AlphaServer ES47, ES80, and GS1280 Systems

Technical Summary

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AlphaServer ES47, ES80, and GS1280 Systems

The *AlphaServer* ES47, ES80, and GS1280 systems are a major advancement in performance, capacity, reliability, and manageability for AlphaServer users. Based on key enhancements to the Alpha microprocessor (EV7), these new systems deliver outstanding performance and scalability to satisfy the most demanding customer requirements. Everything about these systems is new – the EV7 system-on-a-chip, the switchless mesh architecture, the common building blocks, the ability to grow an AlphaServer system to 64 processors, use of RAID-like memory, and server management tools.

Designed to address customer requirements for high-availability, these systems also advance state-of-the-art reliability and serviceability capabilities. They extend system management capabilities, continuing to drive to simpler operational procedures that are designed to support high performance computing. These systems not only lead the industry today but also offer a major step forward on the path to the Itanium™ Processor Family for HP AlphaServer customers.

System Overview

The latest Alpha systems from Hewlett-Packard are based on major enhancements to the EV7 Alpha microprocessor. The EV7 system chip incorporates the EV68 processor core, two memory controllers, integrated L2 cache, a processor-to-I/O port, and four interprocessor ports. The interprocessor ports connect directly to other EV7 system chips, eliminating the need for a central system switch.

Three systems are offered: AlphaServer ES47, ES80, and GS1280. The ES47 is available in a tower or rackmount cabinet configuration; the ES80 and GS1280 systems are available in rackmount cabinet configurations.

Shared system elements provide for modular growth and investment protection. The major components of the ES47/ES80/GS1280 systems are the dual-processor module, system building block drawers, and I/O building block drawers.

The dual-processor modular building block is built with two EV7 system chips, memory cards, power regulators, and a CPU management card. Since the processor chip and memory are located on the same module, memory latency is minimized. When dual-processor building blocks are inserted into a system, a distributed memory system is created that allows the processors to access each other's local memory.

There are two types of system drawers: the 2P drawer contains one dual-processor module; the 8P drawer can contain up to four dual-processor modules. Up to four 2P drawers can be connected to create an eight-processor system; eight 8P drawers can be connected to create a 64-processor system.

The IO7 chip is the basic building component of the I/O subsystem. One side connects to the I/O interface of the EV7 chip; the other side spawns four I/O buses – three PCI or PCI-X and one AGP. The IO7 chip is placed on an I/O riser module used as the basic building block for the I/O drawer. It is also included on the backplane in AlphaServer ES47 and ES80 systems to provide internal I/O capacity.

All systems include support for hard partitions (excluding the ES47 tower system). Partitions must contain at least two processors, but can contain a larger number. If the system is partitioned at building block boundaries (2P drawers in the ES47 and ES80 systems; 8P drawers in the GS1280 system) then the hardware partitions are completely electrically isolated, which means that any error, whether hardware or software, in one partition will have no effect on other running partitions. Partitioned systems configured this way have no single points of failure.

All AlphaServer ES47/ES80/ES1280 systems:

- Support "RAID-like" memory that provides detection and correction for multi-bit errors.
- Support a large set of current PCI options – support for future PCI-X options is built-in.
- Provide integral support for imbedded server management, and support a new improved server management subsystem that can be used from any java-equipped browser.
- Support N+1 power and cooling (fans).

Systems are available with *Tru64 UNIX* or *OpenVMS* operating systems installed. AlphaServer ES47/ES80 systems can be purchased to allow customers to install the Linux operating system.

Features and Benefits

Performance
The Alpha 21364 chip is offered with advanced on-chip memory controllers and switch logic capable of providing 12.3 GB/sec (EV7 chip at 1150-MHz) of memory bandwidth per processor.

Scalability
The modular design allows users to configure systems that can grow to 64 processors and 256 Gbytes of memory without investing in cabinets and power components until they are needed. Growth and performance are incremental.

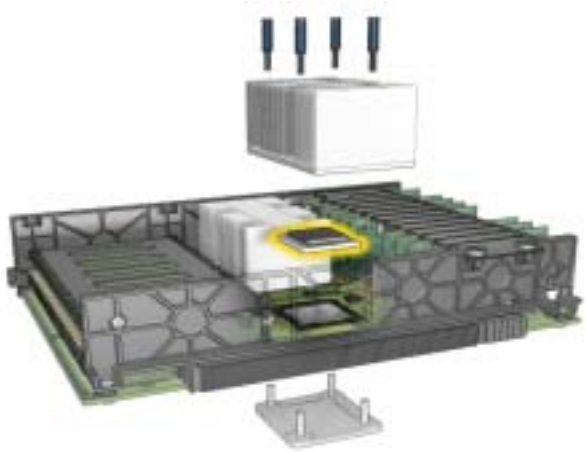
High Availability
Systems can be configured to eliminate power failures by using alternate power sources and redundant, hot-swappable power supplies. Additional redundant features ensure that system resources are available when needed: the console subsystem, I/O subsystems, networks, and storage devices. Hard partitioning of the system, with the ability to power down parts of the system, means service without disruption.

Enhanced Manageability and Flexibility
The entire system is thoroughly instrumented and affords the ability to monitor, track, and provide a status of events. These state-of-the-art systems implement a hierarchy of local area networks. An internal LAN links microprocessors for low-level management. A multi-server LAN is used to manage an entire network installation and connects to the corporate LAN. As a result, any Java-enabled browser can be used as the system management tool, eliminating the requirement for specialized devices. Through the use of appropriate security and networking devices, it is easy to set up remote and local management, and distributed or centralized system management, in accordance with the user's preferences and previously established system management policies. Flexibility is enhanced through system partitions. Hard partitions are supported on all family members except the AlphaServer ES47 tower system.

Basic Building Blocks

EV7 Processor/Memory

The EV7 is a processor that defines state of the art. The EV7's system bus, IP (interprocessor) network, on-chip memory controller, and integrated L2 caches are all new. The EV7 integrates on a single chip the logic and switching for building multi-processor systems of any size. The architecture enables all processors, memory, and I/O channels to connect without using a central system bus or switch. Each processor provides 10.7 GB/sec at 1000 MHz and 12.3 GB/sec at 1150 MHz of peak local memory bandwidth. Each IP provides 6.2 GB/sec of bandwidth at 1150 MHz providing 12.3 GB/sec across all four ports to deliver balanced system bandwidth.



New features of the Alpha 21364 processor include

- Integrated level 2 cache
- Integrated memory controllers
- Integrated router that employs adaptive routing for optimal bandwidth
- Router buffer space for 316 packets
- Clock and packet sent on outgoing links to minimize synchronization time between CPUs
- Programmable routing for optimal performance that can map out faulty nodes

The EV7 system chip contains the CPU, second-level cache, memory controllers, and I/O port. Each chip has four inter-processor ports designated North, South, East, and West for connecting to other EV7s. The North port of one processor connects to the South port of another; East ports connect to West ports. This chip is the basic building block component for all systems and is placed on a dual-processor module.

EV7 Processor/Memory (*continued)*

On 2P systems, the EV7 chips on the dual-processor module are connected using only the North and South ports to create up to an 8P system. On larger systems, the same dual-processor modules are used and will connect up to 64 processors using all four ports on the EV7.

In the smaller enclosures, the I/O port on one of the EV7 chips connects to the I/O subsystem in the drawer with the processor module. In large systems the EV7 I/O port connects to powerful external I/O drawers.

Whether it's a low-end system or a high-performance SMP system with up to 64 processors, the North to South, East to West blueprint is replicated to connect all EV7 processors in a system.

The system architecture allows users to precisely scale local memory to match computer power. The EV7 system chip incorporates two Rambus memory controllers. Each controller drives four RDRAM data channels and a fifth channel for parity. These channels are implemented as industry-standard RIMM cards that plug into the dual-processor module. Since both the EV7 chips and memory are on the same module, each CPU can have its "local" memory, as well as access to remote memory on other dual-processor modules. Thus, memory is distributed throughout the system and high memory bandwidth is available locally. For specific applications, users can configure dual-processor modules without memory. However, if an EV7 chip uses the I/O channel it must have memory. Different RIMMs hold different numbers of RDRAM memory chips, and the chips themselves are available in various densities.

For example: A RIMM card can hold as few as four RDRAMS. Using RDRAMs of 288 Mbits, each RIMM is 128 Mbytes. The minimum configuration of four RIMMs, populating one controller on one EV7, yields 512 Mbytes.

For maximum density memory: The densest RIMM card holds 16 RDRAMs and currently the densest RDRAM is 576 Mbits. Using these components, a single RIMM contains 1 Gbyte, and the eight RIMMs yield 8 Gbytes per EV7 processor (future option). A single EV7 processor is designed to accommodate a substantial 32 Gbytes of memory, providing room to grow as memory densities increase.

Memory is engineered for reliability and capacity. ECC error detection and correction is provided on the four channels, each controller uses an optional fifth channel as a parity channel. Single error correct, double error detect by default with optional RAID technology provides the ability to correct multibit errors as well as control and clocking errors.

I07 Chip

The IO7 chip forms the bridge between the EV7 system chip and the I/O subsystem in all system configurations. To form the EV7 side of the bridge, the IO7 communication port, called the North port, connects directly to the I/O port on the EV7 system chip by way of two uni-directional data paths.

To complete the I/O to EV7 bridge, the IO7 has four South ports that provide an interface to three PCI/PCI-X buses and one AGP bus. The chip is capable of running either PCI or PCI-X protocols depending upon what devices are put on each of its three PCI/PCI-X buses; devices with different protocols on the same bus cannot be run at the same time.

