory Features

Memory throughput is maximized by the following features:

- Read “stream” buffers, which reduce the average memory latency
- Write transaction buffers, which allow memory writes to be “dump and run”
- Interleaving across two or four memory modules in the AlphaServer 2100/2100A system and across two memory modules in the AlphaServer 2000 system
- Intelligent refresh, minimizing the number of collisions between refresh and access cycles
- 256-bit interface to DRAMs
- Numerous reliability and availability features, such as ECC memory and address parity

AlphaServer 2100/2100A Memory Modules

AlphaServer 2100/2100A systems can support up to four memory modules, for a total of 2 gigabytes of memory. A minimum of one memory module is required. Memory is available in 64-MB, 128-MB, and 512-MB variations.

AlphaServer 2000 SIMM Memory

A standard AlphaServer 2000 system can support up to two memory modules for a maximum of 1 gigabyte: two fully populated modules with 16-megabyte SIMMs. The standard systems come with 64 or 128 megabytes of installed memory. You can install up to four banks of memory per module, using industry-standard JEDEC, 72-pin SIMMs in either of two types:

- 1-meg x 36-bit (4-megabyte), 70 nanoseconds or faster
- 4-meg x 36-bit (16-megabyte), 70 nanoseconds or faster

The AlphaServer 2000 system accepts a maximum SIMM height of 27.9 mm (1.1 in.).

AlphaServer 2000 Memory Configuration Rules

The following rules apply when configuring memory on the AlphaServer 2000 system:

- Four-megabyte SIMMs and 16-megabyte SIMMs cannot be mixed on an individual module.
- The first memory module must be filled to capacity before memory is added to the second module.
- The second memory module can be filled with 1, 2, or 4 banks of SIMMs.

System I/O

The AlphaServer 2000 and AlphaServer 2100/2100A systems provide the following I/O functionality:

- Digital’s advanced system bus-to-PCI-bus bridge chip
- PCI-to-EISA bridge chipset
- Extensive buffering incorporated into the chips on both the PCI and EISA buses to allow concurrent operations.
- 1 MB of flash ROM, which contains the diagnostics and console firmware
- Combination chip provides bi-directional printer/parallel port, two serial ports, and floppy disk controller.
- Time-of-year (TOY) clock.
- Keyboard and mouse interface to PS-2 compatible keyboard and mouse connectors.
- PCI-based Ethernet controller, supporting either AUI or twisted-pair interface. On-board AlphaServer 2100 system; adapter on AlphaServer 2000 system and AlphaServer 2100A system.
- PCI-based SCSI controller provides a single-ended, 8-bit, Fast SCSI-2 interface.
- 8 KB of NVRAM to store system configuration information
- PC-style speaker
- Cable interconnect

This I/O functionality is partitioned differently on AlphaServer 2100, AlphaServer 2100A, and AlphaServer 2000 products.

- On the AlphaServer 2100 system, the majority of this functionality is on a separate standard I/O module.
- On the AlphaServer 2100A system, I/O functionality is on the system backplane.
- On the AlphaServer 2000 system, I/O functionality is on the I/O backplane.

I/O Buses

A PCI I/O bus, standard on the base AlphaServer 2000 and AlphaServer 2100/2100A products, supports 32-bit PCI options and EISA options (via a PCI to EISA bridge). Industry-standard PCI and EISA I/O buses allow you to use inexpensive, widely available I/O options.

PCI Bus

For options that require high performance, the systems implement a 32-bit Peripheral Component Interconnect (PCI) bus. The industry-standard PCI bus is the number one choice for high-performance I/O options, such as disk storage and high-performance video applications.

The PCI bus implementation has the following characteristics:

- Supports the on-board PCI devices and the following option slots:
  AlphaServer 2100A system: 8 PCI slots
  AlphaServer 2100 system: 3 PCI slots
  AlphaServer 2000 system: 3 PCI slots
- Fully compliant with the PCI Version 2 Specification
- Operates at 33 MHz, delivering a peak bandwidth of 132 MB/s
- Supports three address spaces: PCI, I/O, PCI memory and configuration space
- Supports byte, word, tri-byte, and longword operations
- Exists in noncached address space only

EISA Bus

For medium-performance options, such as modems, asynchronous communication controllers, and other miscellaneous peripherals, the systems implement the 32-bit, industry standard EISA bus (Extended Industry Standard Architecture). Because the EISA bus is backward-compatible with the well-established ISA bus, the AlphaServer 2000 and AlphaServer 2100/2100A systems can use ISA modules, provided that the chosen operating system supports the device.

The EISA bus implementation has the following characteristics:

- AlphaServer 2100A system: 3 EISA option slots
  AlphaServer 2100 system: 8 EISA option slots
  AlphaServer 2000 system: 7 EISA option slots
- 8.33 MHz operating speed, delivering a peak bandwidth of 33 MB/s with no wait states.
- All slots are bus master slots.
- A two-device chipset provides a bridge from the PCI bus to EISA.

Storage Architecture

The AlphaServer 2000 and AlphaServer 2100/2100A products feature a modular storage architecture that is designed for maximum performance and easy operation and maintenance. All storage bays are accessible from the front of the system and can be removed or added while the system is fully operational. If the system is configured with RAID, disks can be added or removed while the system is running.

Removable Storage

The systems support a floppy drive (FD), a CD-ROM, and a number of tape devices, mounted in 5.25-inch half height (HH) bays. The CD-ROM included in standard systems uses one 5.25 HH bay.

Table 4 Removable Storage Devices

AlphaServer 2000	AlphaServer 2100/2100A	AlphaServer 2100/2100A RM
One 3.5-in. FD Two 5.25-in. HH	One 3.5-in FD Three 5.25 HH or one 5.25 FH and one 5.25 HH	One 3.5-in FD Two 5.25-in HH in the base unit; additional devices in rack-mountable configuration

Disk Storage

Storage subsystems on AlphaServer 2000 and AlphaServer 2100/2100A pedestal configurations use the common storage elements of the Digital StorageWorks modular storage system. This design facilitates easy access and hot swap of disks.

AlphaServer 2100/2100A Disk Storage

AlphaServer 2100/2100A pedestal systems come with one internal BA35E StorageWorks shelf and space for an optional second StorageWorks shelf. Each shelf is capable of running 16-bit (wide) SCSI-2 or 8-bit (narrow) SCSI-2, depending on the controller it is connected to.

