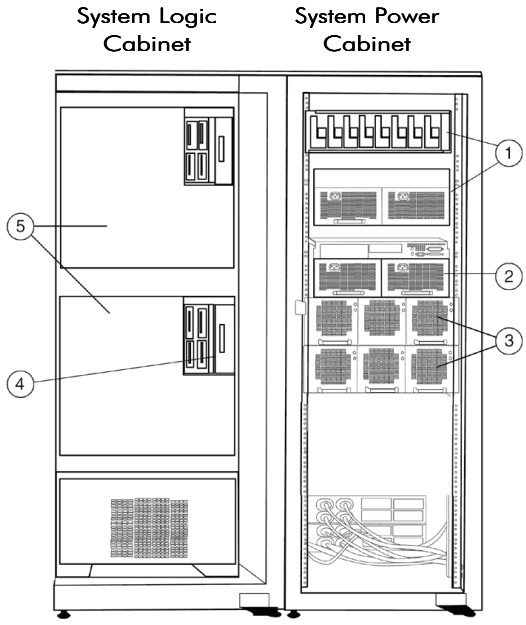
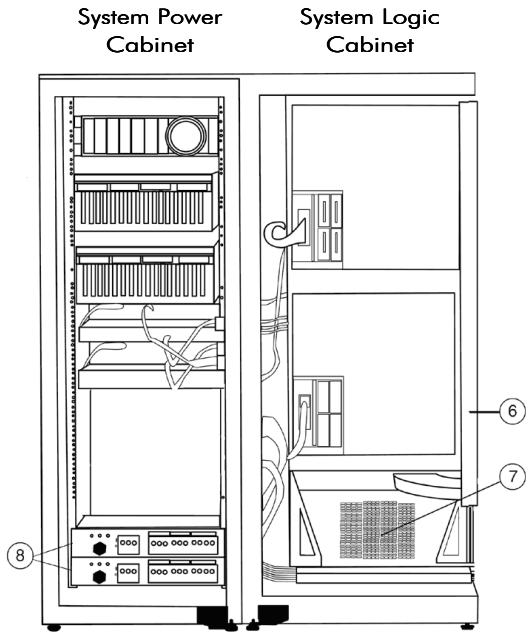
Overview



Front View



Rear View

1. Optional PCI or StorageWorks drawers
2. Standard 14-slot PCI I/O Master Drawer
3. 48-volt DC power shelves, 2 power supplies per shelf, plus optional N+1 (Model 8 includes 1 shelf, Model 16 includes 2 shelves)
4. Connections for PCI drawers
5. System boxes each with 2 QBB's (Model 8 includes 1 system box, 2 QBB's, Model 16 includes 2 system boxes, 4 QBB's)
6. Global switch (GS160 Model 16) or distribution board (GS160 Model 8)
7. Cooling blower

Overview

At A Glance

AlphaServer GS160 systems include:

- One 1224-MHz CPU module; up to 16 (upgradeable to 32) 1224-MHz Alpha 21264 processors supported
- Optional HP Capacity on Demand (CoD) SMP processors for non-disruptive performance growth
- 16-MB of on-board cache per processor
- Advanced crossbar switch with 7-GB/s of memory bandwidth per building block; up to 28.5-GB/s of memory bandwidth per system
- Choice of memory options; up to 128-GB of memory supported (upgradeable to 256 GB)
- Up to 32 64-bit PCI buses with 6.4-GB aggregate I/O bandwidth (upgradeable to 64 PCI channels)
- PCI I/O master drawer with 12 configurable PCI slots; up to 112 64-bit PCI slots supported (upgradeable to 224 slots)
- PCI 10/100 Mbit Ethernet adapter
- 18.2-GB SCSI disk drive
- 600-MB CD-ROM drive
- Enhanced reliability with ECC-protected memory, processor cache and system data paths
- Security of RAID storage and online add and removal of CPUs
- Optional redundant power supplies with N+1 power option
- Tru64 UNIX or OpenVMS factory installed software (FIS); optional high availability support with Tru64 UNIX and OpenVMS cluster solutions
- Upgradeable to AlphaServer GS320
- Product warranty, one-year hardware, on-site next business day

Standard Features

Processor	Up to 16 Alpha 21264 6/1224-MHz CPUs (one CPU per module)
Cache Memory	64-K I and D caches on-chip; 16-MB ECC on-board cache per CPU
Architecture	AlphaServer GS160 utilizes two-level crossbar switch structure Quad building blocks (QBBs) support up to four CPUs, four memory modules, and eight PCI buses on a 7-GB/s non-blocking crossbar switch backplane. The four QBBs in the GS160 Model 16 system are connected by a second level, non-blocking switch with 14-GB/s of bandwidth. The two QBBs in the GS160 Model 8 system are connected by a distribution board. The distribution board is replaced by a global crossbar switch (included in the upgrade kit) if a GS160 Model 8 system is upgraded to a GS160 Model 16 or a GS320 Model 24 or Model 32.

CPUs, Memory, and I/O Slots

Base systems contain one CPU and one master PCI I/O drawer

	Model 8	Model 16
Maximum CPUs supported	8	16
Maximum memory supported	64 GB (8 modules)	128 GB (16 modules)
Maximum PCI slots supported	56	112

NOTE: Systems can be upgraded to a GS320 Model 24 or Model 32 for support of 32 processors, 256-GB memory 224 PCI slots.