The identical IO7 chip allows various system platforms to implement I/O subsystems tailored to their market and design. Systems built around 8P drawers use external I/O drawers. The standard I/O drawer has an IO7 riser module plugged into the backplane that implements all four buses offered by the IO7 South ports:

Port S0 provides an interface to a PCI bus with three slots; two slots have a 5V switching level for Memory Channel and CIPCA devices and one has a 3V switching level generally used for a standard I/O module.

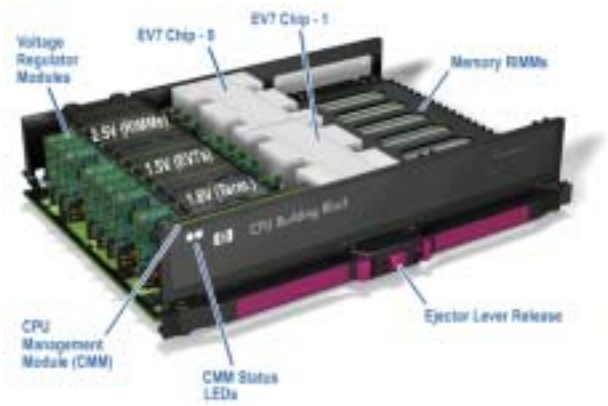
- Port S1 provides an interface to a PCI or PCI-X bus with two slots.
- Port S2 provides an interface to a PCI or PCI-X bus with six slots.
- Port S3 provides an interface to a single-slot AGP bus that operates at 2X or 4X speeds.

For maximum performance, a high-performance I/O drawer with four IO7 riser modules is used. Each IO7 uses only two of its three I/O ports, S0 and S1. Each port controls a single-slot PCI-X bus. Thus, in the high-performance I/O drawer, eight PCI-X devices can each run at 133 MHz. Systems built with a 2P drawer also have an IO7 chip located on the drawer's backplane that uses all four IO7 South ports. Five PCI or PCI-X slots, one AGP slot, and an internal bridge to IDE, SCSI, and USB controllers on an I/O expander module are provided.

System Building Blocks

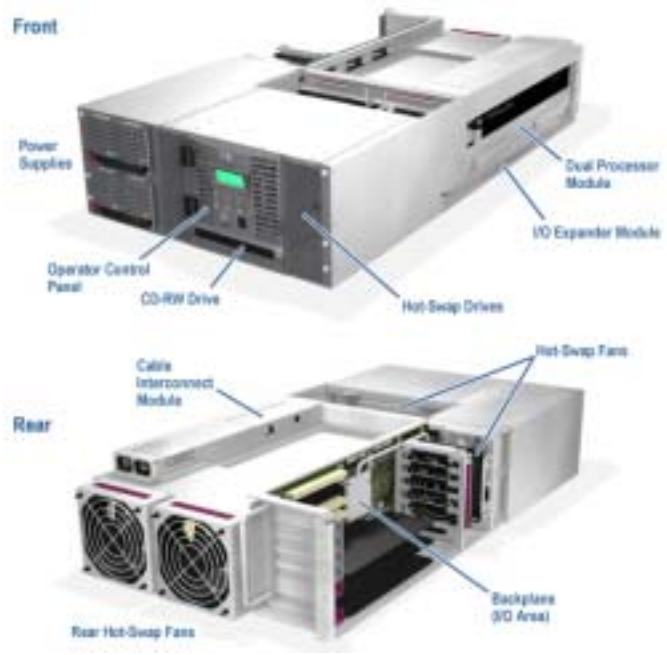
Dual-processor Module

The dual-processor module holds the EV7 system chips, with their integrated memory controllers, I/O port, and second-level cache. Each module has 20 RIMM slots of RDRAM memory. There are nine slots for voltage regulator modules (VRM) that convert the system-supplied 48V DC-to-DC voltages required by the logic on the module and memory. The CPU management module plug-in manages the module.



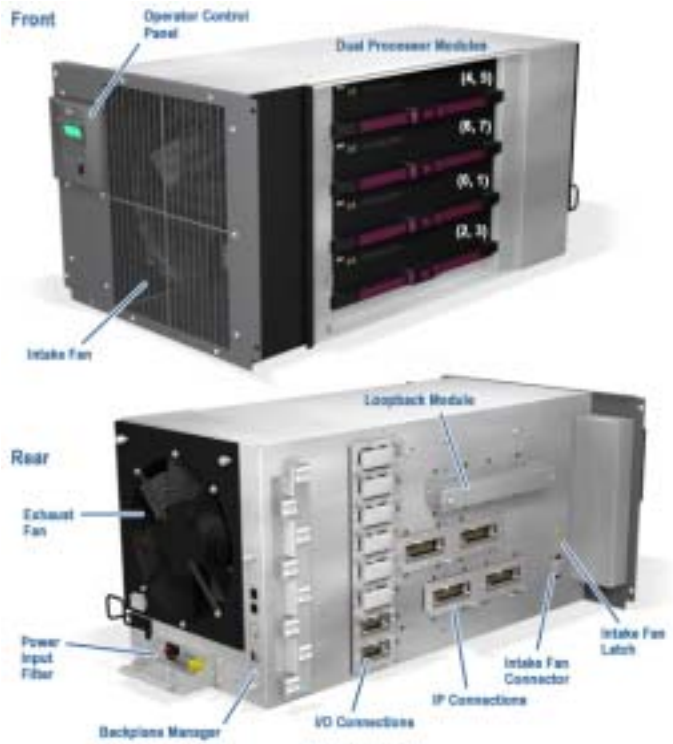
2P System Building Block Drawer

The 2P drawer is the basic building block of the ES47/ES80 systems. Each 2P drawer contains one CPU module, 2P backplane that contains the IO7 chip, five PCI/PCI-X slots, and one AGP slot. The backplane manager and I/O functions, like SCSI drive, CD-ROM, and USB support are contained on an I/O expander module that plugs into the backplane. Each 2P drawer can support one optional I/O expansion drawer.



8P System Building Block Drawer

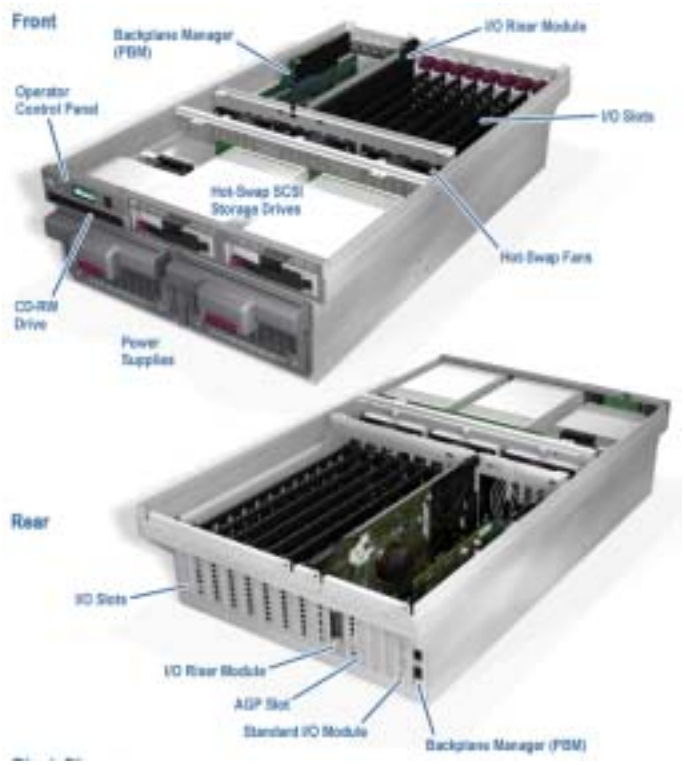
The 8P system drawer is the fundamental building block for the AlphaServer GS1280 systems. It contains up to four CPU modules, a backplane used as the interprocessor interconnect, a backplane manager module used to monitor and manage the system, and an OCP. Each 8P system drawer supports up to eight I/O drawers.



I/O Building Block Drawer

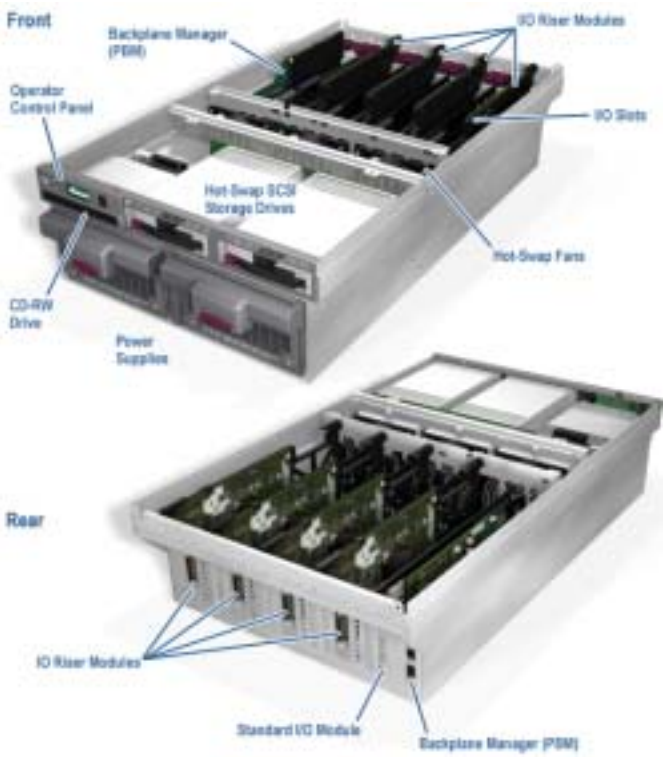
The I/O building block drawer contains a single I/O riser module connected by cable to the I/O port of the EV7 system chip. The IO7 chip on the riser module controls a six-slot and two-slot PCI/PCI-X bus, a three-slot PCI bus with 5-volt switching levels, and an AGP slot all designed into the drawer.