Each internal StorageWorks shelf supports up to eight 3.5-inch SCSI disk drives and can be configured as a single bus or a dual bus. In dual-bus mode, there are two completely separate groupings of four devices. These groupings are physically separated so that if one group of devices fails, the other continues to run (dual SCSI backplane).

AlphaServer 2100/2100A CAB Disk Storage

AlphaServer 2100/2100A rackmountable systems include one 3.5-inch internal disk used as a system disk and one additional 3.5-inch disk bay. The rest of the storage resides outside the main system on multiple rackmountable storage shelves, which are powered independently. This arrangement is ideal for applications that require large disk storage arrays, high availability, and/or other expansion.

The standard 1700 mm cabinet can support one rackmountable system unit and 12 shelves (front and back), for a total of 84 devices. The cabinet system also supports other device formats (5.25-inch) and types (DSSI disks, SSD), which are available in the rackmountable configurations.

AlphaServer 2000 Disk Storage

The AlphaServer 2000 pedestal system has one internal BA35E StorageWorks shelf. The StorageWorks shelf is capable of running 16-bit (wide) SCSI-2 or 8-bit (narrow) SCSI-2, depending on the controller it is connected to. The StorageWorks shelf can be configured to run as a single bus or a dual bus. In dual-bus mode, there are two completely separate groupings of four devices. These groupings are physically separated so that if one group of devices fails, the other continues to run (dual SCSI backplane).

Advantages of Modular Implementation

Disk storage compartments in the pedestal configurations are implemented as modular, separate mechanical assemblies. This allows system upgrades to incorporate evolving storage technology, for example, smaller disk form factors.

Storage Configurations

SCSI Storage Expansion

The AlphaServer 2000 and AlphaServer 2100/2100A products support optional external SCSI expansion.

- On the AlphaServer 2000 and 2100 systems, a SCSI bus expansion port on the rear of the system enables you to extend the bus that runs through the removable-media mass storage compartment outside the system.
- On the AlphaServer 2100A system, external SCSI devices can be connected to the system by adding EISA- or PCI-based adapters.

High-performance, multiport PCI or EISA controllers can be attached to external expanders (HSZ*xx*), allowing large numbers of disks to be configured with the system.

RAID (Redundant Array of Independent Disks)

The systems can be configured with optional PCI or EISA RAID controllers to organize disk data cost-effectively, improve performance, and provide high levels of storage integrity. These controllers can be cabled to the internal StorageWorks shelf or externally. Each StorageWorks shelf supports a maximum of two separate SCSI buses.

RAID Features

The optional RAID controllers have the following features:

- Support for hot-swap drives
- Automatic rebuild after hot swap
- Console supports booting system from RAID
- RAID levels 0, 1, 0+1, 5
- Optional write cache
- Optional read cache
- Support for command queuing

Clustering for Digital UNIX and OpenVMS

As your availability requirements grow, the AlphaServer 2000 and AlphaServer 2100/2100A products can support full clustering capabilities. Clustering allows multiple computer systems to share disks and spread the computing load across multiple CPUs. OpenVMS clusters and high-availability AdvantageCluster configurations for Digital UNIX are available.

OpenVMS systems can be configured into DSSI clusters using the following options:

- KFESA or KFESB EISA/DSSI adapter, which gives the system the capability of creating DSSI clusters.
- HSD*xx* flexible interconnect bridge, which converts DSSI to single-ended SCSI. The HSD*xx* converts the StorageWorks bus to a DSSI bus.

Reliability and Availability Features

The AlphaServer 2000 and AlphaServer 2100/2100A products achieve an unparalleled level of reliability and availability through the careful application of technologies that balance redundancy, error corrections, and fault management. Reliability and availability features are built into the CPU, memory, and I/O, and implemented at the system level.

Processor Features

- Parity protection on CPU cache tag store.
- CPU data cache provides error correction code (ECC) protection.
- Multi-tiered power-up diagnostics to verify the functionality of the hardware.

CPU failover. On multiprocessor systems, when you power up or reset the system, each CPU, in parallel, runs a set of diagnostic tests. If any tests fail, errors are logged, and the failing CPU is configured out of the system. Responsibility for initializing memory and booting the console firmware is transferred to the next higher working CPU, and the boot process continues.

This feature ensures that the system can still power up and boot the operating system in case of a CPU failure. Messages on the operator control panel power-up/diagnostic display indicate the status of failed components. CPU failover is available on the model 4/275, 5/250, and 5/300 systems.

Memory Features

- The memory ECC (error correction code) scheme is designed to provide maximum protection for user data. The memory scheme corrects for single-bit errors, most double-bit errors, and total DRAM failure. It also detects numerous other types of failures, such as RAM address errors.
- Memory failover. The power-up diagnostics are designed to provide the largest amount of usable memory, configuring around errors.

I/O Features

- Parity protection on system bus, PCI, and SCSI buses.
- Extensive error correction built into disk drives.
- Optional internal RAID (redundant array of inexpensive disks) improves reliability and data security.
- Disk hot spare on systems configured with RAID.

System Features

Auto reboot. On systems running Digital UNIX or OpenVMS, a firmware environment variable lets you set the default action the system takes on power-up, reset, or after an operating system crash. For maximum system availability, the variable can be set to cause the system to automatically reboot the operating system after most system failures. Windows NT auto reboots by default, but lets you specify a countdown value so you can stop the system from booting if you need to carry out other tasks from the console firmware.

Ease of software installation. The Digital UNIX and OpenVMS operating systems are factory installed. Factory installed software (FIS) allows you to boot and use your operating system in a shorter time than if you install the software from a distribution kit.

Power-up diagnostics. During the various phases of the power-up process, diagnostics are run to achieve several goals:

- Provide a robust hardware platform for the operating system by ensuring that any faulty pieces of hardware do not participate in the operating system session. This maximizes system uptime by reducing the risk of system failure when the operating system is running.
- Enable efficient, timely repair.

Thermal management. The system's thermal management is designed to maximize system reliability.

- Active fan speed control supports the thermal needs of system cooling with a minimum amount of noise.
- The system monitors the power supply temperature. If an overtemperature condition occurs, the power supply will shut down.
- The system monitors critical fans for failures.

Error logging. Error conditions are logged so that the detected errors will point to the failing component for quick repair.

Disk hot swap. The hardware is designed to enable hot swap of disks within RAID configurations. Hot swap is the removal of a disk or disks from any of the storage compartments while the rest of the system remains powered on and continues to operate. This feature contributes significantly to system availability. Since many disk problems can be fixed without shutting down the entire system, users lose access only to the disks that are removed.

