



Compaq AlphaServer DS20E Systems

Technical Summary



Contents

System Overview	1	Server Management	7
Features and Benefits	1	Operational Management	
Architecture	2	Platform Management	
System Block Diagram		Error Reporting	
System Board	3	Reliability, Availability, and Maintainability	7
Component and Connector Locations		Processor Features	
Third-Generation Alpha Chip	4	Memory Features	
Chip Operation		I/O Features	
Alpha 21264 Features		System Features	
Processor Module	4	Installation and Maintenance	8
Processor Configuration Rules		Clustering	8
Processor Upgrade		PCI to Memory Channel Interconnect	
Memory	5	Operating System Support	
Memory Options		Performance	9
Memory Configuration Rules		Sources of Performance Information	
System I/O	5	Information for Compaq Partners	
PCI Bus		Service and Support	9
ISA Bus		Hardware Warranty	
I/O Configuration Rules		Software Warranty	
I/O Implementation		Compaq AlphaServer DS20E System Diagrams	10
System Control	6	System Features at a Glance	11
Storage	6	Physical Characteristics	12
Fibre Channel			
RAID (Redundant Array of Independent Disks)			

Compaq AlphaServer DS20E Systems

The *Compaq AlphaServer DS20E* system delivers high performance for business, technical, and scientific applications at an affordable price. As a high-capacity database server, high-performance application server, Network File System (NFS) server, or Internet server, the *AlphaServer DS20E* delivers exceptional value and investment protection.

System Overview

The *Compaq AlphaServer DS20E* uses the third-generation Alpha 21264 processor. Two speeds are available, the EV67 chip, which runs at 667 MHz and the EV68 chip, which runs at 833 MHz. The switch-based system interconnect exploits the full potential of these Alpha chips.

The system is available as a pedestal or as a rackmount system. The components in both are identical; the rackmount variant is simply rotated to its side. The rackmount system requires 5U space and can be mounted in a 67- or 79-inch M-series cabinet, along with additional disks. In the largest cabinet up to 6 systems and 4 StorageWorks shelves can be installed.

The DS20E system is available with one or two processors. The system accommodates six hard disks, a floppy diskette drive, a CD-ROM, and space for one additional 5.25-inch removable media device. The system supports up to 218.4 GB of internal storage using 36.4 GB disks.

There are 6 PCI slots, one of which could be used for an ISA device. Integrated on the system board are controllers for a SCSI tape device, a diskette, two serial ports, one parallel port, and the keyboard and mouse.

Three operating systems are supported: *Tru64 UNIX*, *OpenVMS*, and Linux. Customers can order the system that meets their present application needs; they choose the size of the system disk, an Ultra3 SCSI adapter, and an Ethernet adapter. Systems can also be configured in a choice of two cabinet enclosures: a 67-inch or 79-inch M-series cabinet.

Compaq AlphaServer products use the 64-bit Alpha RISC architecture that supports multiple operating systems: *Tru64 UNIX*, *OpenVMS*, and Linux.

More information on *Compaq AlphaServer DS20E* systems is on the World Wide Web:

<http://www.compaq.com/alphaserver/platforms.html>.

Features and Benefits

- **Leadership 64-Bit Architecture**

The Alpha 64-bit architecture was introduced with the Alpha 21064 chip in 1992 and now the 21264, builds upon that proven architecture.

- **Performance**

The Alpha 21264 chip when combined with a switch-based interconnect demonstrates its full potential. This switch-based system provides a memory bandwidth of up to 5.2 Gbytes/sec (peak) using two 256-bit memory buses running at 83 MHz.

- **Reliability and Availability**

The *AlphaServer DS20E* uses the latest technologies to achieve redundancy, error correction, and fault management. The balance between simple error detection and error correction provides high availability at low cost. Hot swappable disks, fans, and power supplies allow repairs to be done without shutting the system down.

- **DS20E Workstation**

The pedestal package can also be ordered as a workstation.