NOTE: Model 8 and Model 16 base systems include 12 configurable PCI slots. System capacities shown are available with both Tru64 UNIX and OpenVMS operating systems.

Network and I/O Controllers	Ethernet	PCI Dual 10/100 Mbit Fast Ethernet Adapter (3X-DE602-AA) included in master PCI shelf box; additional Ethernet adapters are available as options
	Console ports	One bi-directional parallel port with 25-pin D-subminiature connector
		Two EIA-232 full duplex asynchronous modem control serial ports, 9-pin D-subminiature connectors
		One PS/2 compatible keyboard port; one PS/2 compatible mouse port

Boot/Diagnostic Devices

Boot/diagnostic devices included in master PCI shelf box

CD-ROM or DVD-ROM	One 5.25-inch half height 600-MB CD-ROM drive or 16X DVD-ROM
Hard Drives	One 18.2-GB 10,000 rpm SCSI disk drive

Internal Disk Expansion	Total Internal Drive Bays	Up to 14 146-GB drives (2,044 GB) can be mounted in optional storage shelves in system power cabinet

Standard Features

Power Supplies	3-phase power subsystem with power cords; optional redundant 48 VDC hot swap power supplies
OS Support	Tru64 UNIX systems include preinstalled software, Base license, Unlimited User license, Server Extension license, Internet Express, and Secure Web Server NOTE: Tru64 UNIX refers to versions 4.0G, 5.1, 5.1A, 5.1B, or later. Refer to the "Supported Options List" - http://www.hp.com/alphaserver/products/options.html – for any unique limitations based on OS version. OpenVMS systems include preinstalled software, Base license and Enterprise Integration Server License Package Revision V3.0A NOTE: OpenVMS refers to versions 7.2-1H1, 7.2-2, 7.3, 7.3-1, or later. Refer to the "Supported Options List" - http://www.hp.com/alphaserver/products/options.html – for any unique limitations based on OS version. Support for up to four total instances of Tru64 UNIX or OpenVMS, or a combination of both, in hardware partitions on a single GS160 hardware platform (up to two instances supported on Model 8 systems, up to four instances supported on Model 16 systems)
Service and Support	Protected by HP Services including a one-year on-site hardware warranty. Training, consulting, network integration, software support, comprehensive system maintenance and guaranteed uptime services are also available for customers requiring higher levels of service and support.

Step 1 - Assess Application Requirements

- Selection of system components must be made in the context of total application requirements. Although the configuration of system components must be done in steps (for example, base packages, CPUs, memories, etc.), these steps cannot be done in isolation.
- The order in which requirements are assessed is also important, since one requirement may impact others. Before proceeding, it would be useful to assess the total application requirements in the following order:
- What level of availability is required?
- If no single points of failure are allowed, then the solution should be configured as a multi-system cluster.
- If access to specific devices must be assured, consider redundant adapters - RAID, N+1 power, redundant PCI drawers, and redundant consoles.
- If software redundancy is required, consider clusters and/or hardware partitioning. The choice of hardware partitioning will generate a need for multiple master PCI drawers, multiple consoles, and I/O adapters.
- If the "CPU On-Line Add and Remove" feature is required, refer to document EK-GSHPG-RM for configuration and operational requirements.
- What level of hardware partitioning is required for optimal system management?
- What overall capacities are required in terms of processor performance, memory capacity, and disk storage?
- How should the system be configured to optimize performance?
- In most cases, optimum performance is achieved if the system resources (CPUs, memory, and I/O adapters) are balanced across the quad building blocks in the system.
- Memory should be configured according to application guidelines listed in Step 4.
- What are the near-term system expansion needs?
- How will system cabinets be physically arranged? This will determine if expansion cabinets are required and what cable lengths are required.

NOTE: Most configuration steps require that these data be considered in whole or in part. Be sure to execute each step in the context of the total application requirements.

System Ordering Requirements:

Certain system components or services are either required for normal operation or are recommended for best system performance and/or operation. This document uses the following definitions to specify these options:

- **Mandatory purchase**: The system cannot function without this option or service - the option or service must be ordered with the system.
- **Required to function**: This option or service is needed to support a working system - the option or service must be ordered with the system or be available onsite.
- **Recommended**: System performance or function will be enhanced if this option or service is ordered.

Step 2 - Select base system

AlphaServer GS160 systems require selection of the following items:

Mandatory Purchases:

- Base system with operating system license (either OpenVMS or Tru64 UNIX), which includes one
- 1224-MHz CPU module
- Minimum of one memory module

Required Options and Services:

- Software media and documentation for first system onsite
- Installation and/or startup services
- System management console or device and software with equivalent functionality

Recommended Services:

- HP Care Pack Service Package
- VIS Services

NOTE: The base system should be selected in the context of the number of hardware partitions required, the total capacity required, and the anticipated near-term system growth.