Power system: AlphaServer 2000 and AlphaServer 2100/2100A pedestals. On the pedestal units, a modular power supply system provides either redundant power or additional power for larger configurations. There are three modes of operation.

- Single power supply provides power for base configurations.
- Dual power supply in redundant mode provides redundant power for base configurations. If one power supply fails, the second supply will continue to provide power, ensuring uninterrupted system availability.
- Dual power supply in full power mode is required for large configurations.

Power system: AlphaServer 2100/2100A CAB. On the cabinet systems, a single power supply is able to support all system configurations. A second (optional) power supply may be added to provide a fully redundant power configuration.

Refer to the *Digital Systems and Options Catalog* for power configuration details.

Uninterruptible power supply (UPS). An optional, external UPS can be added to the AlphaServer 2000 and AlphaServer 2100/2100A pedestal systems to support critical customer configurations. The AlphaServer 2100/2100A CAB systems can have an integrated UPS (optional), a feature designed to ensure high availability. Because a UPS maintains power to the entire system (CPU, memory, I/O, disks, tapes, and bus interface options), power interruptions are completely transparent to users.

Maintenance

The AlphaServer 2000 and AlphaServer 2100/2100A products use modular components for ease of maintenance. The CPU, memory, PCI, and EISA options are plug-in cards that require no special switch or jumper settings. The internal mass storage elements set the SCSI IDs directly on installation. The power supplies are replaceable, modular units.

AlphaServer 2100/2100A CAB Maintenance

AlphaServer 2100/2100A CAB systems feature sliding rails that allow easy access for service and maintenance. Front-to-back cooling facilitates the installation of third-party equipment without affecting the system's operating temperature. The shock and vibration rating is twice the industry standard, ensuring a higher survival rate in earthquake-prone areas.

Server Management

The AlphaServer 2100/2100A and AlphaServer 2000 products support important operational and platform management requirements.

Operational Management

The servers support all of the management tools and features provided by the operating systems to manipulate and monitor system resources such as disks, printers, networks, and backups. For example, system managers can use the POLYCENTER suite of tools to manage an enterprise-wide system. Under Windows NT, the AssetWorks product can be used to provide a powerful environment for software and operational management. All these tools are usable in a highly distributed environment.

Platform Management

The servers support platform management tasks such as manipulating and monitoring hardware performance, configuration, and errors. For example, the operating systems provide a number of tools to characterize system performance and display errors logged in the system error log file.

In addition, system console firmware provides hardware configuration tools and diagnostics to facilitate quick hardware installation and troubleshooting. The system operator can use simple console commands to show the system configuration, devices, boot and operational flags, and recorded errors. Most console firmware features can be accessed remotely using the POLYCENTER VCS product.

System Installation

The systems are designed for easy hardware, software, and option installation. Options ordered with AlphaServer 2000 or AlphaServer 2100/2100A pedestal systems are preinstalled and tested at the factory. When the computer arrives on site, a qualified service person can install it in a few easy steps. The Digital UNIX and OpenVMS operating systems are factory installed, significantly reducing the time it takes to get up and running. The Windows NT operating system comes with an installation diskette.

Performance

Digital evaluates the performance of the AlphaServer 2000 and AlphaServer 2100/2100A products in an ongoing program of performance engineering, using industry-standard benchmarks that allow comparisons across major vendors' systems. These benchmarks against competitive systems are based on comparable or close CPU performance, coupled with comparable memory and disk expandability.

It is important to remember that system performance is highly dependent upon application characteristics. Thus, benchmark information is one helpful "data point" to be used in conjunction with other purchase criteria such as features, service, and price.

Sources of Performance Information

You can access performance information from Digital via your fax machine as well as from several on-line sources.

InstaFACTS. The InstaFACTS fax service delivers information directly to your fax machine. Call 1-800-723-4431 (via a touch-tone phone in the U.S.A. and Canada) and 908-885-6426 (outside the U.S.A. and Canada). A catalog of documents is available from which you can order an abbreviated table of performance information, including Digital's performance briefs and flashes, TPC results, AIM results, and graphics results.

- *Internet.* Access performance documents from ftp://gatekeeper.dec.com. The directory is pub/DEC/DECinfo/performance/sys.
- *CompuServe.* Type GO VAXFORUM and look in the "hardware" library. For more information contact Doyle Myers at Internet address doyle@wrq.com or 76703.4403@compuserve.com.
- *World Wide Web.* The document URL (Uniform Resource Locator) is http://www.digital.com/info/performance.html.

System Features at a Glance

Table 5 and Table 6 provide a quick reference to the features of the AlphaServer 2100/2100A and AlphaServer 2000 systems.

Table 5 AlphaServer 2100/2100A Features

CPU Features	**2100/2100A 4/275**	**2100/2100A 5/250**	**2100/2100A 5/300**
Symmetric multiprocessing	1-4 processors	1-4 processors	1-4 processors
Processor	Alpha 21064A	Alpha 21164	Alpha 21164
CPU clock speed	275 MHz	250 MHz	291 MHz
Cache size on chip (I-cache/D-cache)	16 KB/16 KB	8 KB/8 KB→96 KB (unified L2)	8 KB/8 KB→96 KB (unified L2)
On-board cache (per processor)	4 MB	4 MB	4 MB
In-cabinet CPU upgrade	Yes	Yes	Yes
Memory (maximum)	2 GB (1 GB for 4-CPU config.)	2 GB (1 GB for 4-CPU config.)	2 GB (1 GB for 4-CPU config.)
Peak Performance	**4/275**	**5/250**	**5/300**
SPECint92	202.9	277.1	319.3
SPECfp92	292.6	410.4	477.3
SPECrate_int92	18,036	24,996	26,510
SPECrate_fp92	25,997	37,926	44,405

Internal Storage	**4/275, 5/250, and 5/300**
Pedestal	16 hot swap disks (68.8 GB), 3 removable media
Cabinet	63 hot swap disks (270.9 GB), 3 removable media
All Systems	1 floppy diskette (1.44 MB), 1 CD-ROM (600 MB), RAID 0, 1, 0+1, 5 (optional)