Architecture

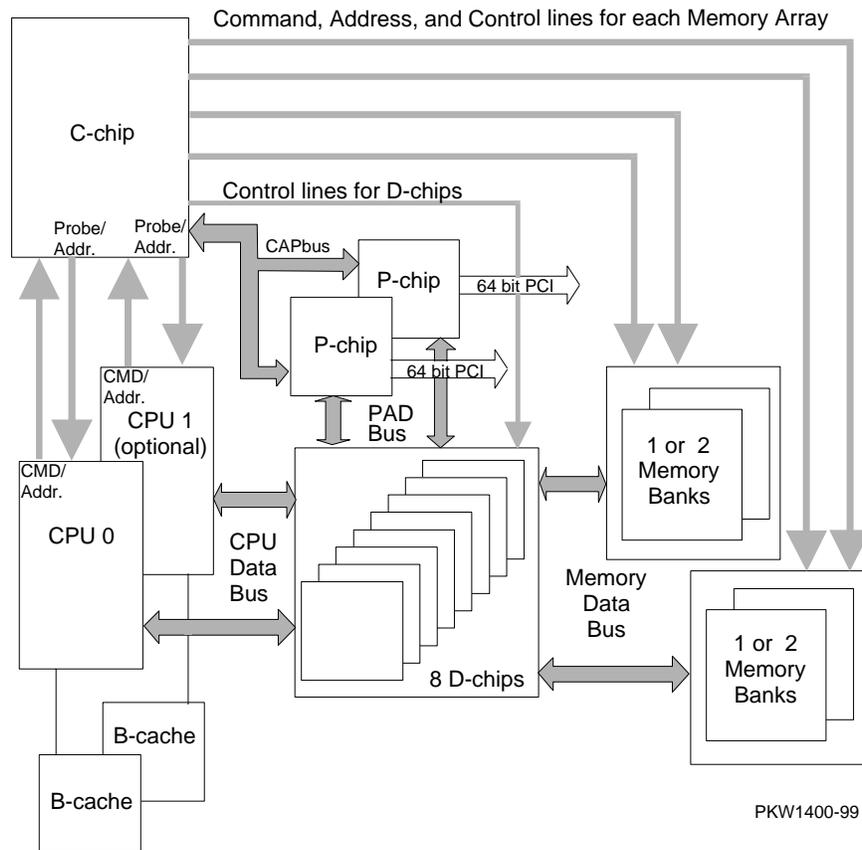
This system is designed to maximize the potential of the Alpha 21264 chip. The traditional bus interconnect has been replaced by a switch-based interconnect system. With a bus design, the processors, memory, and I/O modules must share the bus. As the number of bus users increases, the transactions interfere with one another, increasing latency and decreasing aggregate bandwidth. However, with a switch-based system there is no degradation in performance as the number of CPUs, memory, and I/O users increase. Although the users increase, the speed is maintained.

With a switch-based, or point-to-point interconnect, the performance remains constant, even though the number of transactions multiplies. The switched system interconnect uses a set of complex chips that route the traffic over multiple paths. The chipset consists of one C-chip, eight D-chips, and two P-chips,

- **C-chip.** Provides the interface from the CPUs and main memory. Although there is only one in the system, it allows each CPU to do transactions simultaneously.
- **D-chips.** Provide the data path for the CPUs, main memory, and I/O.
- **P-chips.** Provide the interface to two independent 64-bit PCI buses.

The DS20E system supports up to two CPUs and up to 4 Gbytes memory in 16 DIMM slots. Each memory option contains four DIMMs, so each bank has four DIMMs.

Two 256-bit memory buses support four memory arrays, yielding a 5.2 Gbytes/sec system bandwidth. Transactions are ECC protected. Upon the receipt of data, the receiver checks for data integrity and corrects any errors. Commands and addresses are parity protected.



System Block Diagram

System Board

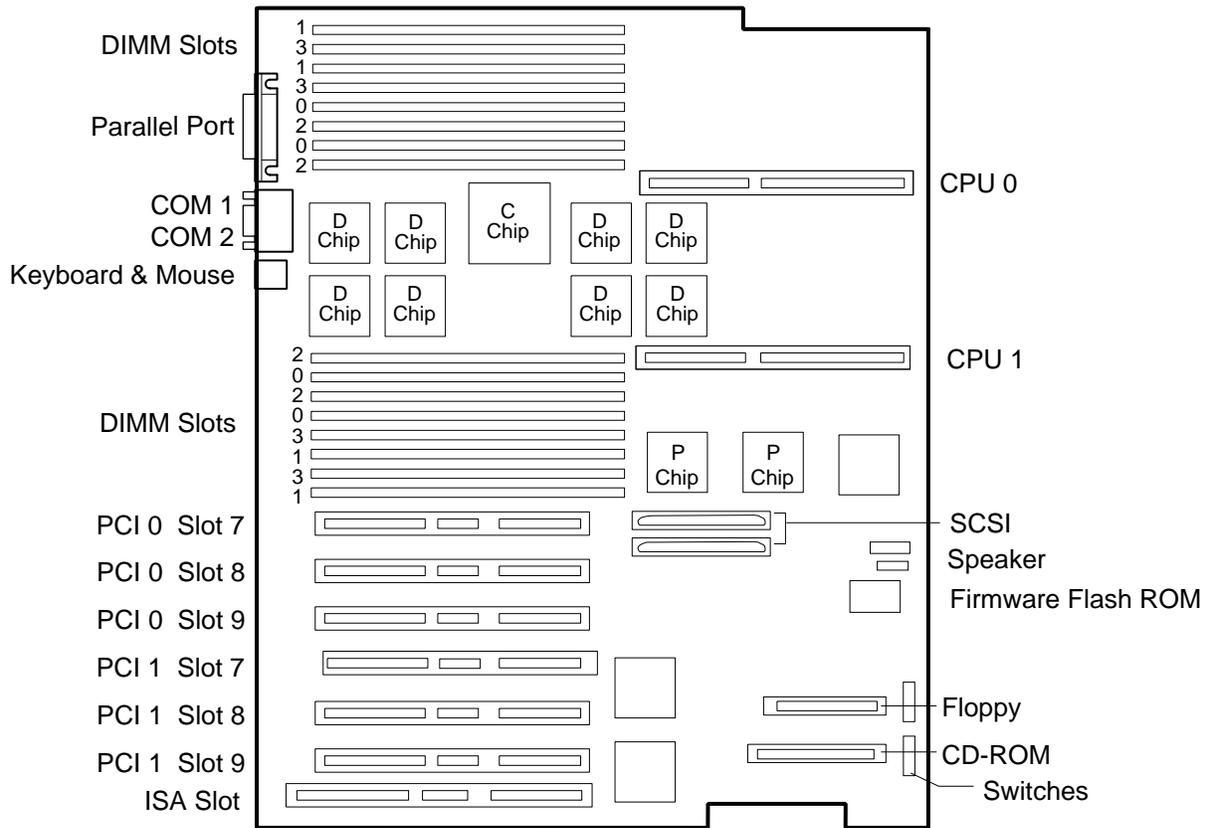
The interconnect switch is implemented on the system board by the chipset consisting of one C-chip, two P-chips, and eight D-chips. This complex chipset provides the data and address path between the CPUs, memory, and the I/O subsystem.