Systems

AlphaServer GS160 (1224-MHz) Base Systems					
Model	OS	System Boxes/QBBs Included	Total CPUs Supported	Input Power	Order Number
Model 8	Tru64 UNIX	1 / 2	8	120/208V	DA-160BG-AA
Model 8	Tru64 UNIX	1 / 2	8	380-415V	DA-160BG-AB
Model 8	OpenVMS	1 / 2	8	120/208V	DY-160BG-AA
Model 8	OpenVMS	1 / 2	8	380-415V	DY-160BG-AB
Model 16	Tru64 UNIX	2 / 4	16	120/208V	DA-160CG-AA
Model 16	Tru64 UNIX	2 / 4	16	380-415V	DA-160CG-AB
Model 16	OpenVMS	2 / 4	16	120/208V	DY-160CG-AA
Model 16	OpenVMS	2 / 4	16	380-415V	DY-160CG-AB

Step 3 - Additional SMP CPUs

- AlphaServer GS160 base systems contain one CPU module. Additional SMP CPUs may be added, up to the limits shown in above table. SMP CPU options include an operating system SMP license.

GS160/320 SMP upgrade CPU, 6/1224-MHz with 16-MB on-board cache, Tru64 UNIX 3X-KN8AC-AD

GS160/320 SMP upgrade CPU, 6/1224-MHz with 16-MB on-board cache, OpenVMS 3X-KN8AC-AE

HP Capacity on Demand (CoD) CPUs

- AlphaServer GS160 base systems can be configured with optional HP Capacity on Demand (CoD) CPUs for non-disruptive future capacity expansion. The CPUs will be field installed as part of the system installation. The total number of CPUs – base CPU, SMP CPUs, and CoD CPUs – must adhere to the limits shown in the above table. Refer to the HP Capacity on Demand Program described in the "Upgrades" section.

GS160/320 CoD SMP CPU, includes one 6/1224-MHz CPU module with 16-MB on-board cache, Tru64 UNIX SMP license, and CoD program license 3X-KN8CC-AD

GS160/320 CoD SMP CPU, includes one 6/1224-MHz CPU module with 16-MB on-board cache, OpenVMS SMP license, and CoD program license 3X-KN8CC-AE

Step 4 - Select Memory Options

- Memory options are engineered specifically for use with this series and include additional components, which are integral to the system architecture.
- Memory options consist of a series of base modules that contain one memory array. A second array (called "upgrades" in the table) may be added to a base module in the factory or in the field.

0.5-GB GS80/160/320 base memory module	3X-MS8AA-AB
0.5-GB GS80/160/320 memory DIMM upgrade	3X-MS8AA-AU
1-GB GS80/160/320 base memory module	3X-MS8AA-BB
1-GB GS80/160/320 memory DIMM upgrade	3X-MS8AA-BU
2-GB GS80/160/320 base memory module	3X-MS8AA-CB
2-GB GS80/160/320 memory DIMM upgrade	3X-MS8AA-CU
4-GB GS80/160/320 base memory module	3X-MS8AA-DB
4-GB GS80/160/320 memory DIMM upgrade	3X-MS8AA-DU

Memory Configuration Guidelines

Memory options should be selected in the context of the application's sensitivity to memory bandwidth and memory capacity, and the number of hardware partitions. This will determine the number of memory base modules and upgrades needed. The total capacity required will determine the size of the arrays to be chosen.

The configuration of memory may influence the performance of applications, and there are numerous ways to configure the choices of memory base modules and upgrade DIMMs. The following general guidelines can lead to several configuration choices. Application-specific guidelines will help narrow down the choices.

- Configuring for capacity: The highest capacity is achieved when the 3X-MS8AA-DB/DU combination is used.
- Configuring for performance: Interleaved operations reduce the average latency and increase the memory throughput over non-interleaved operations. Each memory base module is capable of 4-way interleaving with one array (no upgrades added) or 8-way interleaving with two arrays (base module plus one upgrade). A QBB configured with eight arrays (four base modules plus four array upgrades) provides 32-way interleaving and has the maximum potential memory bandwidth. Refer to "Memory Application Examples" below to determine which applications gain the most benefit from this bandwidth.
- Memory modules should be configured in powers of 2: That is, 0, 1, 2, or 4 base modules in a QBB. Upgrades should also be installed in powers of 2: 0, 1, 2, or 4 base modules in a QBB.
- Although mixed-capacity memory modules may be configured, the highest bandwidth is achieved when a QBB is populated with eight identical arrays: four base modules, and four upgrades. The next-highest bandwidth would be four base modules (four arrays).
- If it is not possible to match the capacities of all the arrays, the next best choice is to configure pairs of identical base modules, or base module/upgrade combinations. For example, a configuration of two 2-GB base modules (3X-MS8AA-CB), each with a 1-GB upgrade (3X-MS8AA-BU), is a better choice than a configuration of three 2-GB modules (3X-MS8AA-CB).

Memory Application Examples

Configuring memory is a compromise between cost, total memory capacity, and memory bandwidth requirements. The behavior of the application must be used to define the most-desired configuration. Some applications are sensitive to memory capacity, some are sensitive to memory bandwidth, some are sensitive to neither. If actual application measurements are not available, the following may be used as guidelines:

- Large memory (VLM) applications, in which large amounts of memory can substantially reduce I/O, may be optimized for total memory capacity and future capacity growth. In VLM applications, the right balance might be one memory base module, with upgrade, for every two CPUs. This would result in one memory array per CPU.
- Typical commercial applications, such as transaction processing (OLTP) and multi-user timesharing, usually operate efficiently from cache and may not be materially affected by memory bandwidth. Memory configuration is a balance between memory bandwidth and future capacity growth. It is advisable to match the number of arrays to the number of CPUs.
- Data mining can benefit from additional memory bandwidth. It is best to match the number of memory base modules to the number of CPUs.
- The most demanding high-performance technical applications (HPTC) achieve a performance level that is directly proportional to memory bandwidth. In these cases, configure one memory base module with upgrade per CPU. This results in two memory arrays per CPU.