I/O Features	**4/275, 5/250, and 5/300**	
Maximum disk	Internal-Total	Utilizing HSZ40 Arrays
Pedestal	68.8 GB	Up to 4 TB
Cabinet	270.9 GB	Up to 4 TB
Maximum I/O throughput	132 MB/sec (PCI), 33 MB/sec (EISA)	
I/O support		
AlphaServer 2100A	8 PCI slots, 3 EISA slots	
AlphaServer 2100	3 PCI slots, 8 EISA slots	

High Availability Features	**4/275, 5/250, and 5/300**
System	Auto reboot, memory failover, thermal management, RAID, disk hot swap, dual SCSI backplane, ECC cache, ECC memory, SMP CPU failover, error logging, optional UPS. CAB version also includes: multiple systems, multiple power sources, dual-ported storage, optional integrated UPS.
OpenVMS clusters	Yes
AdvantageCluster (UNIX)	DECsafe ASE

Warranty (hardware)	**4/275, 5/250, and 5/300**
	3-year, on site

Table 6 AlphaServer 2000 Features

CPU Features	2000 4/275	2000 5/250	2000 5/300
Symmetric multiprocessing	1-2 processors	1-2 processors	1-2 processors
Processor	Alpha 21064A	Alpha 21164	Alpha 21164
CPU clock speed	275 MHz	250 MHz	291 MHz
Cache size on chip (I-cache/D-cache)	16 KB/16 KB	8 KB/8 KB→96 KB (unified L2)	8 KB/8 KB→96 KB (unified L2)
On-board cache (per processor)	4 MB	4 MB	4 MB
In-cabinet CPU upgrade	Yes	Yes	Yes
Memory (maximum)	1 GB	1 GB	1 GB

Performance	4/275	5/250	5/300
SPECint92	202.9	277.1	319.3
SPECfp92	292.6	410.4	477.3
SPECrate_int92 (max)	9,423	13,112	15,164
SPECrate_fp92 (max)	13,242	18,802	23,176

Internal Storage	4/275, 5/250, and 5/300
	8 hot-swap disks (34.4 GB), 2 removable media, floppy disk
	RAID 0, 1, 0+1, 5 (optional)

I/O Features	4/275, 5/250, and 5/300	
Maximum disk	Internal-Total	Utilizing HSZ40 Arrays
	34.4 GB	Up to 4 TB
Maximum I/O throughput	132 MB/sec (PCI), 33 MB/sec (EISA)	
I/O support	3 PCI slots, 7 EISA slots	

High Availability Features	4/275, 5/250, and 5/300
System	Auto reboot, memory failover, thermal management, RAID, disk hot swap, dual SCSI backplane, ECC cache, ECC memory, SMP CPU failover, error logging, optional UPS. CAB version also includes: multiple systems, multiple power sources, dual-ported storage, optional integrated UPS.
OpenVMS clusters	Yes
AdvantageCluster (UNIX)	DECsafe ASE

Warranty (hardware)	4/275, 5/250, and 5/300
	3-year, on-site

System Architecture

The AlphaServer 2000 and AlphaServer 2100/2100A products share the same functional components. Minor variations in component layout are implemented to meet the requirements of the enclosures. The following illustrations show the component layout for each product. Note that the configurations shown are examples and do not represent the only possible configurations.