A flash ROM holds the console code and the NVRAM data. Switches are located near the CD-ROM connector. One of these switches must be set when the system is upgraded to faster processors.

Integrated into the system board are controllers for the floppy diskette, the CD-ROM, a SCSI tape drive, two serial ports, one parallel port, and keyboard and mouse.

Connectors are provided for the following:

- 2 CPU modules
- 16 DIMM memory modules
- 6 PCI devices
- 1 ISA device
- 1 floppy diskette drive
- 1 IDE CD-ROM
- I/O panel for parallel port, COM1 and COM2 ports, keyboard and mouse



PK-0320C-99

Component and Connector Locations

Third-Generation Alpha Chip

The third generation of the Alpha microprocessor, the Alpha 21264, is a superscalar superpipelined implementation of the Alpha architecture. The first offering of this chip was known as EV6. These systems are offered with the EV67 chip (.28 micron) and the EV68 chip (.18 micron). Each chip has over 15.2 million transistors. In our discussion here, the Alpha 21264 designation applies to all variants of the chip.

Designed for performance, the Alpha 21264 achieves this goal by carefully studied and simulated architectural and circuit analysis. The 21264 memory system also enables the high performance levels. On-chip and off-chip caches provide for very low latency data access, which allows for very high bandwidth data access. (In DS20E systems the size of the off-chip cache is 8 MB running at 222 MHz (dual data rate cache) for EV67 and 8 MB running at 278 MHz DDR for EV68.)

Internal to each chip is a 64-Kbyte instruction cache (I-cache) and a 64-Kbyte data cache (D-cache).

- **I-cache.** 64 Kbytes, two-way set-associative, virtually addressed cache with 64-byte blocks
- **D-cache.** 64 Kbytes, two-way set-associative, virtually indexed, physically tagged, writeback cache with 64-byte blocks

Chip Operation

Several key design choices were made in the chip architecture to maximize performance: Four instructions are fetched each cycle, and then how those instructions are handled boosts the speed of execution. Register renaming assigns a unique storage location with each write reference to a register, avoiding register dependencies that can be a potential bottleneck to processor performance.

Another design feature, out-of-order execution, permits instructions to execute in an order different from the order that the instructions are fetched. In effect, instructions execute as soon as possible. This allows for faster execution since critical path computations are started and completed as soon as possible.

In addition, the Alpha 21264 employs speculative execution to maximize performance. It speculatively fetches and executes instructions even though it may not know immediately whether the instruction will be on the final execution path. This is particularly useful, for instance, when the 21264 predicts branch directions and speculatively executes down the predicted path. The sophisticated branch prediction in the 21264 coupled with the speculative and dynamic execution extracts the most instruction parallelism from applications.