Master and expansion versions of the I/O building block drawer are available. The I/O master building block drawer contains 10 PCI/PCI-X available slots, one AGP slot, N+1 redundant power system, CD-RW drive, integrated Ultra3 SCSI adapter, two Ultra3 SCSI disk drive bays, and dual USB ports. The I/O expansion drawer contains 11 PCI/PCI-X available slots, one AGP slot, and N+1 redundant power system.



High-Performance I/O Building Block Drawer

The high-performance I/O building block drawer contains up to four I/O riser modules connected by cable to the I/O ports of up to four EV7 chips. Only two of the four I/O ports on the IO7 chip on the riser modules are used to control two single-slot PCI-X buses. Each bus supports a high-performance PCI-X option running at 133 MHz. The master drawer contains seven PCI/PCI-X available slots, N+1 redundant power system, CD-RW drive, integrated Ultra3 SCSI adapter, two Ultra3 SCSI disk drive bays, and dual USB ports. The high-performance expansion drawer contains eight PCI/PCI-X available slots and N+1 redundant power system.

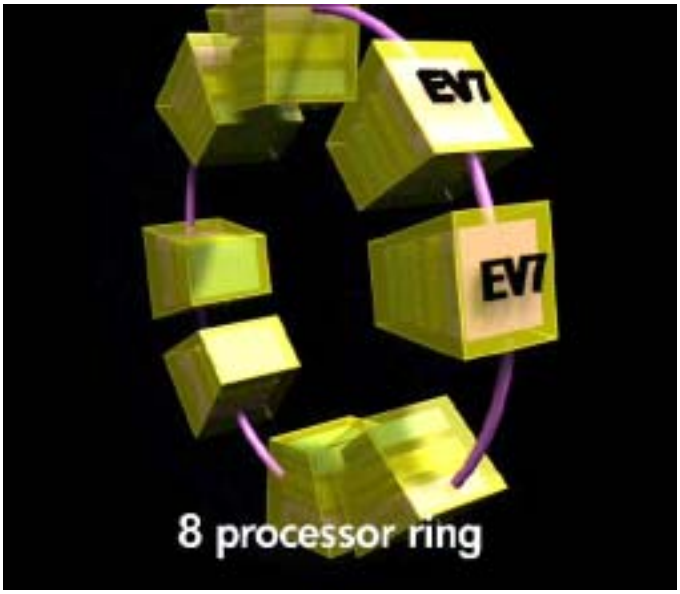


Connectivity

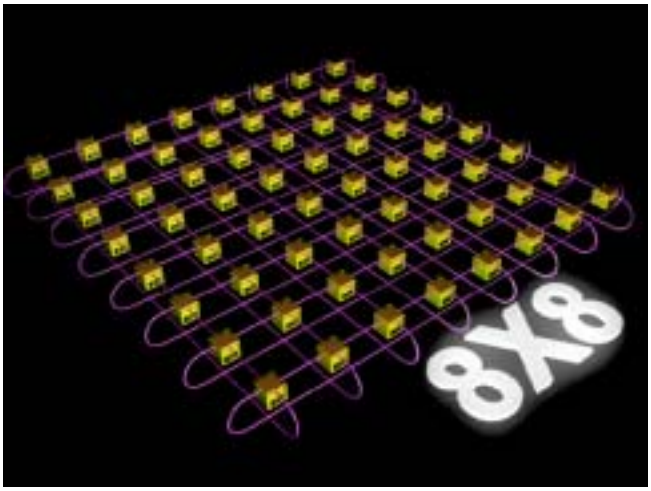
Interprocessor Connectivity

Each EV7 system chip controls its own memory and optionally its own I/O subsystem. The chip also connects directly to other EV7 system chips in such a way that their memories and I/O subsystems can be shared.

The EV7 has four interprocessor ports, designated North, South, East, and West. (In ES47/ES80 systems with 2P building block drawers, only two of the four ports are used, the North and the South.) The first connection is made in etch on the dual-processor module where the North port of one is connected to the South port of the other. The unused North and South ports are brought out to a bulkhead connector where an interprocessor cable is used to connect to the North and South ports of other processors in other 2P drawers. A maximum of eight processors in four drawers can be connected in a single cabinet in a ring of processors.

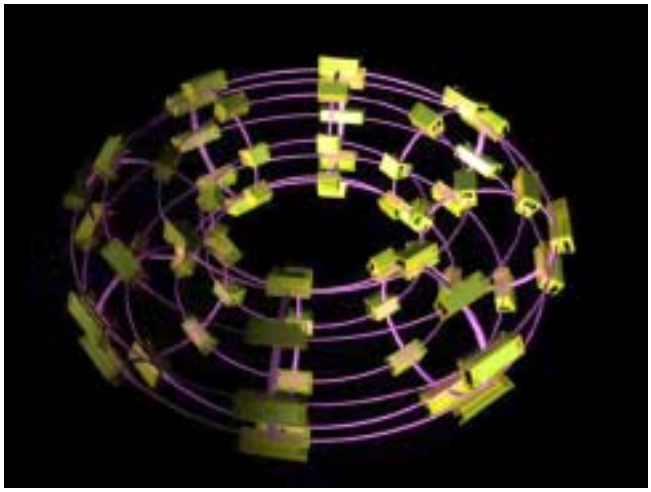


In AlphaServer GS1280 8P building block drawers, all four interprocessor ports are used. The following graphic depicts 64 EV7 system processors laid out in a grid. It illustrates the East port of a processor connected to the West, and the South port connected to the North – the other ports in the graphic are not connected.



When the West ports are connected to the East ports, a torus ring is created. CPUs connected in a torus ring reduce the number of hops necessary to enable one CPU to gather data from another and provide alternate paths if a particular inter-processor path fails or is busy. If a path fails, the partition will crash, but on a subsequent reboot, routing using different paths may be possible.

Arrays that are in a perfect square configuration, such as 4x4, 8x8, etc., perform optimally, allowing for the maximum interconnect and the least number of hops. When a system in a torus configuration has more than one partition, the toroid nature of the system is compromised because links between processors at the edges of partitions no longer exist. The value of the partition versus the value of keeping the torus ring in tact should be an important consideration.



I/O Connectivity

The IO7 chip connects to the EV7's I/O port. Each EV7, with local memory available, can support one IO7 chip. When an EV7 chip is added, an additional IO7 chip is supported. In 8P drawer systems, the IO7 chips reside on riser modules in an I/O system building block drawer. In 2P drawer systems, the I/O port of one EV7 connects to an IO7 chip on the drawer's backplane; the I/O port of the other EV7 chip is brought out of the drawer and can be cabled to an I/O riser module in an I/O expansion drawer. The IO7 chip has four I/O bus ports, three PCI/PCI-X ports, the fourth supports AGP. The PCI/PCI-X ports operate with buses that have from one to six slots.

The IO7 on the 2P drawer backplane supports one AGP slot, one single-slot PCI-X, and two dual-slot PCI buses – all on the backplane itself. The fourth port connects to an I/O expander module that has IDE, SCSI, and USB bus controllers. The IDE and SCSI adapters only support options internal to the drawer.

In 8P drawer systems, the I/O ports of all EV7 chips are brought out of the drawer on the back of the backplane and can be cabled to I/O riser modules in up to eight I/O system expansion drawers. In an 8P drawer system, an optional standard I/O module that occupies one PCI slot contains IDE, SCSI, and USB bus controllers. IDE and SCSI controllers support options in the I/O expansion drawer only.

LEDs on the 8P backplane and on riser modules are part of the server management scheme. These LEDs are lit by firmware when a test cable command is issued indicating there is connectivity through the cable.

Power Connectivity

AC power enters the AlphaServer systems directly into the 2P drawer in the ES47 Tower or Power Distribution Units (PDUs) for rackmounted ES47, ES80, and GS1280 systems. There are different types of PDUs that can be used. In ES47 and ES80 rack systems, there are three-phase 30 amp and single-phase 20 amp PDUs available. In GS1280 systems a three-phase 30 amp PDU and three-phase 60 amp PDU are available.

In systems that comprise 2P drawers, the PDU is used to distribute power to two hot-swap power supplies. These power supplies convert the AC input to 48V DC and Vaux and pass it to the backplane where it is distributed through the drawer. Additional DC-to-DC power converters on the I/O expander module and dual-processor module convert the 48V power to the various voltages required by the logic. Vaux powers the backplane manager logic and I^2C network, providing low-voltage power even when the system is shut off.

In systems that comprise one or two 8P drawers, the 30 amp PDU is used. AC is converted to 48V DC and Vaux through a subrack containing three 48V power supplies that power a single 8P drawer. These power supplies are hot swappable and redundant; if one fails it can be replaced without powering down the drawer. From the subrack, power is passed through the backplane to converters on the dual-processor module where it is converted to the voltages needed. Vaux is also passed to the backplane where it's distributed to the backplane manager module and the I^2C network.