Figure 1: AlphaServer 2100A System Architecture

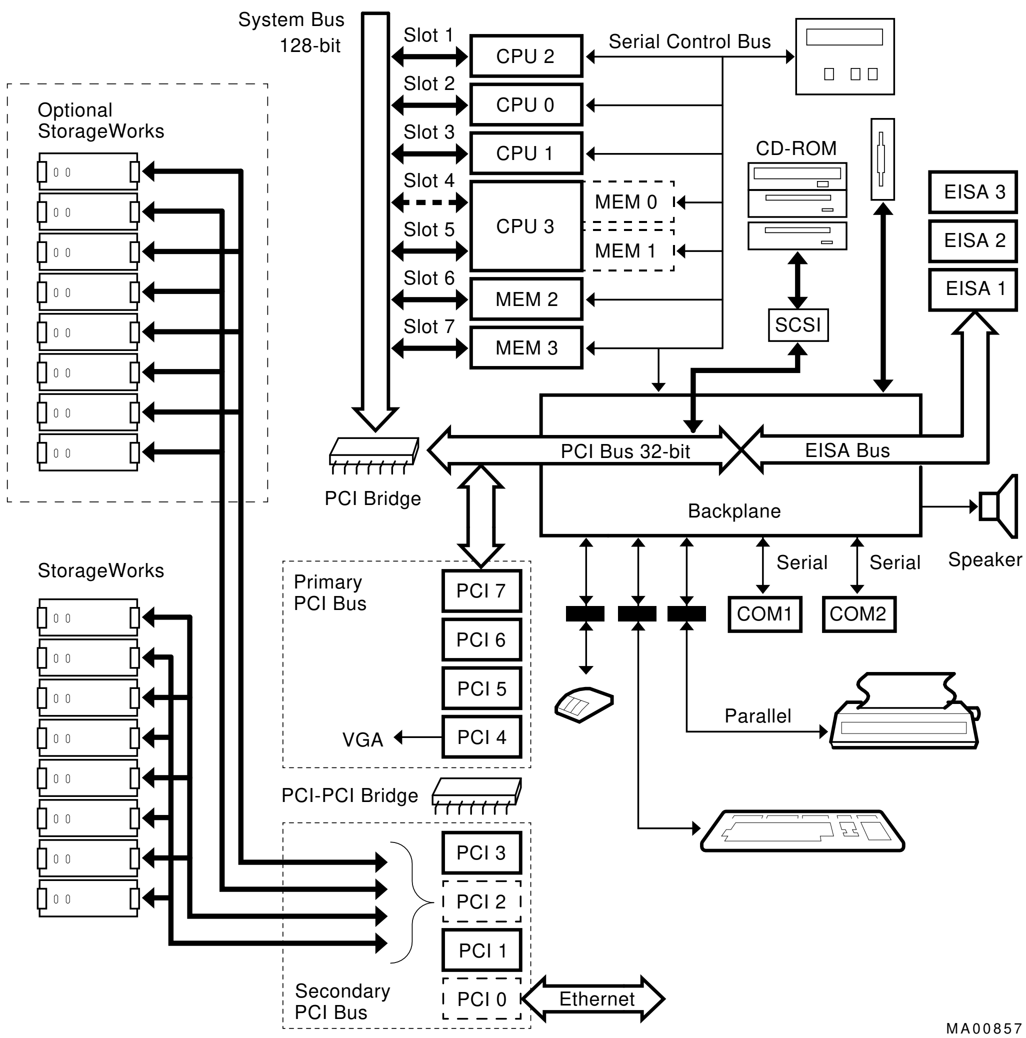


Figure 2: AlphaServer 2100A RM System Architecture