For more information about the chip, see:

<http://www.compaq.com/alphaserver/download/ev6chip.pdf>

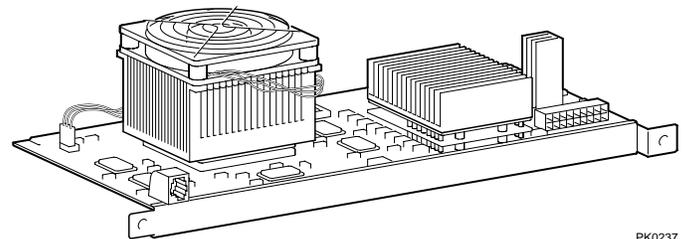
Alpha 21264 Features

- Out-of-order instruction execution
- Large (64 Kbyte) on-chip data and instruction caches
- Improved branch prediction through intuitive execution
- Register renaming
- Increased bandwidth for high-speed access to second-level cache and system memory
- Motion video instructions
- Square root and divide instructions
- All instructions are 32 bits long and have a regular instruction format
- Floating-point unit, supports DIGITAL and IEEE floating-point data types
- 80 integer registers, 64 bits wide
- 72 floating-point registers, 64 bits wide

Processor Module

An *AlphaServer* DS20E can have one or two CPU modules. In addition to the Alpha 21264 chip, the CPU module has an 8-Mbyte second-level cache and a DC-to-DC converter with heatsink that provides the required voltage to the Alpha chip. Power-up diagnostics are in a flash ROM on the module.

Cooling of the microprocessor chip is provided by a fan on the chip heatsink, as shown here.



PK0237

Processor Configuration Rules

The first CPU module is installed in CPU slot 0. The second CPU is installed in CPU slot 1.

Processor Upgrade

Upgrading to faster processor modules requires setting a switch on the system board.

Memory

The switch interconnect can move a large amount of data over two independent memory data buses. Each memory bus is 256 bits wide (32 bytes). The memory bus speed is 83 MHz. This yields 2.67 GB/sec bandwidth per bus ($32 \times 83 \text{ MHz} = 2.6 \text{ GB/sec}$). With two CPUs the bandwidth becomes 5.2 GB/sec.

Memory throughput in this system is maximized by the following features:

- Two 256-bit wide memory data buses
- Very low memory latency (120 ns) and high bandwidth with 12 ns clock
- Numerous reliability and availability features, such as ECC memory and command/address parity

Memory Options

Each memory option consists of four 200-pin DIMM modules. The DIMMs are synchronous DRAMs. Each system supports up to four memory options (16 DIMMs) for a total of 4 gigabytes of memory. The options run at a speed of 83 MHz. Memory options are supported in the following sizes:

- 256 Mbytes
- 512 Mbytes
- 1 Gbyte

Memory Configuration Rules

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

System I/O

There are two 64-bit PCI buses. Industry-standard PCI I/O buses allow you to use inexpensive, widely available I/O options. Both 32-bit and 64-bit PCI options can be used. Six slots can be used for PCI controllers, or five slots for PCI and one slot for an ISA option.

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:

- Fully compliant with the PCI Version 2.1 Specification
- Operates at 33 MHz, delivering a peak bandwidth of 500 MB/sec; over 250 Mbytes/sec for each PCI bus
- Supports 6 option slots
- Supports peer-to-peer I/O operations
- Supports three address spaces: PCI I/O, PCI memory, and PCI configuration space
- Supports byte/word, tri-byte, and longword operations
- Exists in noncached address space only

The Adaptec 7895 chip provides the bridge from PCI to SCSI, providing for support of an internal tape drive.

ISA Bus

The ISA bus provides system support functions and the use of peripheral devices. An ISA connector is available for devices that provide functions not offered in a PCI implementation.

The Cypress SIO chip, which provides the bridge between the PCI bus and the ISA bus, incorporates the logic for the following:

- ISA interrupt controller
- Speaker driver
- Decoding and control for utility bus peripheral devices
- IDE interface for CD-ROM (no other IDE devices are supported)

I/O Configuration Rules

A graphics adapter, if present in the system, must be installed in PCI 0.

I/O Implementation

Two separate 64-bit PCI buses are provided, each with three slots. As can be seen in the block diagram, the C-chip controls both PCI control chips.

PCI 0 offers the following:

- Slots for three PCI devices or two PCI devices and one ISA device
- Integrated control for system functions and bulkhead ports
- Integrated control for two IDE ports

PCI 1 offers three PCI slots.