AC is also distributed from the PDUs to power supplies in separate I/O drawers. These power supplies, also redundant and hot swappable, convert the AC to Vaux and several standard DC voltages used by the I/O buses. The connector prevents older options with 5V switching levels from plugging into these buses. A PCI bus with 5V switching levels dedicated to Memory Channel and CIPCA devices receives 5 volts. In addition, DC-to-DC converters on both the backplane and the I/O riser module convert some of the DC voltages supplied to additional voltages needed by these modules. Thus, AC power is distributed and converted to the necessary voltages close to the location where they are used.

Configurations

Overview

The modular building-block approach has been used to create the latest AlphaServers – from small, medium, to very large systems. The building blocks are the dual-processor module, placed in either 2P or 8P building block drawers, and IO7 riser modules placed in either standard or high-performance I/O building block drawers.

With these building blocks, a very broad range of systems can be created. At the low end is the AlphaServer/AlphaStation ES47, a two-processor tower that supports 8 Gbytes of memory, five PCI/PCI-X slots of varying speeds, and a single AGP slot. The ES47 is also available installed in a cabinet with support for up to four processors, up to 16 Gbytes of memory (32 Gbytes future), up to 32 PCI/PCI-X slots, up to four AGP slots, utilizing two standard I/O drawers.

The ES80 system is built with 2P drawers; four drawers can be connected to create an 8P system with up to 32 Gbytes of memory (64 Gbytes future), up to 64 PCI/PCI-X slots, and up to eight AGP slots.

The GS1280 is built with 8P drawers. A single cabinet system might consist of an 8P drawer, power, two I/O drawers, and four *StorageWorks* shelves.

The modular design extends into the I/O space. An I/O drawer is available with 11 variable speed PCI/PCI-X slots supported by one processor.

The systems can be mounted in the new HP 11000 Series Cabinet. The unique frame and rail design enables fast assembly, easy mounting, and outstanding structural integrity. Equipment installation effort is dramatically reduced because the vertical mounting system was specifically designed to minimize installation time.

AlphaServer ES47 Systems

AlphaServer ES47 1000-MHz systems, with 1.75 Mbyte ECC L2 on-chip cache per processor, are available in two configurations: a tower system and a cabinet system. The 2P drawer is the basic building block for these systems. Each 2P building block drawer includes the EV7 dual-processor module with N+1 voltage regulators and memory RIMMS, I/O expander module that contains the IO7 chip, two redundant power supplies, and disk drive bays. The backplane manager and I/O functions, like SCSI drive, CD-RW, and USB support, are contained on the I/O expander module that plugs into the backplane.

The AlphaServer/AlphaStation ES47 tower system consists of one 2P drawer that supports two 1000-MHz EV7 processors, five PCI/PCI-X slots, one AGP slot, and up to 8 Gbytes of RDRAM memory (16 Gbytes future). The ES47 tower system supports two internal disk drives.

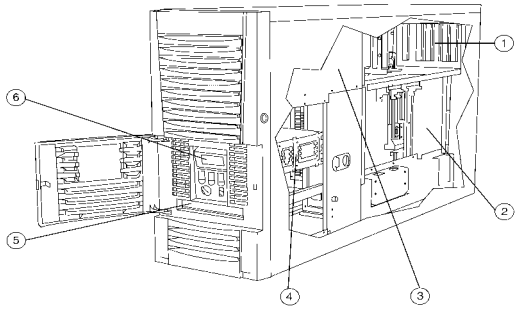
AlphaServer ES47 Model 2 and Model 4 cabinet systems include one or two 2P drawers that support two or four 1000-MHz EV7 processors, up to 32 PCI/PCI-X slots, up to four AGP slots, and up to 16 Gbytes of RDRAM memory (32 Gbytes future). The ES47 cabinet systems support up to four internal drives in two system building block drawers. Up to 14 drives can be mounted in each optional StorageWorks shelf.

Each I/O expansion drawer supports 12 total slots spread over four buses. The drawer contains 11 PCI/PCI-X slots and one AGP slot and N+1 redundant power system. ES47 Model 2 supports one optional I/O expansion drawer; Model 4 supports two optional I/O expansion drawers.

AlphaServer ES47 systems include integrated Ultra3 SCSI adapter for internal disk drives, slim-line, multi-bay CD-RW drive, dual USB ports per system building block, hot-swap 48V auto-sensing power supplies, and factory installed Tru64 or OpenVMS software.

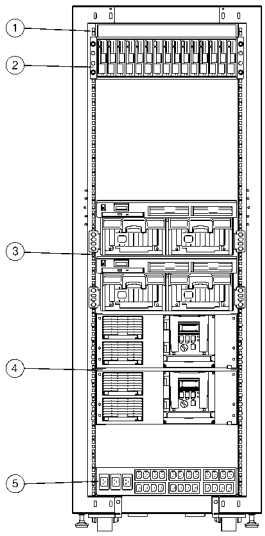
Dual-processor modules, memory, disk drives, and Ethernet adapter are mandatory options. ES47 cabinet systems require the purchase of cabinet, PDU, and factory integration service. ES47 tower systems require two country-specific power cords.

AlphaServer ES47 Tower System



1. I/O Slots
2. CPU Building Block Module
3. Hot-swap Power Supplies
4. Hard Disk Drive Bays
5. CD-RW Drive
6. Operator Control Panel

AlphaServer ES47 Cabinet System



1. Cable/DSL HUB
2. StorageWorks Drawer (Optional)
3. PCI/PCIX I/O Expansion Drawer(s) (Optional)
4. System Building Block Drawer (Model 2 includes 1 drawer; Model 4 includes 2 drawers)
5. AC input controller(s) (Mandatory Option)

AlphaServer ES80 Systems

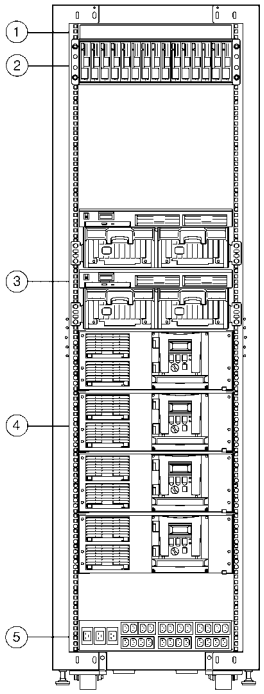
AlphaServer ES80 1000-MHz systems, with 1.75 Mbyte ECC L2 on-chip cache per processor, are available in a cabinet configuration. Four models are offered: Models 2, 4, 6, and 8. The 2P drawer is the basic building block for these systems. Each 2P building block drawer includes one EV7 dual-processor module with N+1 voltage regulators and memory RIMMS, I/O expander module that contains the IO7 chip, two redundant power supplies, and disk drive bays. The backplane manager and I/O functions, like SCSI drive, CD-RW, and USB support, are contained on the I/O expander module that plugs into the backplane.

AlphaServer ES80 systems support up to four 2P drawers, up to eight 1000-MHz EV7 processors, up to 64 PCI/PCI-X slots, up to eight AGP slots, and up to 32 Gbytes of RDRAM memory (64 Gbytes future). The ES80 systems support up to eight internal drives, two in each system building block drawer. Up to 14 drives can be mounted in each optional StorageWorks shelf.

ES80 systems include integrated Ultra3 SCSI adapter for internal disk drives, slim-line, multi-bay 16X/10X/24X CD-RW drive, dual USB ports per system building block, hot-swap 48V auto-sensing power supplies, and factory installed *Tru64* or *OpenVMS* software.

Dual-processor modules, memory, disk drives, cabinet, PDU, factory integration service, and Ethernet adapter are mandatory options.

AlphaServer ES80 System



1. Cable/DSL HUB
2. StorageWorks Drawer (Optional)
3. PCI/PCIX I/O Expansion Drawer(s)
4. System Building Block Drawer (Model 2 includes 1 drawer; Model 4 includes 2 drawers; Model 6 includes 3 drawers; Model 8 includes 4 drawers)
5. AC input controller(s)

AlphaServer GS1280 Systems

The AlphaServer GS1280 1150-MHz systems, with 1.75 Mbyte ECC L2 on-chip cache per processor, are the expandable enterprise system family members. The systems currently support up to 16 processors, up to 64 Gbytes of RDRAM memory, up to 43 PCI/PCI-X slots, and up to four AGP slots.

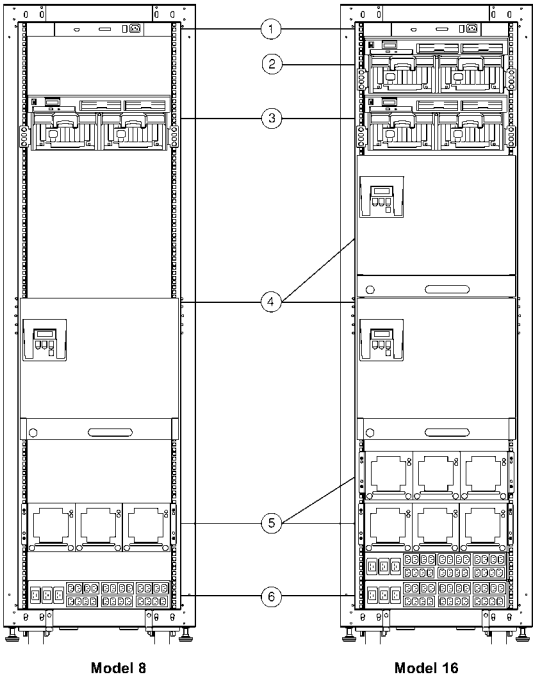
Two models of the GS1280 are offered: Model 8 with one 8P building block drawer and Model 16 with two 8P drawers. The 8P building block drawer is the core of the GS1280 systems. Each 8P drawer can contain up to four dual-processor modules. GS1280 systems include a 41U cabinet with cable/ DSL hub, and one or two 48V DC power shelves with three 48V dc hot-swap power supplies each. Preinstalled Tru64 UNIX or OpenVMS operating system software is included.