The following table represents how 8 GB could be configured in a 4-CPU QBB in each of the four referenced applications. The numbers under each application represent how many of each memory option would be ordered.

Memory Configuration Examples – Configuring a system drawer with a total of 8 GB for specific applications					
		Application			
		VLM	OLTP, Timesharing	Data Mining	HPTC
1-GB base module	(3X-MS8AA-BB)	-	-	-	4
1-GB upgrade	(3X-MS8AA-BU)	-	-	-	4
2-GB base module	(3X-MS8AA-CB)	2	2	4	-
2-GB upgrade	(3X-MS8AA-CU)	2	2	-	-
The following additional configuration options utilizing the 4-GB base module are available:					
4-GB base module	(3X-MS8AA-DB)	2	2	N/R	N/R
4-GB upgrade	(3X-MS8AA-DU)	-	-		
NOTE: N/R = Not recommended - For these applications, configure either four or eight like-sized memory options rather than one or two.					

Step 5 - Evaluate Configuration Requirements to Support Optional Partitioning

Configuration Requirements for Partitions

Configuring partitions requires some attention to detail with respect to minimum requirements for option selection, population, and option placement.

- A single AlphaServer GS160 can be divided into logical hardware partitions, each running an instance of Tru64 UNIX or an instance of OpenVMS. Each partition is allocated its own dedicated "shared-nothing" set of hardware resources: QBB(s), CPU module(s), memory module(s), and I/O.
- Multiple-QBB hard partitions within a GS server do not provide complete hardware failure isolation across hard partitions. Single hard partitioned QBBs within the server do provide hardware failure isolation.
- Each hardware partition is viewed as a unique node, from a system point-of-view, with its own instance of Tru64 UNIX or OpenVMS operating system and application software, independent system console, and error log.
- Hardware partitions are defined on QBB boundaries; each partition is an integer multiple of QBBs.
- Up to two hardware partitions are supported on GS160 Model 8 systems; up to four hardware partitions are supported on Model 16 systems.
- One system management console (3X-DS8BA-xx or 3X-DS8DA-xx) and one console hub (3X-DS8AA-AA) are recommended per system.
- Supported option rules apply for maximum configurations of each AlphaServer GS160 system partition. Care must be exercised to ensure that any planned reconfiguration of hardware partitions will not violate option support rules.

Minimum Hardware Required per AlphaServer GS160 Hardware Partition

Each hardware partition requires a minimum of one QBB, however, multiple QBBs are allowed within a single hardware partition. The first QBB in a hardware partition must be configured with the minimum hardware listed below. This, and other QBBs in the partition, can be configured with additional hardware once this minimum requirement is met.

- One Alpha 21264 6/1224-MHz CPU module
- One 3X-MS8AA-BB/CB/DB memory module (1 GB, 2 GB, 4 GB)
- One 3X-KFWHA-AA system I/O module and one 3X-DWWPA-AA master PCI drawer. Depending upon the configuration, this may require the use of a 3X-H9A20-AD/AE/AF expansion cabinet.
- AlphaServer GS160 systems are normally configured according to standard module placement rules, and are shipped with one copy of the operating system installed at the factory (Tru64 UNIX or OpenVMS). However, systems with hardware partitions offer hardware and software configuration flexibility. Factory integration services (VIS) are recommended to enable custom module configuration and factory installation of multiple copies of the operating system on hardware- partitioned systems.

Optimizing System Resources

The following configuration guidelines can be used to improve performance in systems or in each partition of a hardware-partitioned system.

- Balance the resources in the system (or hardware partition) based upon the available backplane space and the proposed option populations:
- Sparsely configured systems, those using half or less than half of their available capacity for CPUs, memory, and PCI drawers, should be configured with the options concentrated in as few QBBs as possible. For example, a GS160 Model 16 with eight CPUs, eight memory modules, and four PCI drawers would usually be configured in the first two QBBs. The first two QBBs would be "active" and the 3rd and 4th QBBs would be available for expansion.
- Densely populated systems, those using more than half of their available capacity for CPUs, memory, and PCI drawers, should be configured with the options spread out across all QBBs.
- Configure active QBBs symmetrically, each with CPUs, memory, and PCI drawers.
- Configure the I/O adapters so that each active QBB has direct access to the most frequently accessed data.

System Software Required for AlphaServer GS160 Hardware Partition Support

Software Licensing for Hardware Partitions

- Base systems include operating system license (Tru64 UNIX or OpenVMS) that licenses hardware partitions up to the physical limit of the base system package: two hardware partitions for Model 8 systems, four partitions for Model 16 systems.

User and capacity-based licensing is unaffected by hardware partitions. Examples:

- If a product is licensed for 200 concurrent users, these users can be split among the partitions, but cannot exceed 200 total users.
- If users have an enterprise capacity license for a product, that license can be loaded into the license databases on each of the hardware partitions.