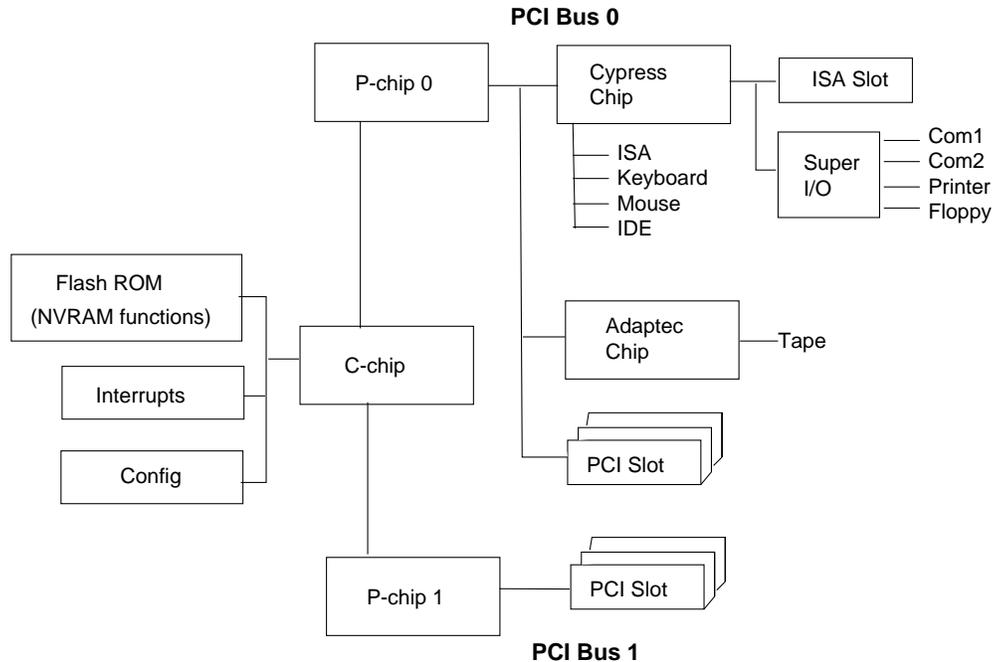
At the rear of the system are connectors offering access to two serial communications ports, one parallel port, and ports for the keyboard and mouse. Six breakouts are also on the back panel.

System Control

The system features module provides for the following:

- Remote server management
- Environmental monitoring
- Power system event data collection

The module is located at the top rear of the system.



PK-0319D

Block Diagram of I/O Control

Storage

The *AlphaServer* DS20E system offers up to nine internal storage devices including a CD-ROM drive, floppy diskette drive, one additional 5.25-inch removable media device, and six hot-swap disk drives. The system supports up to 218.4 Gbytes of internal storage (using 36.4 GB disks). The disk cage supports up to six Ultra3 SCSI Universal 1-inch disk drives (9.1, 18.2, or 36.4 GB). The drives are available at 10,000 or 15,000 RPM.

Fibre Channel

Available on these *AlphaServer* systems is the next storage interface, Fibre Channel, which eliminates issues with today's SCSI interfaces such as distance, bandwidth, scalability, and reliability. Fibre Channel (FC) is the answer to not only server-to-storage connections but also to server-to-server networking, because multiple protocols are supported. SCSI, TCP/IP, video, or raw data can all take advantage of high-performance, reliable Fibre Channel technology.

With the KGPSA PCI Fibre Channel adapter, the DS20E systems provide a storage interconnect that is 2.5 times as fast as UltraSCSI: 100 vs 40 Mbytes/sec data throughput. The KGPSA adapter allows you to manage storage including the HSG80 RAID controller in a switched FC topology.

RAID (Redundant Array of Independent Disks)

The system can be configured with optional PCI RAID controllers to organize disk data cost-effectively, improve performance, and provide high levels of storage integrity.

The optional RAID controllers have the following features:

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

Server Management

The *AlphaServer* products support important operational and platform management requirements.

Operational Management

Server/Network Management. Comaq Insight Manager is included with every system. This software tool allows you to monitor and control Alpha based servers. *Insight Manager* consists of two components: a Windows-based console application and server- or client-based management data collection agents. Management agents monitor over 1,000 management parameters. Key subsystems are instrumented to make health, configuration, and performance data available to the agent software. The agents act upon that data, by initiating alarms in the event of faults and by providing updated management information, such as network interface or storage subsystem performance statistics.

Remote Server Management. An integrated remote management console (RMC) lets the operator perform several tasks from a serial console: monitor the system power, temperature, and fans, and reset, halt, and power the system on or off, regardless of the operating system or hardware state. The monitoring can be done locally or remotely through a modem.

Platform Management

The *AlphaServer* DS20E systems 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. Also, the console aids in inventory support by giving access to serial numbers and revisions of hardware and firmware.

Error Reporting

Compaq Analyze, a diagnostic tool used to determine the cause of hardware failures, is installed with the operating systems. It provides automatic background analysis, as it constantly views and reads the error log file. It analyzes both single error/fault events and multiple events. When an error condition is detected, it collects the error information and sends it and an analysis to the user. The tool requires a graphics monitor for its output display.

Reliability, Availability, and Maintainability

The *AlphaServer* DS20E system achieves an unparalleled level of reliability and availability through the careful application of technologies that balance redundancy, error correction, and fault management. Reliability and availability features are built into the CPU, memory, and I/O, and implemented at the system level.

Processor Features

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

With two processors, when you power up or reset the system, each CPU, in parallel, runs a set of diagnostic tests. If any tests fail, the failing CPU is configured out of the system. Responsibility for initializing memory and booting the console firmware is transferred to the other CPU, and the boot process continues. This feature ensures that a system can still power up and boot the operating system in case of a CPU failure. LEDs on the control panel indicate test status and component failure information.