Two I/O building block drawers are available: I/O master drawer and I/O expansion drawer. The I/O master drawer supports 11 total configurable slots spread over four buses. The master drawer supports two hard drives and includes an integrated UltraSCSI adapter. The master I/O drawer contains 10 PCI/PCI-X available slots and one AGP slot, N+1 redundant power system, slim-line, multi-bay 16X/10X/24X CD-RW drive, and dual USB ports. The I/O expansion drawer supports 12 total available slots spread over four buses. It contains 11 PCI/PCI-X slots, one AGP slot, and N+1 redundant power.

An I/O master building block drawer, AC input controllers, dual-processor modules, memory, disk drives, and Ethernet adapters are mandatory options.

AlphaServer GS1280 systems are only configurable with external I/O drawers, with support for four drawers at announcement. GS1280 systems can be partitioned with as few as two processors each. Therefore, the 8-way system supports up to four partitions and the 16-way system up to eight partitions.

AlphaServer GS1280 System



1. Cable/DSL HUB
2. PCI/PCIX I/O Expansion Drawer (Optional)
3. PCI/PCIX I/O Master Drawer (Mandatory Option)
4. System Building Block Drawer (Model 8 includes 1 drawer, Model 16 includes 2 drawers)
5. 48-volt DC power shelves, 3 power supplies per shelf (Model 8 includes 1 shelf, Model 16 includes 2 shelves)
6. AC input controller(s) (Mandatory Option)

System Features at a Glance

	ES47 Tower	ES47 Cabinet	ES80 Cabinet	GS1280 Cabinet
Processor	1000 MHz EV7	1000 MHz EV7	1000 MHz EV7	1150 MHz EV7
SMP	2 CPUs	Model 2 – 2 CPUs Model 4 – 4 CPUs	Model 2 – 2 CPUs Model 4 – 4 CPUs Model 6 – 6 CPUs Model 8 – 8 CPUs	Model 8 – 2, 4, 6, 8 CPUs Model 16 – 4, 8, 12, 16 CPUs
Memory (currently supported)	8 GB	Model 2 – 8 GB Model 4 – 16 GB	Model 2 – 8 GB Model 4 – 16 GB Model 6 – 24 GB Model 8 – 32 GB	Model 8 – 32 GB Model 16 – 64 GB
Cache Memory	1.75 MB ECC L2 on-chip cache per CPU			
PCI/PCI-X Slots*	5	Model 2 – 16 Model 4 – 32	Model 2 – 16 Model 4 – 32 Model 6 – 48 Model 8 – 64	Model 8 – 44 (4 I/O drawers) Model 16 – 88 (8 I/O drawers)
AGP Slots*	1	Model 2 – 2 Model 4 – 4	Model 2 – 2 Model 4 – 4 Model 6 – 6 Model 8 – 8	Model 8 – 4 (4 I/O drawers) Model 16 – 8 (8 I/O drawers)
Storage Adapter	Integrated Ultra3 SCSI adapter	Integrated Ultra3 SCSI adapter (one per drawer)	Integrated Ultra3 SCSI adapter (one per drawer)	Integrated in master I/O drawer
Internal Drive Bays	2	Model 2 – 2 Model 4 – 4	Model 2 – 2 Model 4 – 4 Model 6 – 6 Model 8 – 8	-
Dual USB Port	1	1 per drawer	1 per drawer	1 per I/O drawer
CD-RW	Yes	Yes	Yes	I/O drawer
Power Supplies	2 - 208V 48V auto-sensing, hot-swap, N+1	2 - 208V 48V auto-sensing, hot-swap, N+1 per drawer	2 - 208V 48V auto-sensing, hot-swap, N+1 per drawer	3-phase power subsystem with power cords, 48Vdc hot-swap
Partitions	N/A	Up to 2	Up to 4	Model 8 – Up to 4 Model 16 – Up to 8 (2 CPU minimum)
Form Factor	Tower	Cabinet (41U)	Cabinet (41U)	Cabinet (41U)
Operating Systems	Tru64 UNIX V5.1B OpenVMS V7.3-1 Linux Redhat V7.2	Tru64 UNIX V5.1B OpenVMS V7.3-1 Linux Redhat V7.2	Tru64 UNIX V5.1B OpenVMS V7.3-1 Linux Redhat V7.2	Tru64 UNIX V5.1B OpenVMS V7.3-1
Software Tier	Workgroup	Workgroup	Departmental	Enterprise
Clustering	Memory Channel CI Clusters	Memory Channel CI Clusters	Memory Channel CI Clusters	Memory Channel CI Clusters
Memory Bandwidth per processor	10.7 GB/s	10.7 GB/s	10.7 GB/s	12.3 GB/s
I/O Bandwidth per processor	3.2 GB/s	3.2 GB/s	3.2 GB/s	3.2 GB/s
Server Management	Embedded			
Hardware Warranty	1-year, on-site next business day			
Software Warranty	90-day software, telephone support			

* For current configuration guidelines and qualified options and quantities supported, refer to AlphaServer QuickSpecs at http://h18000.www1.hp.com/products/quickspecs/Division/10410.html and for additional product information refer to http://h18002.www1.hp.com/alphaserver/index.html#new_sys

Server Management

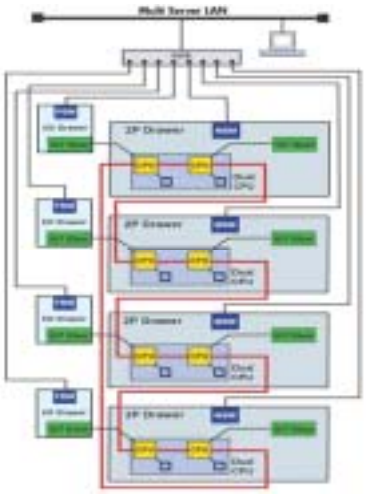
Overview

Server management features allow system administrators the ability to **configure**, **monitor**, **control**, and **troubleshoot** servers at local or remote sites. The main tasks of server management are:

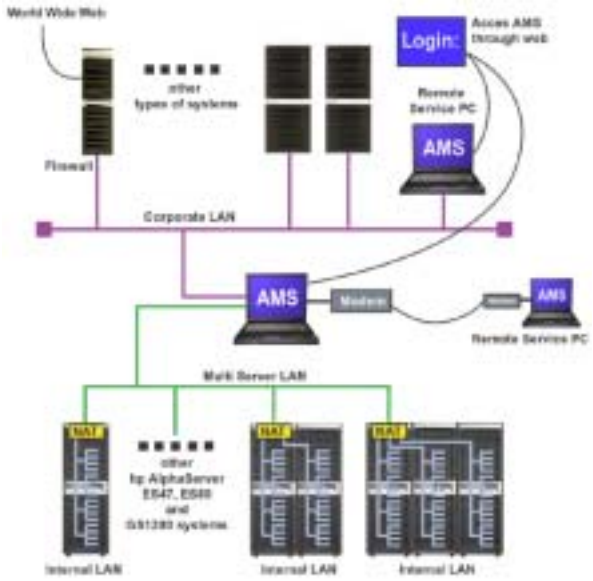
- Defining and modifying hard and soft partitions
- Monitoring system error status and configurations
- Booting a system
- Examining system counters
- Halting and restarting CPUs
- Running diagnostics
- Updating firmware

These functions can be performed using a console terminal plugged into a serial port or connecting over an Ethernet. Users can dial-in and control their system from a remote location. System hardware and software is designed and instrumented for flexible system management. On each dual-processor module, a CPU Management Module (CMM) controls the CPUs and monitors voltage and temperature.

In the processor drawer, a backplane manager (MBM) controls the CMMs and drives the operator control panel. Likewise, in each I/O drawer a PCI Backplane Manager (PBM) controls the I/O components.



All server management hardware components are connected by an internal LAN. Off-the-shelf Ethernet hubs and routers can interface to the internal LAN or the multi-server LAN for flexible and secure remote control.



Server Management Software and Firmware

Server Management software and firmware offer three levels of control. Selection of the appropriate level is determined by the complexity of the environment and the user's preference.

- AlphaServer Management Station (AMS)
- AlphaServer Management Utility (AMU)
- Telnet Connections

AlphaServer Management Station (AMS)

The AlphaServer Management Station (AMS) includes the AMU, which provides a high level of server management for a single or multi-platform environment. The AMS comprises both hardware and software. The hardware is a Tru64 UNIX platform.

The software application includes a console management facility for console logging of each operating system instance and monitoring and accessing each operating system instance. Event management allows a user to setup scan strings as SRM or operating system events for each operating system instance, and provides notification via e-mail, should such an event occur. Such events are also logged for each operating system instance. Event and console log viewing are provided.

The AMS provides a simple, intuitive windows environment for monitoring and managing each of the connected AlphaServers. From this GUI, a user can monitor the entire server environment, launch the AMU (included as part of this application) to determine detailed status or manage a specific ES47/ES80/GS1280 platform, launch Telnet sessions for each operating system instance for monitoring and control, and view console and event logs.