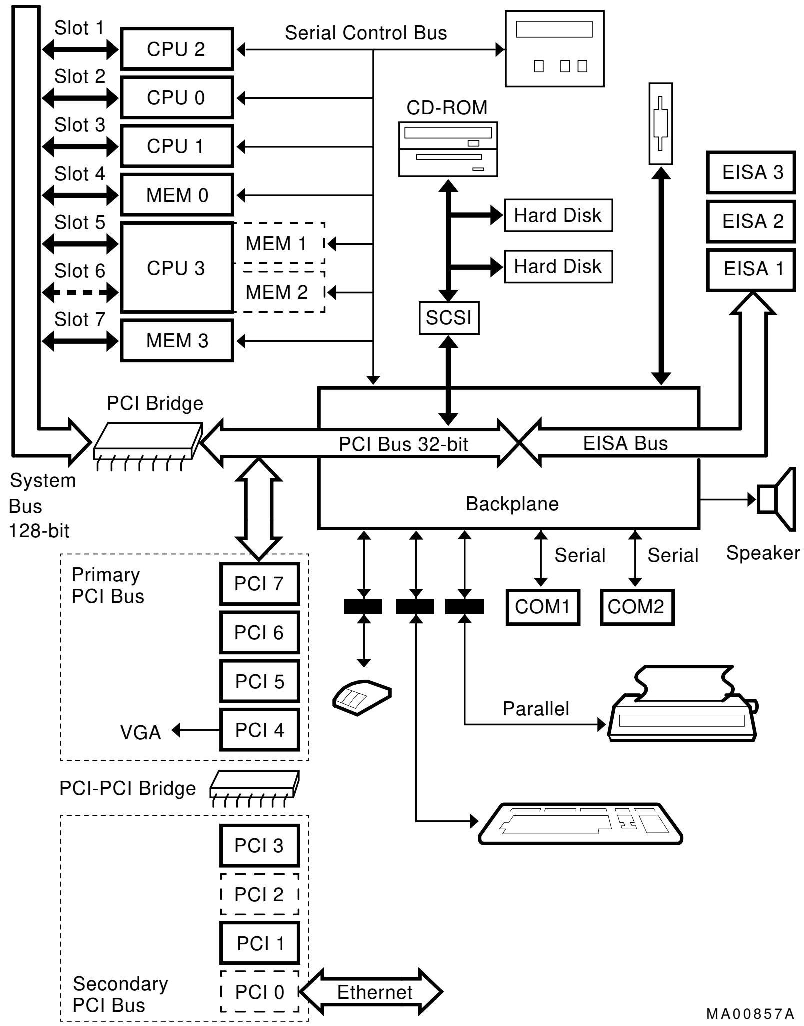


Figure 3 AlphaServer 2100 System Architecture

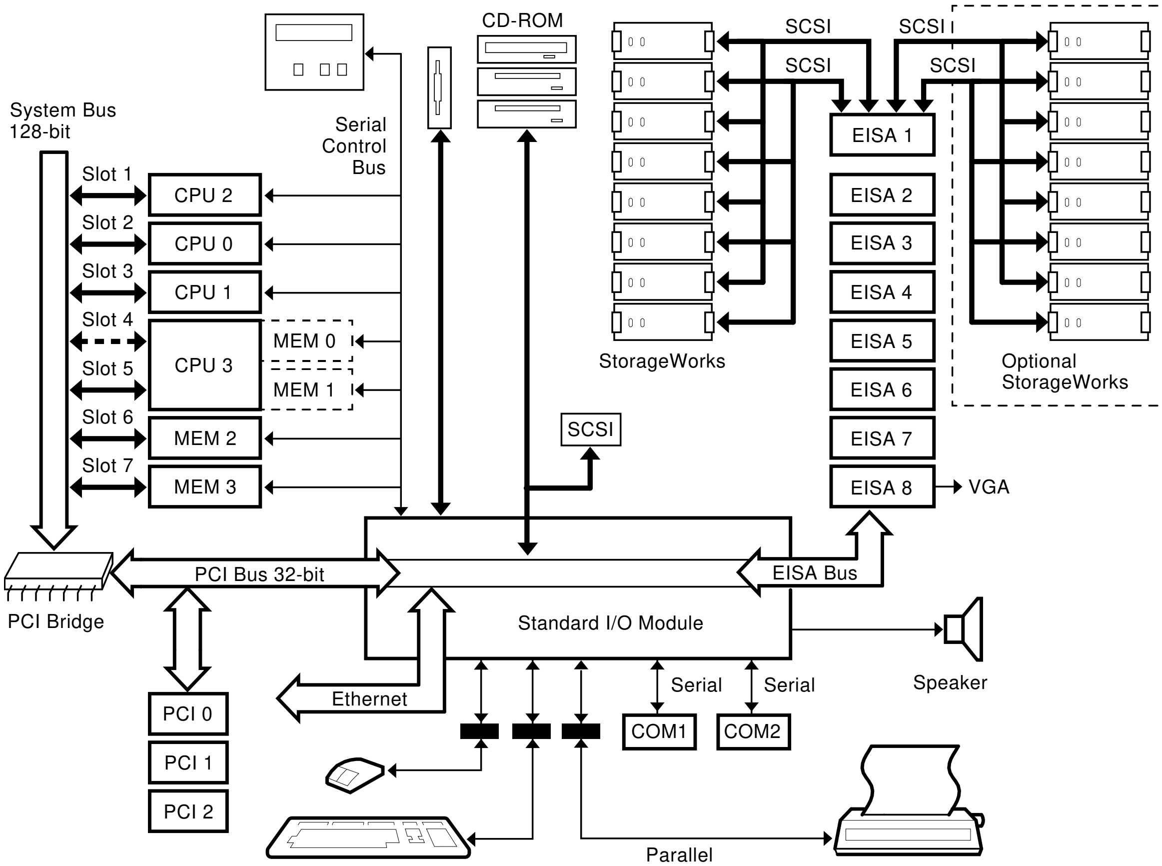
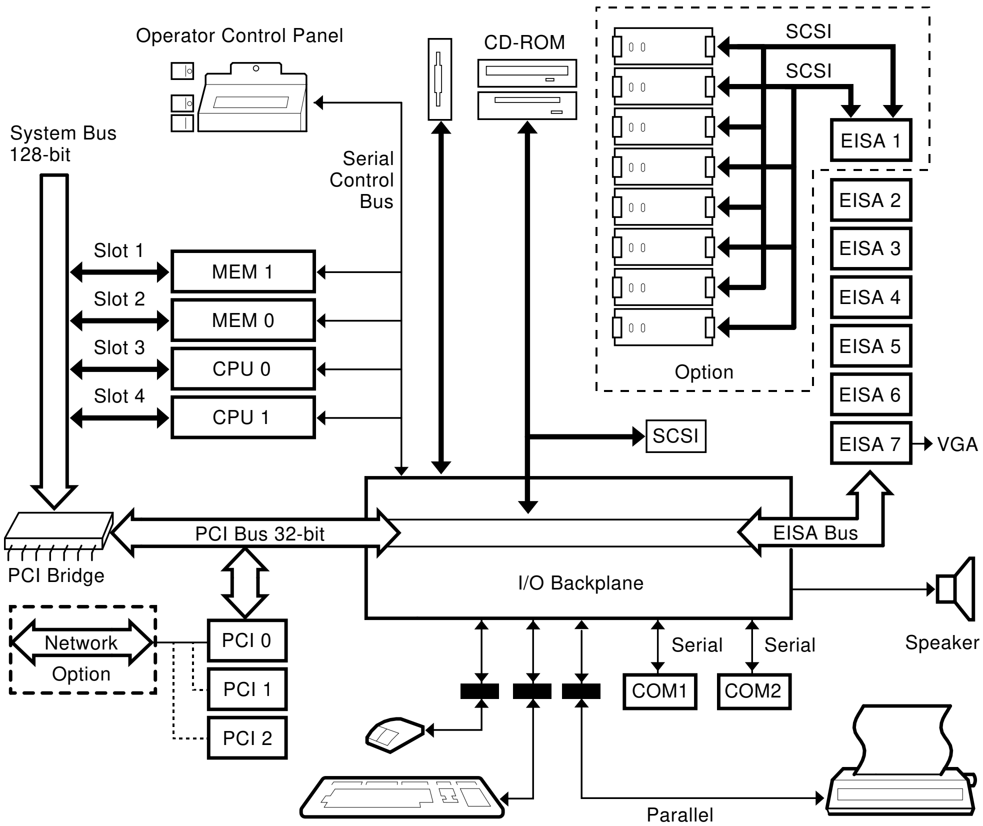