Memory Features

- The memory ECC scheme is designed to provide maximum protection for user data. The memory scheme corrects single-bit errors and detects double-bit errors and total DRAM failure. It also detects 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

- ECC protection on the switch interconnect and parity protection on the PCI and SCSI buses.
- Extensive error correction built into disk drives.
- Optional internal RAID improves reliability and data security.
- Disk hot swap.

System Features

Auto reboot. On systems running *Tru64 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.

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

Diagnostics. During 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 hardware does not participate in the operating system session. This maximizes system uptime by reducing the risk of system failure.
- Enable efficient, timely repair.

The system has a built-in firmware update utility (LFU) that provides update capability for console and PCI I/O adapter firmware. A fail-safe loader provides a means of reloading the console in the event of corrupted firmware.

Thermal management. The air temperature and fan operation are monitored to protect against overheating and possible hardware destruction. Two fans in the rear of the enclosure cool the system box; if one system fan fails, the second one speeds up to provide additional cooling. Also, each power supply has two fans, and each processor has its own fan on the chip heatsink. The system shuts down if a processor fan fails or if the temperature reaches a threshold. The system fans are hot swappable.

Error handling. Parity and other error conditions are detected on the PCI and ISA buses. The memory checking scheme corrects single-bit errors and detects double-bit errors. Multiple ECC corrections to single-bit errors detected by the operating systems help in determining where in the system the error originated. Errors are logged for failure analysis.

Disk hot swap. The hardware is designed to enable hot swap of disks. 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.

N+1 power redundancy A third power supply can be added to provide redundant power to the system box.

An external UPS can be used to support critical customer configurations. Because power is maintained for the entire system (CPU, memory, and I/O), power interruptions are completely transparent to users.

Installation and Maintenance

The systems are designed for easy hardware, software, and option installation. Options ordered with a system are preinstalled and tested at the factory. The operating systems are also installed at the factory. Installation of the system is relatively simple and may take only 30 minutes.

Some maintenance tasks can be performed while the system is running. Systems are designed so that system fans, power supplies, and disks can be replaced without shutting down the system.

Clustering

A cluster is a loosely coupled set of systems that behaves (is addressed and managed) like a single system, but provides high levels of availability through redundant CPUs, storage, and data paths. Clusters are also highly scalable; that is, CPU, I/O, storage, and application resources can be added incrementally to efficiently increase capacity. For customers, this translates to reliable access to system resources and data, and investment protection of both hardware and software.

Clustering allows multiple computer systems to communicate over a common interface, share disks, and spread the computing load across multiple CPUs.

PCI to Memory Channel Interconnect

Under *Tru64 UNIX* and *OpenVMS*, you can build high-availability clusters using the PCI to Memory Channel interconnect. The Memory Channel interconnect is a high-bandwidth, low-latency PCI-based communications interconnect for up to eight *AlphaServer* systems. Data written to one computer's memory is shared by other computers on the Memory Channel bus.

The PCI CCMAB adapter is the interface between a PCI and a Memory Channel bus. This bus is a memory-to-memory computer system interconnect that permits I/O space writes in one computing node to be replicated into the memories of all other nodes on the Memory Channel bus. A write performed by any CPU to its reflected address region results in automatic hardware updates to memory regions in other nodes. One node's write is "reflected" to other nodes as a direct side effect of the local write. This provides a memory region with properties similar to a high-performance shared memory across a group of nodes.

Operating System Support

For clustered *Tru64 UNIX* systems, TruCluster Software solutions allow users access to network services and provide further failover recovery from server, network, or I/O failures. *Tru64 UNIX* cluster systems use the SCSI bus and/or PCI to Memory Channel interconnect bus between disks and systems.

OpenVMS cluster systems use the CI, SCSI, Ethernet, FDDI, DSSI, and Memory Channel as the interconnect between disks and systems.

The primary means of clustering *AlphaServer* DS20E systems depends on the operating system.

- Ethernet, *OpenVMS*
- CI clusters, *OpenVMS* only
- Memory Channel, *Tru64 UNIX* and *OpenVMS*
- SCSI clusters, *Tru64 UNIX* and *OpenVMS*
- DSSI clusters, *OpenVMS* only

Performance

Compaq has 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 CPU performance, coupled with comparable memory and disk expandability. See Table 1 for the performance numbers of the *AlphaServer* DS20E systems.

System performance, however, 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

Performance information is available on the Internet.

<http://www.compaq.com/alphaserver/performance/index.html>

http://www.ideasinternational.com/benchmark/spec/specfp_s2000.html

Information for Compaq Partners

If you are a Channel or Reseller Partner, you can find the tools, resources, and information you need to conduct Compaq business online on the secure Compaq Partner Network extranet site:

<http://CPN.compaq.com>.

Also see the Compaq Solutions Alliance site at

<http://csa.compaq.com>

Service and Support

Compaq provides a comprehensive set of services that range from migration, consulting, and training, to direct support of Alpha systems, software, and applications. For information on Compaq Services, point your Web browser to <http://www.compaq.com/services>.