AlphaServer Management Station (AMS) *(continued)*

The AMS provides a level of security between a general corporate LAN and a private multi-server management LAN to which the AlphaServers are connected. To gain control access, local and remote users must log into the AMS and be authenticated.

Server Platform Manager (SPM)

The Server Platform Manager, using a graphical interface, is the top-level software for launching AMS applications and managing servers and partitions.

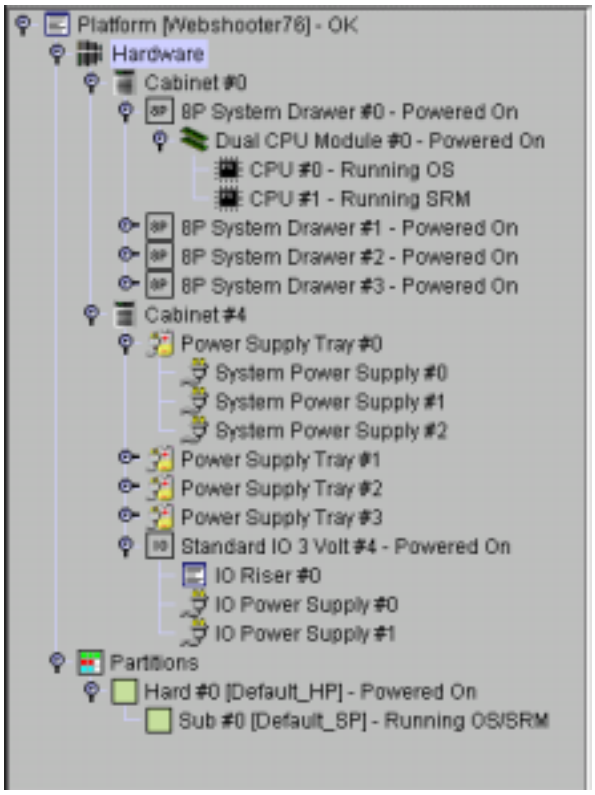
Three types of access are permitted: administrator, operator, and user. At the individual server level, the SPM lets users perform the activities shown in the menu. To manage partitions, users right-click on a partition, choose “Console” from the dropdown menu, and then “Telnet” into either the operating system or the SRM console, whichever is running on the partition. From the SRM console, users can boot the operating system, then run a utility to generate information on error logs.

AlphaServer Management Utility (AMU)

The AMU is a GUI based application that provides a sophisticated, yet user-friendly graphics interface to monitor and manage a single ES47/ES80/GS1280 system. From this application, users can monitor the status of the platform and provide a significant level of control of the platform. The AMU is a Web-based utility, which allows a user access from a browser. The AMU provides the following capabilities:

- Hardware physical views – with platform status of each
- key element
- Hardware logical view
- Platform cable connection view
- Environmental information
- Platform error/event log
- Platform firmware upgrades
- Basic event notification (future release)
- GUI point/click partitioning (future release)

The following diagram depicts a tree structure of the system. System cabinets, their components, and I/O connections are shown. Users can “Zoom In” on a processor drawer for more details.



The AMU is currently supported on Intel/Windows 2000 and Alpha Tru64 UNIX platforms.

Telnet Connections

A Telnet connection can be established over the multi-server LAN to the MBM. Using this approach, the user has full control of the ES47/ES80/GS1280 platforms, but must work at the MBM firmware’s CLI (Command Line Interpreter) level. CLI commands are used for:

- Displaying configuration information
- Updating firmware
- Powering on or off, halting, or resetting the system or a partition
- Providing partitioning and cabling functions
- Displaying information about the hardware environment
- Implementing remote server functions

Furthermore, the CLI enables connection to the SRM console. Users enter the system management CLI on a PC connected directly to the internal LAN hub. In addition to establishing a Telnet connection to manage the platform, users can establish additional Telnet connections to each of the operating system instances for monitoring and control or to each operating system running within the platform.

Partitions

A system consists of a set of resources – processors, memory, and I/O. Partitioning is simply the process of dividing these resources into subsets capable of running an instance of an operating system. An undivided system can be considered a single hard partition. Each partition must contain some quantity of each resource type to allow booting an operating system instance and running applications.

- Larger systems running a single application are often underutilized. Partitions can be sized according to the requirements of individual applications, and the total system utilization is thereby increased.
- Running a single large system with multiple partitions provides advantages over individual, smaller systems in different locations.
- Requirements for floor space and special electrical and cooling systems can be concentrated in one place, reducing the total cost of operation.
- Different partitions on a single system can be monitored and managed by a single person, either on site or from a remote location. Problems can be isolated and maintenance scheduled from a central observation point.

There are two types of partitions supported by the hardware, firmware, and operating systems that allow varying levels of flexibility in moving resources from one application to another.

Hard partitions in the new EV7 based AlphaServer ES and GS systems can be made up of two or more processors. If full hardware isolation of faults is desired, then hard partitions must be confined to the 8P building block boundaries in the case of the GS series and at the 2P building block boundaries in the ES series. With the introduction of the EV7 Alpha chip, all transactions between processors, memory, and I/O ports occur within a hard partition boundary. There are no transactions that exit the hard partition even when the partition is smaller than the 8P or 2P bounds of the specific building block comprising the system. The reason for maintaining hard partitions at the physical boundary of the building block is to avoid having power supplies, fans, and other infrastructure faults from affecting more than a single partition.

Soft partitions are the second type. Soft partitions are always implemented as a sub-partition of a hard partition. With soft partitions, there are no hardware boundaries between partitions. Using resource management software like *OpenVMS* Galaxy, resources may be moved through agreement of the operating system instances in each soft partition more easily and quickly than with hard partitions, but the resources are not protected from interference, and hardware faults are not isolated. Hard and soft partitions provide the kind of control users need to utilize their system most effectively.

Reliability, Availability, and Maintainability

The AlphaServer ES47/ES80/GS1280 systems provide numerous features that improve their reliability and availability. The improvements are gained by having high circuit density, less interconnect, and overall less heat dissipation than other technologies. Availability is improved by having more error detection and retry of error conditions.

System Features

- Reduced component count – embedded system router, memory controller, cache
- Increased ECC coverage in EV7 – 93% of EV7 signal pins are covered by ECC or parity protection
- Memory subsystem improvements – "RAID" memory capability
- DC-to-DC converter improvements – N+1 capability, NEBS compliant
- Fault management improvements – inline data correction on the system mesh (interprocessor connections)
- Separate management bus
- Built-in self-test and console ROM-based diagnostics at system level
- Console messages reflecting the status of booting
- Parity and error correction
- Test-directed diagnostics and symptom-directed diagnostics
- System fault management
- Ease of repair
- Redundant, hot-swappable power supplies

High Availability

The following features address high availability:

- Partitioning allows users to physically isolate portions of the system. Each partition has its own resources and runs its own copy of an operating system. The operating system need not be the same version or even the same operating system as that running in other partitions. Because power can be removed from an individual partition, parts of the system can be serviced without shutting down the entire system.
- Clustering provides continuous availability to storage and computational abilities and applications in spite of failure of a complete system.
- With the Tru64 UNIX operating system, TruCluster Server software provides for application failover. By monitoring the performance of cluster members and automatically initiating recovery procedures in the event of system or component failures, a TruCluster system ensures system availability.
- Disks may be hot swapped to eliminate a source of system downtime. When used with RAID configurations, hot swapping is transparent to applications and to users.
- N+1 redundant power supplies keep a system running even if a power supply fails. The 48V power supplies are hot swappable.
- Automatic server recovery: Systems with multiple CPU or memory modules automatically recover from failures of those modules by rebooting to exclude those failed modules. Thus, a hard fault is transformed into a transient outage, followed by continued operation with degraded performance.

Parity and Error Correction

All of the buses connecting the EV7 processors to memory and each other provide single-bit correct and double-bit error detect ECC to provide best-in-class error correction and isolation. Each checkpoint within the system preserves error information that assists software in determining where in the system the error originated. This allows the software to contain the error to those processes that are affected by the error.

Within the processor, the L1 and L2 cache data are protected by ECC. Parity is provided on all major data paths and arrays to provide error detection within the processor. In addition, all memory references within the system are timed to ensure proper completion. Excessive delay will result in a machine check. Lastly, the cache coherence protocol engine monitors all state transitions to ensure correct sequencing of the data state. Any attempt by a broken processor to perform an illegal state change will cause a machine check and the poisoning of the affected data.

Performance and Scalability Improvements

- Mesh architecture – inherent reliability with CPUs, RAID memory functionality, and I/O system board
- NUMA enhancements and faster SMP operation – built-in SMP interconnect logic
- Device interrupts off primary CPU
- Improved performance for multi-thread applications
- Reduction in IOLock8 usage in Fibre Channel port drivers
- Enhancement in shadowing completion
- Server consolidation – more applications per box
- System availability
- Redundant power supplies, fans
- ECC protected cache
- ECC protected memory
- Automatic server recovery
- Pre-failure warning on hard drives, processors, and memory
- Fault resiliency
  Partitioned systems with no single points of failure at the system level increase in inherent reliability
- Key system innovations which include:
  - Switchless mesh architecture that provides significant service innovations that directly impact application availability
  - RAID-like memory
  - Complete fault isolation between partitions
  - Lower TCO and simpler system management and operational practices through workload and system management tools and improvements

Technical Specifications

AlphaServer/AlphaStation ES47 Tower System

Power Requirements			
AlphaServer ES47 Tower System	**US/Canada**	**Japan**	**Europe**
Nominal voltage(s)	100-120/200-240V*	100-120/200-240V	200-240V
Frequency range	50-60 Hz	50-60 Hz	50-60 Hz
Phases	1	1	1
Rating	10/7A per cord	10/7A per cord	10/7A per cord
Receptacle (site)	IEC 320 C13 to country specific	IEC 320 C13 to country specific	IEC 320 C13 to country specific
* 100-120V operation requires that two power supplies be present; power supply redundancy is not provided during 100-120V operation.			