Licensing Partitioned AlphaServer GS160 Systems for Both OpenVMS and Tru64 UNIX

- If the system requires both OpenVMS and Tru64 UNIX operating systems be licensed, one operating system license is included in the base system and the second is added as a line item. The second operating system license upgrade, which includes the license for only one CPU, would be added to the order using the following part numbers. Order appropriate media and documentation kits from Step 13.

OpenVMS software upgrade for GS160/GS320	QB-63PAQ-AG
Tru64 UNIX software upgrade for GS160/GS320	QB-595AN-AA

Options

- Only those SMP processors intended for use with the second operating system must be similarly licensed. Use the following license-only part numbers to add an SMP license for any CPUs intended for use with the second operating system:

OpenVMS Alpha SMP license for GS160/GS320	QL-MT1A9-6R
Tru64 UNIX Alpha SMP license for GS160/GS320	QL-MT4A9-6R

- The order of licensing is not important, but the following examples are similarly constructed for clarity. The configuration starts with a Tru64 UNIX base system part number and the addition of OpenVMS licenses.

Example 1: 16-CPU GS160 system in which all processors are licensed for both OpenVMS and Tru64 UNIX:

- Base system order would include a DA-160CE-Ax and 15 3X-KN8BA-AD SMP upgrade CPUs
- Add one QB-63PAQ-AG OpenVMS Software Upgrade and 15 QL-MT1A9-6R OpenVMS Alpha SMP licenses

Example 2: 16-CPU GS160 system in which all the processors are licensed for Tru64 UNIX and eight processors are also licensed for OpenVMS:

- Base system order would include a DA-160CE-Ax and 15 3X-KN8BA-AD SMP upgrade CPUs
- Add one QB-63PAQ-AG OpenVMS software upgrade and seven QL-MT1A9-6R OpenVMS Alpha SMP licenses
- User and capacity-based licenses would be added for the second operating system environment as though it were a standalone system.

Step 6 - Configure Packaging Options

Step 6a - Redundant (N+1) Power Supplies

- Power supplies included with Model 8 and Model 16 systems can support all combinations of CPUs, memory, and I/O that can be configured within the system boxes.
- Additional 48V power regulators can be ordered to provide N+ 1 power redundancy.
- For Model 8 systems, order one power supply to achieve N+ 1 capability; for Model 16 systems, order two power supplies to achieve N+ 1 capability.

2000W 48V power supply	H7506-BA

Step 6b - Internal System Expansion

AlphaServer GS160 Model 8 and Model 16 systems support two additional shelves in the power cabinet.
Available choices are:

- One additional PCI drawer (master or expansion)
- One additional PCI drawer (master or expansion) and one DS-SL13R-xx StorageWorks shelf, or
- One or two StorageWorks DS-SL13R-xx shelves
- Mixed configurations of BA36R and DS-SL13R-xx shelves are supported

Internal StorageWorks Expansion	• System power cabinet provides space for up to two forward facing storage shelves. • Up to two DS-SL13R-xx Ultra3 SCSI (LVD) shelves; each shelf supports a maximum of 14 Ultra3 disk drives

Options

Configuring DS-SL13R-xx Ultra3 (LVD) Shelves

- Each single-bus Ultra3 shelf requires a 3X-KZPCA-AA Ultra2 (LVD) SCSI adapter or DS-KZPCC-xx RAID controller and a SCSI cable to connect controller to shelf
- Each split-bus Ultra3 shelf requires two 3X-KZPCA-AA Ultra2 (LVD) SCSI adapters, at least one dual-channel 3X-KZPEA-DB Ultra3 (LVD) SCSI adapter, or DS-KZPCC-xx RAID controllers and SCSI cables to connect controller to shelf
- Ultra3 shelves connected to 3X-KZPCA-AA adapters in the power cabinet require BN38C-02 2-meter cables; DS-KZPCC-xx RAID controllers require BN37A-02 2-meter cables.
- Ultra3 shelves connected to 3X-KZPCA-AA adapters in an attached expander cabinet require BN38C-10 10-meter cables; DS-KZPCC-xx RAID controllers require BN37A-10 10-meter cables.
- Ultra3 shelves connected to 3X-KZPCA-AA adapters in a remote expander cabinet require 10 20-meter BN38C-xx cables, depending upon physical cabinet location; DS-KZPCC-xx RAID controllers require BN37A-xx cables.
- Ultra3 Universal drives are listed in a subsequent section

StorageWorks Model 4314R Ultra3 SCSI (LVD) single-bus Universal drive rackmount shelf, International except Japan	DS-SL13R-AA
StorageWorks Model 4314R Ultra3 SCSI (LVD) single-bus Universal drive rackmount shelf, Japan	DS-SL13R-AJ
StorageWorks Model 4354R Ultra3 SCSI (LVD) split-bus Universal drive rackmount shelf, International except Japan	DS-SL13R-BA
StorageWorks Model 4354R Ultra3 SCSI (LVD) split-bus Universal drive rackmount shelf, Japan	DS-SL13R-BJ

NOTE: Model 4314 shelf with DS-KZPCC-CE RAID controller does not support a disk drive in the last slot.