Hardware Warranty

The *AlphaServer* DS20E system and components, including CPU, memory, PCI controllers, and power supplies, have a 3-year on-site, 5-day per week, 9-hour per day hardware warranty with next-day response time.

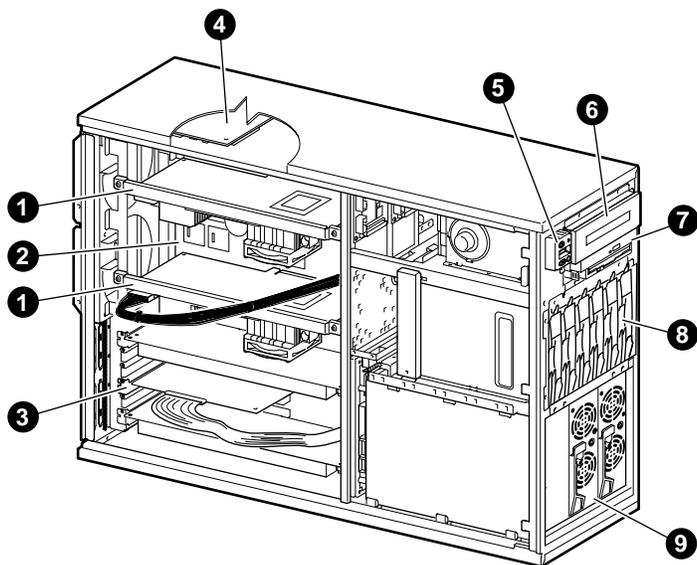
StorageWorks components are supported by the comprehensive StorageWorks warranty: five years for disks, three years for controllers, two years for tape devices, and one year for other components. The first year includes on-site next-day response time. Network products carry the network products warranty.

Users can upgrade to higher levels of service through a variety of hardware supplemental services.

Software Warranty

The warranty for *Tru64 UNIX* and *OpenVMS* is conformance to SPD with advisory telephone support for a period of 90 days. Users can upgrade to higher levels of service through a variety of software supplemental services.

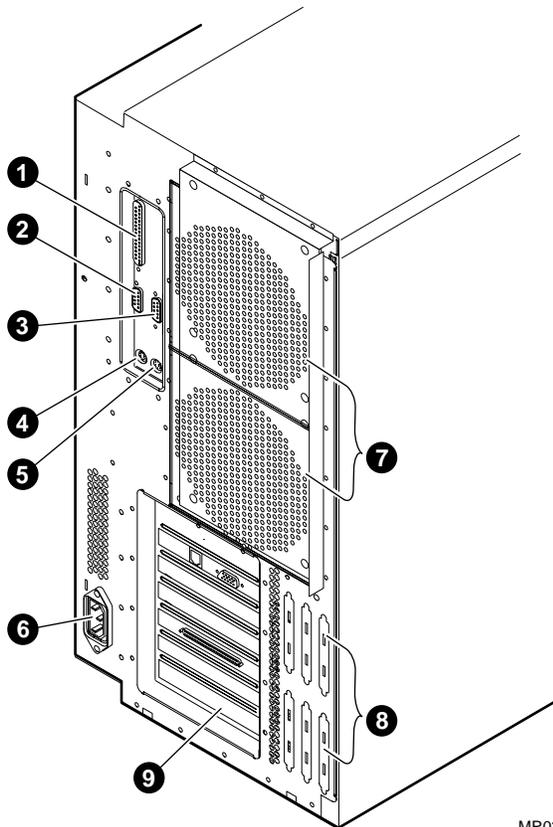
Compaq AlphaServer DS20E System Diagrams



MR0300A

1. CPUs
2. System board
3. PCI slots
4. System features module
5. Control panel
6. Removable media bay
7. CD-ROM / floppy diskette drive
8. Storage drive bays
9. Power supplies (2 minimum)

1. Parallel port
2. Serial port (COM2)
3. Serial port (COM1)
4. Keyboard port
5. Mouse port
6. AC power inlet
7. System fans
8. SCSI breakouts
9. PCI/ISA bulkhead ports



MR0301A

System Features at a Glance

Table 1 provides a quick reference to features of *Compaq AlphaServer DS20E* systems.