Physical Characteristics	
Dimensions (H x W x D)	20.1 x 8.6 x 35 in./51 x 22 x 90 cm
Shipping Dimensions (H x W x D)	48 x 30 x 18.5 in./122 x 76 x 47 cm
Weight – Maximum Configuration	132 lbs./59 kg
Shipping Weight – Maximum Configuration	164 lbs./73 kg

Heat Dissipation Btu/hr	
Minimally configured system	783W / 2,672 Btu/hr
Fully configured system	850W / 2,701 Btu/hr

Clearances	**Operating**	**Service**
Front	6 in./15 cm	6 in./15 cm
Rear	6 in./15 cm	6 in./15 cm
Left Side	None	None
Right Side	None	29.5 in/75 cm

Environmental	**Operating**	**Non-Operating**
Temperature	50 to 95°F/10 to 40°C	-40 to 151°F/-40 to 66° C
Humidity	20% to 80%	20% to 80%, Storage (60 days) 115°F/46°C
Altitude	10,000 ft./3,048 m Note: Maximum operating temperature at sea level; reduce by 1.8°F (1°C) for each 2,000 ft (600 m) above sea level	40,000 ft./12,192 m
Vibration	10 to 500 Hz 0.1G peak	1.03 Grms 5-300 Hz

Acoustics (Declared values per ISO 9296 and ISO 7779	**Idle/Operating** L_{wAd}, B	**(Bystander Position)** LpAm, dBA
ES47 Tower	6.6	47

Regulatory Agency approvals	UL: Listed to UL 60950; cUL: Listed to CAN/CSA-C22.2 No. 950 3rd Ed, 1995 CB Report to IEC 950:1991+A1: 1992 + A2: 1993 + A3: 1995 + A4: 1996 CB Report to EN60950 (1992) with Amdts. 1, 2, 3, 4 and 11 FCC: Part 15.B Class A IC ICES-003 Class A CE: EN55022: 1998, EN55024: 1998, EN61000-3-2: 1995, EN61000-3-3: 1995 VCCI: V-3/02.04 Class A BSMI: CNS 13438 Class A C-Tick: AS/NZS 3548:1995 Class A

AlphaServer ES47 Cabinet System

Power Requirements			
AlphaServer ES47 System	**US/Canada**	**Japan**	**Europe**
PDU Part Number	3X-H7606-AA	3X-H7606-AA	3X-H7606-AB
Nominal voltage(s)	208	200	380/415
Rated current	24A	24A	24A
KVA Model 2, one I/O drawer, nine StorageWorks shelves	6.683	6.683	6.683
KVA Model 4, two I/O drawers, six StorageWorks shelves	6.166	6.166	6.166
Frequency range	50-60 Hz	50- 60 Hz	50-60 Hz
Phases	3W+N+G	3W+N+G	3W+N+G
Number of auxiliary PDUs required	0	0	0
Rating	10/7A per cord	10/7A per cord	10/7A per cord
Receptacle (site)	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W

Physical Characteristics		
Dimensions (H x W x D)	79 x 24 x 47 in./200 x 60 x 120 cm (41U Rack) 6 x 17.5 x 34 in./15 x 44.5 x 86 cm (Drawer)	
Shipping Dimensions (H x W x D)	86 x 32 x 48 in./217 x 92.5 x 142 cm (41U Rack)	
	ES47 Model 2 with one I/O Expansion Drawer, one StorageWorks Shelf, 41U rack	**ES47 Model 4** with two I/O Expansion Drawers, one StorageWorks Shelf, 41U rack
Weight – Maximum Configuration	706 lbs./320 kg	910 lbs./413 kg
Shipping Weight – Maximum Configuration (cardboard outside wrap not included)	883 lbs./400 kg	1,088 lbs./476 kg

Heat Dissipation	**ES47 Model 2** with one I/O Expansion Drawer, one StorageWorks Shelf, 41U rack)	**ES47 Model 4** with two I/O Expansion Drawers, one StorageWorks Shelf, 41U rack)
Minimally configured system (one PCI option, one disk, eight memory RDRAMs, I/O Expansion Drawer, no StorageWorks Shelf)	894 W	1,788 W
Btu/hr	3,051	6,102
Airflow@20C DT, cfm	336	617
Fully configured system (three PCI options, one AGP option, two disks, 20 RDRAMs, I/O Drawer, one StorageWorks Shelf)	1,930 W	3,860 W
Btu/hr	6,587	13,174
Airflow@20C DT, cfm	201	348

Clearances	**Operating**	**Service**
Front	32 in./81 cm	32 in./81 cm
Rear	44 in./112 cm	44 in./112 cm
Left Side	None	None
Right Side	None	None

Environmental	**Operating**	**Non-Operating**
Temperature	50 to 95°F/10 to 40°C	-40 to 151°F/-40 to 66°C
Humidity	20% to 80%	20% to 80%, Storage (60 days) 115°F/46°C
Altitude	10,000 ft./3,048 m Note: Maximum operating temperature at sea level; reduce by 1.8 °F (1°C) for each 2,000 ft. (600 m) above sea level	40,000 ft./12,192 m
Vibration	10 to 500 Hz 0.1G peak	1.03 Grms 5-300 Hz

AlphaServer ES47 Cabinet System (*continued*)

Acoustics (Declared values per ISO 9296 and ISO 7779)	**Idle/Operating** L_{wAd}, B	**(Bystander pos.)** L_{pAm}, dBA
ES47 Model 2 with one 2P System Building Block Drawer	6.6	48
ES47 Model 4 with two 2P System Building Block Drawers	6.9	51
ES47 System Building Block Drawer	6.6	48
I/O Expansion Drawer (3X-BA70A-BA)	7.1	51
StorageWorks Shelf (DS-SL13R-xx)	6.9	53

Note: Current values for specific configurations are available. 1 B = 10 dBA

Regulatory - Agency approvals	UL: Listed to UL 60950; cUL: Listed to CAN/CSA-C22.2 No. 950 3rd. Ed. 1995
	CB Report to IEC 950:1991+A1: 1992 + A2: 1993 + A3: 1995 + A4: 1996
	CB Report to EN60950 (1992) with Amdts. 1, 2, 3, 4 and 11
	FCC: Part 15.B Class A
	IC ICES-003 Class A
	CE: EN55022: 1998, EN55024: 1998, EN61000-3-2: 1995, EN61000-3-3: 1995
	VCCI: V-3/02.04 Class A
	BSMI: CNS 13438 Class A
	C-Tick: AS/NZS 3548:1995 Class A

Power Requirements

AlphaServer ES80 System	US/Canada	Japan	Europe
PDU Part Number	3X-H7606-AA	3X-H7606-AA	3X-H7606-AB
Nominal voltage(s)	208	200	380/415
Rated current	24A	24A	24A
KVA Model 6, two I/O drawers, five StorageWorks shelves	6.349	6.349	6.349
KVA Model 8, two I/O drawers, three StorageWorks shelves	5.932	5.932	5.932
Frequency range	50-60 Hz	50-60 Hz	50-60 Hz
Phases	3W+N+G	3W+N+G	3W+N+G
Number of auxiliary PDUs required	0	0	0
Rating	10/7A per cord	10/7A per cord	10/7A per cord
Receptacle (site)	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W

Physical Characteristics

Dimensions (H x W x D)	79 x 24 x 47 in. / 200 x 60 x 120 cm (41U Rack) 6 x 17.5 x 34 in. / 15 x 44.5 x 86 cm (Drawer)
Shipping Dimensions	86 x 32 x 48 in. / 217 x 92.5 x 142 cm (41U Rack)

	ES80 Model 2 with one I/O Expansion Drawer, one StorageWorks Shelf, 41U rack)	**ES80 Model 4** with two I/O Expansion Drawers, one StorageWorks Shelf, 41U rack)	**ES80 Model 6** with three I/O Expansion Drawers, one StorageWorks Shelf, 41U rack)	**ES80 Model 8** with four I/O Expansion Drawers, one StorageWorks Shelf, 41U rack)
Weight – Maximum Configuration	706 lbs./320 kg	910 lbs./412 kg	1,104 lbs./500 kg	1,304 lbs./591 kg
Shipping Weight – Maximum Configuration (cardboard outside wrap not included)	883 lbs./400 kg	1,088 lbs./493 kg	1,282 lbs./581 kg	1,483 lbs./672 kg