Power Option for DS-SL13R-xx Shelves

- Additional power supply provides N+ 1 power for 4314R Ultra3 (LVD) StorageWorks shelves; power supply uses a dedicated location in the shelf.
- Not required for 4354R shelves.

Redundant power supply for 4314R Ultra3 (LVD) StorageWorks shelf, North America	DS-SE2UP-BA
Redundant power supply for 4314R Ultra3 (LVD) StorageWorks shelf, International	DS-SE2UP-BI

System I/O Expansion

- Model 8 systems support up to four PCI drawers; Model 16 systems support up to eight PCI drawers. One PCI drawer included in Model 8 and Model 16 base systems.
- Model 8 and Model 16 power cabinets provide space for one additional PCI drawer if no more than one internal storage shelf is configured.
- Additional PCI drawers and storage shelves can be configured in 3X-H9A20-AD/AE/AF I/O expansion cabinet, described in a subsequent section.
- All PCI drawers contain 14 PCI slots configured into four PCI buses; two of the buses have four slots each, the other two buses have three slots each.
- There are two types of PCI drawers: expansion drawers and master drawers. Base system configurations include one PCI master drawer with 12 configurable PCI slots.
- Expansion drawers contain 14 PCI slots and N+1 redundant power system; expansion drawers are used for most PCI expansion applications.
- Optional master drawers contain 13 configurable PCI slots, N+1 redundant power system, plus the console ports and storage devices required for use as a system console. (These devices are listed on page 2. Note that the Fast Ethernet adapter is not included in optional master PCI drawers.) Optional master drawers have two applications:
  - As redundant console sub-systems
  - As consoles for individual partitions in hardware partitioned systems
- PCI drawers are connected to a QBB utilizing a 3X-KFWHA-AA system I/O module that connects to the PCI drawer using two BN39B cables.

Options

PCI Drawer Expansion

- PCI drawers are connected to a QBB utilizing a 3X-KFWHA-AA system I/O module that connects to the PCI drawer using two BN39B cables.
- Maximum one additional drawer in the system power cabinet; see "External Expansion Cabinets" for more details.
- PCI drawers can be split between multiple QBBs as long as all QBBs are contained within the same hardware partition.
- PCI drawers mounted in a common H9A20 Expansion Cabinet can server multiple systems.

Master PCI shelf mount box for system and I/O expansion cabinets with standard I/O PCI module and 13 PCI expansion slots. (The 1st master is standard with all systems and includes a standard Ethernet network card and the system module and cable pair for connection to the QBB.)	3X-DWWPA-AA
Expansion PCI shelf mount box for system and I/O expansion cabinets with 14 PCI expansion slots	3X-DWWPA-BA
System I/O module for connecting to master or expansion PCI shelves	3X-KFWHA-AA
I/O module cable for connection between I/O module and master or expansion PCI shelves are mounted in system power cabinet; two are mandatory per system I/O module	BN39B-04

Step 6c - External Expansion Cabinets

- Additional PCI drawers and storage shelves can be installed in optional 3X-H9A20-AD/AE/AF expansion cabinets. Up to four 3X-H9A20-AD/AE/AF cabinets are supported.
- 3X-H9A20-AD/AE/AF I/O expansion cabinet can be configured to hold all disk BA36R StorageWorks shelves or DS-SL13x-xx Ultra3 StorageWorks shelves or combination of StorageWorks shelves and PCI drawers.
- If no PCI drawers are configured, cabinet supports up to eight BA36R or five DS-SL13R-xx StorageWorks shelves.
- If one PCI drawer is configured, cabinet supports up to five BA36R or four DS-SL13R-xx StorageWorks shelves.
- If two PCI drawers are configured, cabinet supports up to four BA36R or three DS-SL13R-xx StorageWorks shelves.
- If three PCI drawers are configured, cabinet supports up to two BA36R or two DS-SL13R-xx StorageWorks shelves.
- If four PCI drawers are configured, the cabinet supports one BA36R or DS-SL13R-xx StorageWorks shelf.
- BA36R and DS-SL13R-xx StorageWorks shelves can be combined in the same expansion cabinet.

Black I/O expansion cabinet for use with GS160 systems, includes two 120V single-phase power controllers and cords for use in US and Canada - Does not support dual AC input configurations	3X-H9A20-AD
Black I/O expansion cabinet for use with GS160 systems, includes two 220-240V single phase power controllers and cords for use in Europe – Supports dual AC input configurations	3X-H9A20-AE
Black I/O expansion cabinet for use with GS160 systems, includes two 200-240V single phase power controllers and cords for use in US, Canada, and Japan – Supports dual AC input configurations	3X-H9A20-AF

- If large quantities of disks are required, the use of StorageWorks Storage Array cabinets and components is highly recommended.
- Systems installed in the US and Canada may use the 3X-H9A20-AD when 120V input power is required. In all other cases, the 3X-H9A20-AF is preferred because of the ability to support dual AC input.
- 3X-H9A20-AD/AE/AF cabinets may be joined to GS160 systems. PCI drawers placed in these cabinets require 7-meter I/O cables.
- 3X-H9A20-AD/AE/AF cabinets may be placed up to 6 meters from the system cabinet. Multiple expander cabinets may be connected to one another or placed separately. Each group of free-standing H9A20 cabinets requires an end-panel trim kit (CK-H9A20-AB).
- PCI drawers placed in remote cabinets require 10-meter I/O cables.