Table 1 AlphaServer DS20E Features

CPU Features	67/667			68/833
Processor	1–2 Alpha 21264 chips			1–2 Alpha 21264A chips
CPU clock speed	667 MHz			833 MHz
Cache on chip	64 KB I-cache 64 KB D-cache			64 KB I-cache 64 KB D-cache
On-board cache	8 MB			8 MB
Upgradable in pedestal and cabinet	CPU, memory, I/O, storage			CPU, memory, I/O, storage
Memory (maximum)	4 GB			
Performance	1 CPU	2 CPUs		1 CPU 2 CPUs
SPECint2000	444	–		571 –
SPECfp2000	514	577		784 –
SPECweb99	685	1,050		– –
Standard Features	1.44 MB diskette drive, CD-ROM drive, 2 serial ports, 1 parallel port, keyboard and mouse, integrated remote system management console, operating system license and customer documentation, Internet software			
Internal Storage				
Removable media	CD-ROM, floppy diskette, one additional 5.25-inch removable media bay			
Hard disks	218.4 GB (6 hot swap disks, 36.4 GB each)			
I/O slots	6 PCI slots (5 PCI and 1 PCI/ISA)			
Maximum PCI throughput	Over 500 MB/sec with two 256 MB/sec buses			
Availability Features				
System	System auto reboot, thermal management, remote system management, RAID 0, 1, 0+1, 5, hot swap of disks, power supplies, and fans, memory failover, ECC memory, ECC cache, N+1 power supply, SMP CPU failover, error logging, optional uninterruptible power supply			
<i>OpenVMS</i> clusters	CI, Ethernet, DSSI, SCSI, FDDI, PCI to Memory Channel Interconnect			
<i>Tru64 UNIX</i> TruClusters Solutions	SCSI, PCI to Memory Channel Interconnect			
Operating Systems	<i>Tru64 UNIX</i> , <i>OpenVMS</i> , Linux			
Warranty				
Hardware	3-year, on-site, 5 day x 9 hour warranty with 24-hour response			
Software	90-day telephone advisory support for <i>OpenVMS</i> and <i>Tru64 UNIX</i>			

Physical Characteristics

Table 2 details basic physical characteristics of the system.

Table 2 AlphaServer DS20E Physical Characteristics

Dimensions	Pedestal	Rackmount	
Height	47.0 cm (18.5 in.)	22.2 cm (8.75 in.)	
Width	22.5 cm (8.85 in.)	44.5 cm (17.5 in.)	
Depth	69.9 cm (27.5 in.)	66.0 cm (26 in.)	
Weight	36 kg (80 lbs) typical; 40 kg (88 lbs) maximum	36 kg (80 lbs) nominal; 39 kg (86 lbs) maximum With brackets, slides, & cables 38 kg (84 lbs) nominal; 40 kg (88 lbs) maximum	
Environmental			
Temperature	Operating	10–35° C (50–95° F)	
	Storage (60 days)	-40–66° C (-40–151° F)	
	Rate of change	11° C/hr (20° F/hr)	
Relative humidity	Operating	20–80%	
	Nonoperating	20–80%	
	Storage (60 days)	10–95%	
	Rate of change	20%/hr	
Maximum wet bulb temperature	Operating	28° C (82° F)	
	Storage (60 days)	46° C (115° F)	
Minimum dew point temperature	Operating	2° C (36° F)	
Maximum heat dissipation	Nominal	550 watts, 1,878 Btu/hr	
	Maximum	780 watts, 2,664 Btu/hr	
Airflow	Intake location	Front	
	Exhaust location	Rear	
Altitude	Operating	3,037 m (10,000 ft)	
	Nonoperating	12,192 m (40,000 ft)	
Vibration	Operating	10–500 Hz .1 G peak	
Mechanical shock	Operating		
	Pedestal	7.5 G, 10+/-3ms	
Acoustics	M-series cabinet	5.0 G, 10+/-3ms	
		Average	Declared
	Idle	5.8 L ^{wA} , B	44 L ^{pA} ^m , dba
	Operating	6.3 L ^{wA} , B	49 L ^{pA} ^m , dba
Electrical (Power supplies are universal, PFC, auto ranging, 100/240 Vac)			
Nominal voltage (Vac)	100	120	200–240
Voltage range (Vac)	90–100	110–128	180–250
temporary condition			
Power source phase	Single	Single	Single
Nominal frequency (Hz)	50/60	50/60	50/60
Frequency range (Hz)	49–51 / 59–61	49–51 / 59–61	49–51 / 59–61
RMS current (maximum steady state)			
Pedestal and rackmount			
Single power cord	6.6 A	5.5 A	3.0 A
Maximum VA	780	765	730
M-series cabinet (configuration dependent)			
Nominal voltage (Vac)	100	120	220–240
Each power cord	24 A	24 A	16 A



© 2001 Compaq Computer Corporation

Compaq, the Compaq logo, Compaq Insight Manager, AlphaServer, StorageWorks, and TruCluster Registered in U.S. Patent and Trademark Office. OpenVMS and Tru64 are trademarks of Compaq Information Technologies Group, L.P. in the United States and other countries.

Linux is a registered trademark of Linus Torvalds in several countries. UNIX is a trademark of The Open Group in the United States and other countries. All other product names mentioned herein may be trademarks of their respective companies.

Compaq shall not be liable for technical or editorial errors or omissions contained herein. The information in this document is provided "as is" without warranty of any kind and is subject to change without notice. The warranties for Compaq products are set forth in the express limited warranty statements accompanying such products. Nothing herein should be construed as constituting an additional warranty.