Heat Dissipation	**ES80 Model 2** with one I/O Expansion Drawer, one StorageWorks Shelf, 41U rack)	**ES80 Model 4** with two I/O Expansion Drawers, one StorageWorks Shelf, 41U rack)	**ES80 Model 6** with three I/O Expansion Drawers, one StorageWorks Shelf, 41U rack)	**ES80 Model 8** with four I/O Expansion Drawers, 1 StorageWorks Shelf, 41U rack)
Minimally configured system (one PCI option, one disk, eight memory RDRAMs, I/O Expansion Drawer, no StorageWorks Shelf)	894W	1,788W	2,682W	3,576W
Btu/hr	3,051	6,102	9,153	12,204
Airflow@20C DT, cfm	336	617	1,063	1,399
Fully configured system (three PCI options, one AGP option, two disks, 20 RDRAMs, ES80, I/O Expansion Drawer, one StorageWorks Shelf)	1,930W	3,860W	4,596W	5,928W
Btu/hr	6,587	13,174	15,686	20,230
Airflow@20C DT, cfm	201	348	1,063	1,399

Clearances – All Models	**Operating**	**Service**
Front	32 in./81 cm	32 in./81 cm
Rear	44 in./111 cm	44 in./111 cm
Left Side	None	None
Right Side	None	None

AlphaServer ES80 Systems *(continued)*

Environmental	**Operating**	**Non-Operating**
Temperature	50 to 95°F/10 to 40°C	-40 to 151°F/-40 to 66°C
Humidity	20% to 80%	20% to 80%, Storage (60 days) 115°F/46°C
Altitude	10,000 ft./3,048 m Note: Maximum operating temperature at sea level; reduce by 1.8°F (1°C) for each 2,000 ft. (600 m) above sea level	40,000 ft./12,192 m
Vibration	10 to 500 Hz 0.1G peak	1.03 Grms 5-300 Hz

Acoustics (Declared values per ISO 9296 and ISO 7779)	**Idle/Operating** L_{wAd}, B	**(Bystander pos.)** L_{pAm}, dBA
ES80 Model 2 with one 2P System Building Block Drawer	6.6	48
ES80 Model 4 with two 2P System Building Block Drawers	6.9	51
ES80 Model 6 with three 2P System Building Block Drawers	7.1	53
ES80 Model 8 with four 2P System Building Block Drawers	7.2	54
ES80 System Building Block Drawer	6.6	48
I/O Expansion Drawer (3X-BA70A-BA)	7.1	51
StorageWorks Shelf (DS-SL13R-xx)	6.9	53

Note: Current values for specific configurations are available. 1 B = 10 dBA

Regulatory – Agency approvals	UL: Listed to UL 60950; cUL: Listed to CAN/CSA-C22.2 No.6950-00 CB Report to IEC 950:1991+A1: 1992 + A2:1993 + A3: 1995 + A4:1996 CB Report to EN60950 (1992) with Amdts. 1, 2, 3, 4 and 11 FCC: Part 15.B Class A IC ICES-003 Class A CE: EN55022: 1998, EN55024: 1998, EN61000-3-2: 1995, EN61000-3-3: 1995 VCCI: V-3/02.04 Class A BSMI: CNS 13438 Class A C-Tick: AS/NZS 3548:1995 Class A

Power Requirements

AlphaServer GS1280 Model 8	North America	Japan	Europe
PDU Part Number	3X-H7606-AA	3X-H7606-AA	3X-H7606-BA
Voltage	120/208	200	380/415
Rated Current	24A	24A	24A
Phase/Frequency	3W+N+G, 50-60 Hz	3W+G, 50-60 Hz	3W+N+G, 50-60 Hz
KVA, Model 8, one I/O Drawer, five StorageWorks Shelves	6.092	6.092	6.092
Current, per phase	17.5A	18A	9.5A
KVA, Model 8, two I/O Drawers, four StorageWorks Shelves	5.982	5.982	5.982
Current, per phase	17A	17.8A	9.5A
Internal Power Outlets	3 x C19, 24 x C13	3 x C19, 24 x C13	3 x C19, 24 x C13
Line Connection	Fixed cord & plug	Fixed cord & plug	Fixed cord & plug
Power Cord	5 x 10AWG	5 x 10AWG	5 x 4 mm2
Power Plug	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W
Number of PDUs required	1	1	1
Main Breaker	30A	30A	30A
Sub-breakers	3 x 20A(2p), 1 x 20A(3p)	3 x 20A(2p), 1 x 20A(3p)	3 x 15A(2p), 1 x 15A(3p)
Agency	UL Listed, cUL	UL Listed, cUL	TUV & CB report
Physical Characteristics			
Dimensions (H x W x D)	79 x 24 x 47 in./ 200 x 60 x 120 cm	79 x 24 x 47 in./ 200 x 60 x 120 cm	79 x 24 x 47 in./ 200 x 60 x 120 cm
Shipping Dimensions (H x W x D)	85 x 36 x 56 in./ 217 x 92.5 x 142 cm	85 x 36 x 56 in./ 217 x 92.5 x 142 cm	85 x 36 x 56 in./ 217 x 92.5 x 142 cm
Service Clearance			
Front	31.5 in./80 cm	31.5 in./80 cm	31.5 in./80 cm
Sides	0	0	0
Rear	31.5 in./80 cm	31.5 in./80 cm	31.5 in./80 cm
Installed Weight.	1,240 lbs./563 kg	1,240 lbs./563 kg	1,240 lbs./563 kg
Heat Dissipation (Watts/Btu/hr)			
Maximum heat output, Model 8, Watts	3,405	3,405	3,405
Maximum heat output, Model 8, Btu/hr	11,622	11,622	11,622
Typical heat output, Model 8, Watts	2,430	2,430	2,430
Typical heat output, Model 8, Btu/hr	8,297	8,297	8,297
Maximum heat output, full rack	6,405	6,405	6,405
Maximum heat output, full rack, Btu/hr	21,861	21,861	21,861
Typical heat output, full rack, Watts	3,330	3,330	3,330
Typical heat output, full rack, Btu/hr	11,366	11,366	11,366
Airflow, cfm, minimum, full rack	850	850	850
Airflow, cfm, maximum, full rack	1,210	1,210	1,210

Acoustics (Declared values per ISO 9296 and ISO 7779)	**Idle/Operating** LwAd, B	**(Bystander pos.)** LpAm, dBA
GS1280 Model 8 System Building Block Drawer plus power shelf	7.1	52
GS1280 System Building Block Drawer	6.8	50
Power shelf with three PSU	6.7	48
I/O expansion drawer (3X-BA70A-BA)	7.1	51
StorageWorks Shelf (DS-SL13R-xx)	6.9	53

Note: Current values for specific configurations are available. 1 B = 10 dBA

Power Requirements

AlphaServer GS1280 Model 16	**North America**	**Japan**	**Europe**
PDU Part Number	3X-H7606-AA	3X-H7606-AA	3X-H7606-BA
Voltage	120/208	200	380/415
Rated Current	24A	24A	24A
Phase/Frequency	3W+N+G, 50-60 Hz	3W+G, 50-60 Hz	3W+N+G, 50-60 Hz
KVA, Model 16, one I/O drawer, one StorageWorks Shelf	6.193	6.193	6.193
Current, per phase	19A	20A	10.5A
KVA, Model 16, two I/O drawers, 0 StorageWorks Shelves	6.083	6.083	6.083
Current, per phase	18.5A	19A	10A
Internal Power Outlets	3 x C19, 24 x C13	3 x C19, 24 x C13	3 x C19, 24 x C13
Line Connection	Fixed cord & plug	Fixed cord & plug	Fixed cord & plug
Power Cord	5 x 10AWG	5 x 10AWG	5 x 4 mm^2
Power Plug	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W
Number of PDUs required	1	1	1
Main Breaker	30A	30A	30A
Sub-breakers	3 x 20A(2p), 1 x 20A(3p)	3 x 20A(2p), 1 x 20A(3p)	3 x 15A(2p), 1 x 15A(3p)
Agency	UL Listed, cUL	UL Listed, cUL	TUV & CB report
Physical Characteristics			
Dimensions (H x W x D)	79 x 24 x 47 in./ 200 x 60 x 120 cm	79 x 24 x 47 in./ 200 x 60 x 120 cm	79 x 24 x 47 in./ 200 x 60 x 120 cm
Shipping Dimensions (H x W x D)	86 x 32 x 48 in./ 217 x 92.5 x 142 cm	86 x 32 x 48 in./ 217 x 92.5 x 142 cm	86 x 32 x 48 in./ 217 x 92.5 x 142 cm
Service Clearance			
Front	31.5 in./80 cm	31.5 in./80 cm	31.5 in./80 cm
Sides	0	0	0
Rear	31.5 in./80 cm	31.5 in./80 cm	31.5 in./80 cm
Installed Weight	1,310 lbs./594 kg	1,310 lbs./594 kg	1,310 lbs./594 kg
Heat Dissipation (Watts/Btu/hr)			
Max Heat Output, Model 16, Watts	6,810	6,810	6,810
Max heat Output, Model 16, Btu/hr	23,243	23,243	23,243
Typical Heat Output, Model 16, Watts	3,700	3,700	3,700
Typical Heat Output, Model 16, Btu/hr	12,632	12,632	12,632
Airflow, cfm, minimum, full rack	1,500	1,500	1,500
Airflow, cfm, maximum, full rack	2,200	2,200	2,200

Acoustics **(Declared values per ISO 9296 and ISO 7779)**	**Idle/Operating** LwAd, B	**(Bystander pos.)** LpAm, dBA
Two GS1280 Model 16 System Building Block Drawers and two power shelves	7.4	55
GS1280 8P System Building Block Drawer	6.8	50
Power Shelf with three PSU	6.7	48
I/O Expansion Drawer (3X-BA70A-BA)	7.1	51
StorageWorks Shelf (DS-SL13R-xx)	6.9	53

Note: Current values for specific configurations are available. 1 B = 10 dBA

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