Black end-panel trim kit for remote 3X-H9A20-AD/AE/AF cabinets	CK-H9A20-AB
I/O module cables for connection between I/O module and master or expansion PCI drawers mounted in 3X-H9A20-AD/AE/AF expansion cabinet adjacent to the system; two cables (BN39B-07 or BN39B-10) are mandatory per PCI drawer.	BN39B-07
I/O module cables for connection between I/O module and master or expansion PCI drawers mounted in a second expansion cabinet or in remote 3X-H9A20-AD/AE/AF expansion cabinets; two cables (BN39B-07 or BN39B-10) are mandatory per PCI drawer.	BN39B-10

Step 7 - Storage

Step 7a - Storage Adapters and Controllers

- Tru64 UNIX supports a maximum of 64 total SCSI controllers per operating system instance (hardware partition). OpenVMS supports a maximum of 26 total SCSI controllers per operating system instance. Total SCSI controllers (all types) in the system must be within these limits regardless of the maximum per system I/O adapter limitations. Refer to the "Supported Options List" for specific configuration rules.
- Each master PCI drawer contains embedded SCSI controllers (a FIS disk and a CD), which is included in the overall count of SCSI controllers configured in the system (or partition). Tru64 UNIX counts FIS disk and CD-ROM as an embedded SCSI device. OpenVMS counts the FIS disk only as an embedded SCSI device. Therefore, one (OpenVMS) or two (Tru64 UNIX) SCSI controllers per master PCI drawer must be included in the total count of SCSI devices in the system.
- Calculating the total number of SCSI controllers in the system (or partition) is done by adding all the devices in the system that the operating system categorizes as a SCSI device. Tru64 UNIX includes the following devices in this count: KZPBA-CA, KZPBA-CB, 3X-KZPBA-CC, 3X-KZPCA-AA, DS-KZPCC-CE, DS-KGPSA-CA., DS-KGPSA-DA Fibre Channel, and two embedded master PCI components per master PCI drawer. OpenVMS includes the following devices in this count: KZPBA-CA, KZPBA-CB, 3X-KZPBA-CC, 3X-KZPCA-AA, 3X-KZPEA-DB, DS-KZPCC-AC, and one embedded master PCI component per master PCI drawer.
- For cluster configurations, use Y cable (BN39A-0G).
- Manufacturing may substitute correct cable lengths depending on configuration.

NOTE: "Per System" quantities apply to systems or to each hardware partition. The SCSI adapters included in the base system or in 3x-DWWPA-AA master PCI drawers must be included in this calculation.

	Maximum # Supported						
	Tru64 UNIX			OpenVMS			
	Per System	Per QBB	Per PCI Drawer	Per System	Per QBB	Per PCI Drawer	
Fibre Channel							
PCI Fibre Channel adapter (uses one PCI slot); requires Fibre Channel with SC connector for adapter	26/62*	26/26*	13	26	26	13	DS-KGPSA-CA
2-GB PCI-X Fibre Channel adapter	26/32*	26	12	26	26	12	DS-KGPSA-EA
Fibre Channel SC-SC cable (BNGBX-xx), xx=02, 03, 05, 10, 15, 30, 50 meters							BNGBX-xx
Fibre Channel SC-LC cable, 2-meter (2976), 5-meter (2977), 15-meter (2978), 30-meter (3458), 50-meter (3459)							3R-Axxxx-AA
Fibre Channel LC-LC cable, 2-meter (2979), 5-meter (2980), 15-meter (2981), 30-meter (3454), 50-meter (3455)							3R-Axxxx-AA
SCSI							
PCI 1-port UltraSCSI differential host adapter* (uses one PCI slot); requires BN38C-xx cable	24/62*	24/26*	12/13*	24	24	12	3X-KZPBA-CC
VHDCI male-to-68-pin HD male UltraSCSI cable xx=02, 03, 05, 10, 20 meters (use -02 for connecting SCSI adapter to SCSI devices when both the PCI shelf and StorageWorks shelf are in the system cabinet or in an adjacent expansion cabinet; use -05, -10, and -20 for connecting SCSI adapter to SCSI devices when the PCI shelf and StorageWorks shelf are in two different cabinets)							BN38C-xx

Options

PCI 1-port Ultra2 (LVD) SCSI adapter, 32-bit, single-channel (uses one PCI slot); includes external 68-pin HD connectors; requires BN38C-xx cable to connect adapter to Ultra2 or Ultra3 shelf; HSZxx RAID controllers not supported.	8	8	8	8	8	8	3X-KZPCA-AA
68-pin HD male-to-VHDCI male UltraSCSI cable; xx=02, 03, 05, 10, 20 meters							BN38C-xx
PCI 2-channel Ultra3 (LVD) SCSI adapter, 64-bit/66-MHz (uses one PCI slot); includes internal 68-pin HD and external 68-pin VHDCI connectors; requires 3X-BC56J-xx cable to connect adapter to DS-SL13R-Bx/DS-SSL14-xx Ultra3 shelf. NOTE: OpenVMS 7.2-2, or later, is required; Tru64 UNIX 5.1B PK4, or later is required, maximum cable length is 12 meters.	4	4	4	4	4	4	3X-KZPEA-DB
68-pin VHDCI male-to-VHDCI male UltraSCSI cable; xx=02, 03, 04, for 6, 12, and 24 meters respectively							3X-BC56J-xx