Figure 4: AlphaServer 2000 System Architecture



Physical Characteristics

Table 6 details basic physical characteristics of the AlphaServer 2000 and AlphaServer 2100/2100A products.

The illustrations on the following pages show the main components of the systems.

Table 7 AlphaServer 2000 and AlphaServer 2100/2100A Physical Characteristics

Characteristic	AlphaServer 2000	AlphaServer 2100/2100A	AlphaServer 2100/2100A RM
Dimensions (W x L x H) inches	16.7 x 25.6 x 23.6	16.9 x 31.9 x 27.6	14 x 19 x 27.8
Weight	75 kg (165 lb)	114 kg (250 lb)	45.4 kg (100 lb)
Maximum usable power	2 x 400 W	2 x 602 W	2 x 1000 W per unit
Operating temperature	10°C–40°C (50°F–104°F)	10°C–35°C (50°F–95°F)	10°C–40°C (50°F–104°F)
Operating humidity	20%–80%	20%–80%	20%–80%
Acoustical environment	Open office	Open office	Computer room

Figure 5: AlphaServer 2100A System Front Components

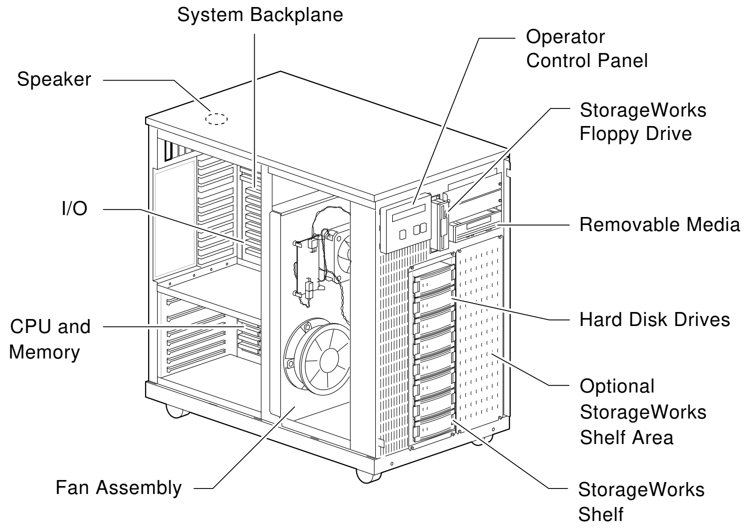


Figure 6 AlphaServer 2100A System Rear Components

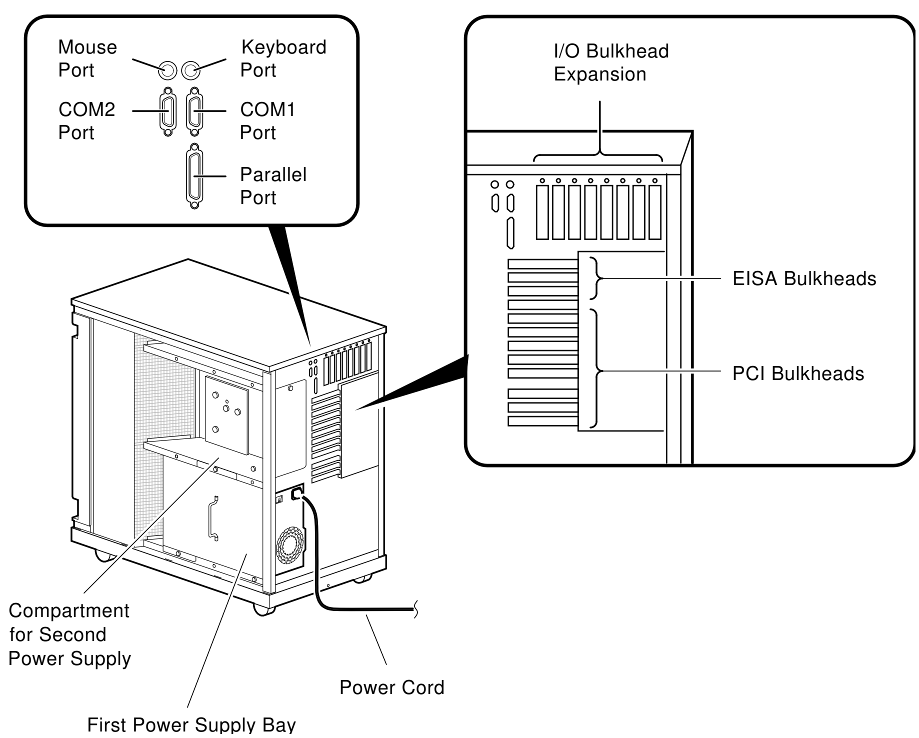


Figure 7: AlphaServer 2100/2100A RM Upper Compartments

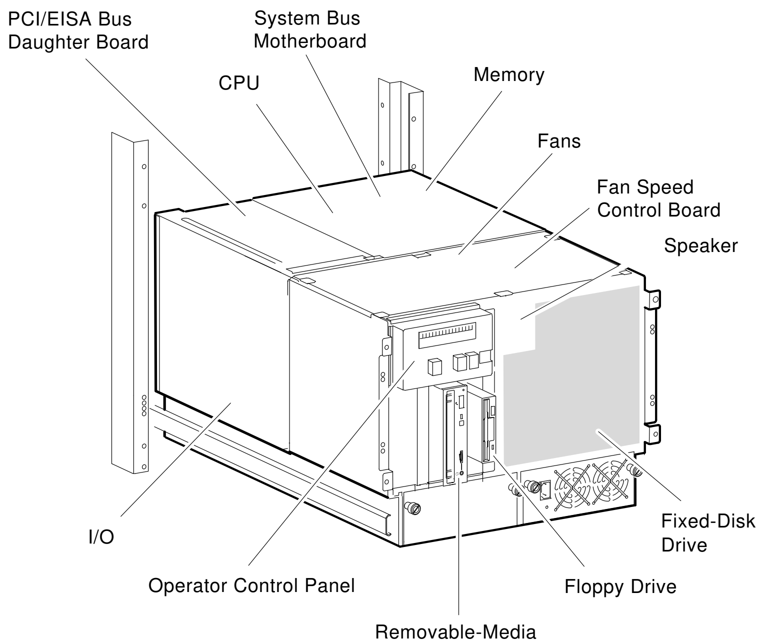


Figure 8: AlphaServer 2100/2100A RM Lower Compartments

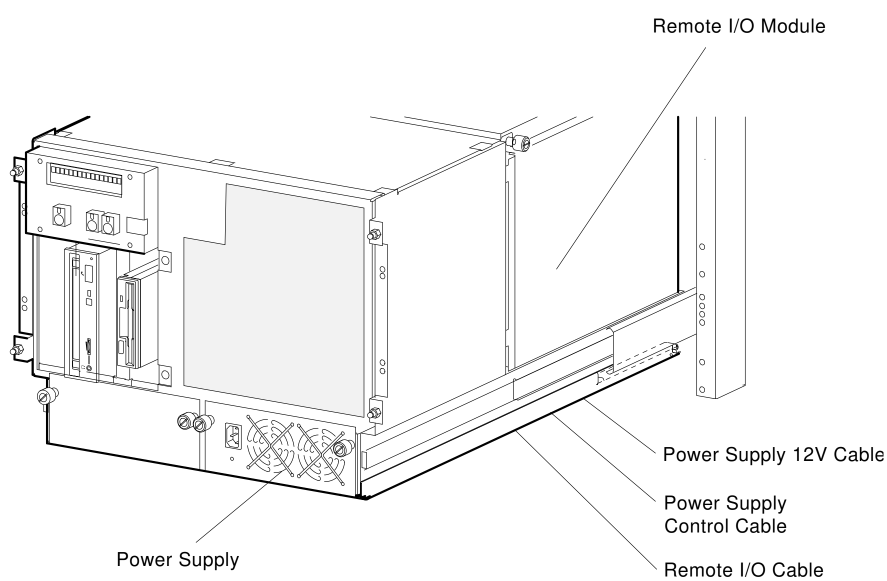


Figure 9: AlphaServer 2100 System Front Components

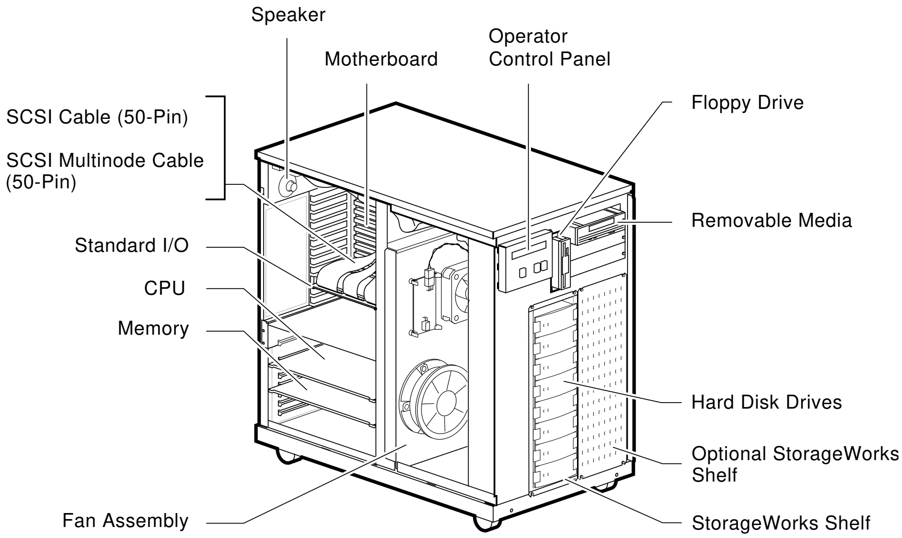


Figure 10 AlphaServer 2100 System Rear Components

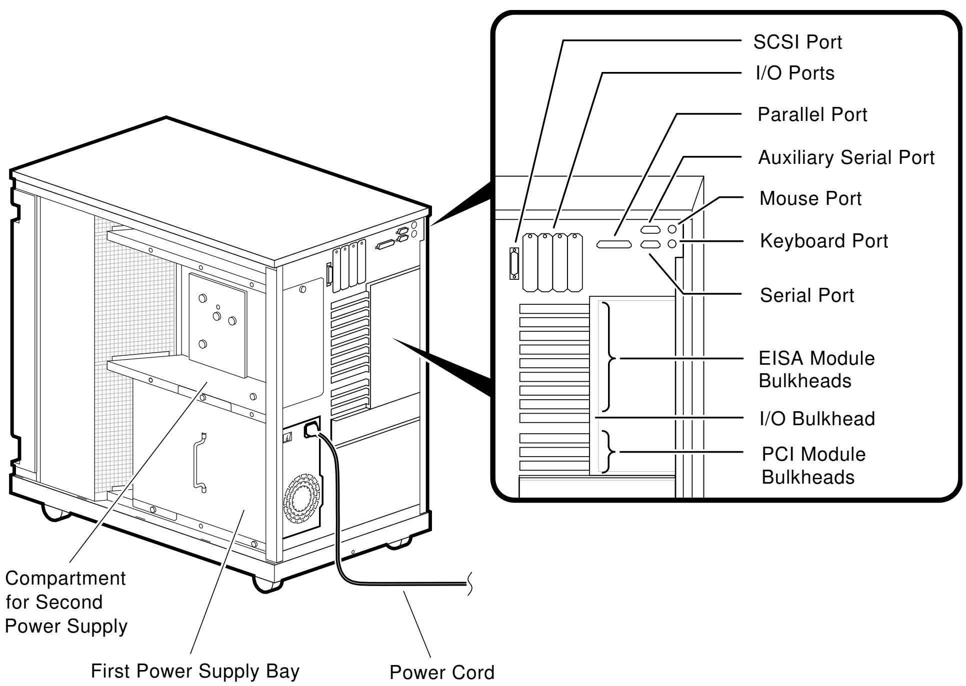


Figure 11 AlphaServer 2000 System Front Components

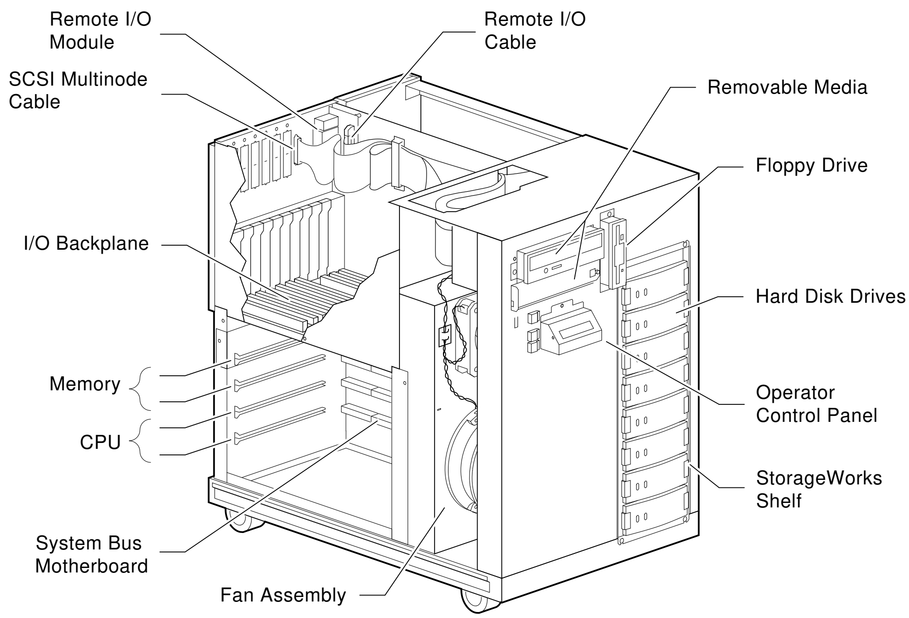
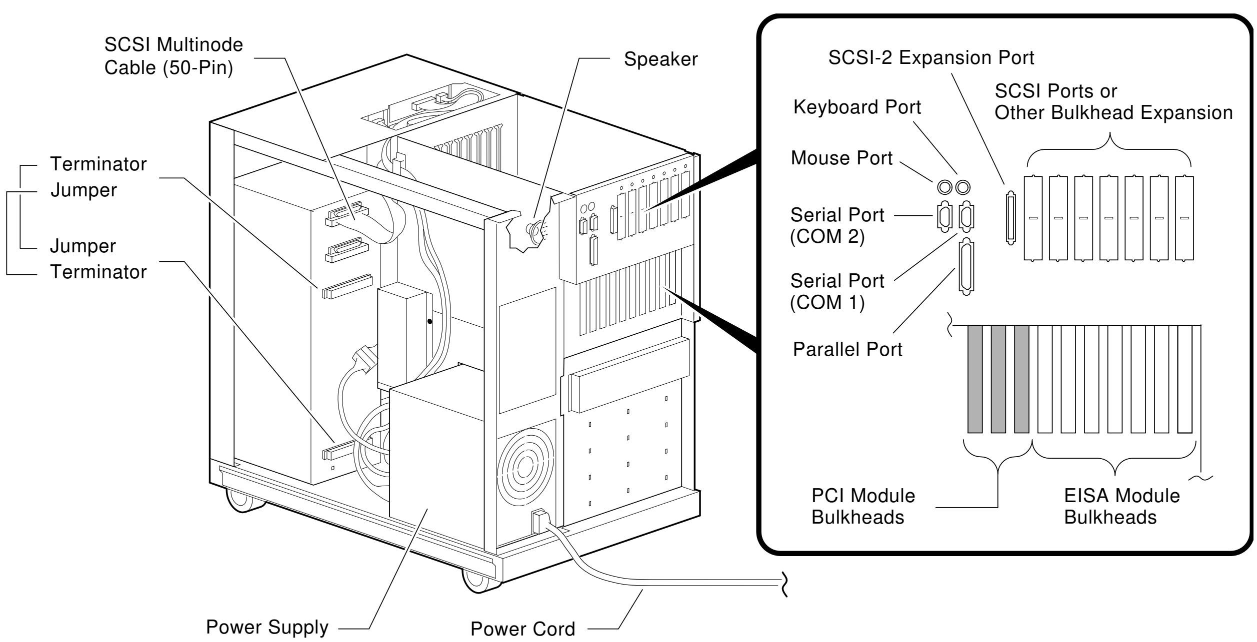


Figure 12 AlphaServer 2000 System Rear Components



Sample Cabinet Configuration
The illustration below shows a possible configuration for the cabinet system.

Figure 13: AlphaServer 2100/2100A Cabinet