RAID							
PCI 2-port PCI to Ultra3 64-bit, 66-MHz, LVD backplane RAID controller with 128-MB cache (uses one PCI slot); requires connection to DS-SL13R-xx shelves. NOTE: No host-based volume shadowing or shared bus support under OpenVMS.	8	8	4	8	8	4	3X-KZPDC-BE
PCI 4-port PCI to Ultra3 64-bit, 66-MHz, LVD backplane RAID controller with 256-MB cache (uses one PCI slot); requires connection to DS-SL13R-xx shelves.	8	8	4	8	8	4	3X-KZPDC-DF
PCI 1-channel Ultra2 (LVD) SCSI RAID controller**, 16-MB cache, (uses one PCI slot); supports 14 disks per channel with DS-SL13R-xx Ultra3 shelves; requires BN37A-xx cable to connect adapter to DS-SL13R-xx Ultra3 shelf.	8	8	8	-	-	-	DS-KZPCC-AC
PCI 2-channel Ultra3 (LVD) SCSI RAID controller**, 128-MB cache, (uses one PCI slot); supports 14 disks per channel with DS-SL13R-xx Ultra3 shelves; requires BN37A-xx cable to connect adapter to DS-SL13R-xx Ultra3 shelf.	8	8	8	-	-	-	DS-KZPCC-BE
PCI 4-channel Ultra3 (LVD) SCSI RAID controller**, 256-MB cache, (uses one PCI slot); supports 14 disks per channel with DS-SL13R-xx Ultra3 shelves; requires BN37A-xx cable to connect adapter to DS-SL13R-xx Ultra3 shelf.	8	8	8	-	-	-	DS-KZPCC-DF
PCI 3-channel Ultra2 (LVD) SCSI RAID controller**, 64-MB cache, (uses one PCI slot); supports 14 disks per channel with DS-SL13R-xx Ultra3 shelves; requires BN37A-xx cable to connect adapter to DS-SL13R-xx Ultra3 shelf.	8	8	8	-	-	-	DS-KZPCC-CE
68-pin VHDCI male-to-VHDCI male UltraSCSI cable; xx=02, 03, 05, 10, 20 meters							BN37A-xx

* = Tru64 UNIX V5.1 is required to support 62 adapters per partition and 13 adapters per PCI drawer. Tru64 UNIX 4.0G supports 26 adapters per partition.
** = Requires a Graphics Adapter or Graphical Display Station for its configuration utility (other than the base system console).

NOTE: Use 2-meter cable to connect adapters, controllers, and shelves within the GS160 power cabinet.
Use 10-meter cable to connect adapters, controllers to shelves in attached H9A20 expander cabinets.
Use 10- to 25-meter cables to connect adapters, controllers to shelves in remote expander cabinets.

Options

HVD to LVD Converters	HVD (High Voltage Differential) adapters and LVD (Low Voltage Differential) devices are normally incompatible due to their different signaling voltage levels. This incompatibility does not allow direct communication between the different technologies. The HVD to LVD converter allows connectivity between legacy HVD Host Bus Adapters and today's LVD devices. The converter provides: • Connectivity in direct attach or shared configurations of all currently available LVD devices, including disks, tapes, libraries, and shelves (4314 or 4354) when used with the KZPBA-CB and 3X-KZPBA-CC HVD adapters. With the retirement of StorageWorks 1 disks and HVD shelves (BA36R), converters are desirable where upgrades to LVD HBAs, or upgrades to current operating system versions are not possible. • Shared and direct attach configurations are interconnected much the same as those previously configured with homogeneous HVD solutions, except that the HVD output is now passed through the converter before proceeding to the LVD device. Where required, Y cables (BN21W-0B), terminators (H879-AA), cables (BN38C-10, BN37A-20), one or two HVD/LVD converters (one-port, two-port), Memory Channel adapters (CCMAB), one Memory Channel cable (BN39B-10), are used in conjunction with the LVD device of choice.	
	HVD to LVD one-port converter	3X-DWZCV-BA
	HVD to LVD two-port converter	3X-DWZCV-CA
CI Adapters (OpenVMS only)	PCI CI adapter, maximum 26 per system or hardware partition (12 per QBB, six per PCI); requires two PCI slots	CIPCA-BA
	Computer interconnect cable set, connects CIPCA to star coupler; select length xx=10, 20, 45 meters	BNCIA-xx
Step 7b - Internal Storage		
Ultra3 SCSI (LVD) **Storage Devices** (for use with DS-SL13R-xx Shelves)	18.2-GB Ultra3 SCSI 15,000 rpm Universal 1-inch disk drive	3R-A3848-AA
	36.4-GB Ultra3 SCSI 10,000 rpm Universal 1-inch disk drive	3R-A3838-AA
	36.4-GB Ultra3 SCSI 15,000 rpm Universal 1-inch disk drive	3R-A3849-AA
	72.8-GB Ultra3 SCSI 10,000 rpm Universal 1-inch disk drive	3R-A3839-AA
	72.8-GB Ultra3 SCSI 15,000 rpm Universal 1-inch disk drive	3R-A3851-AA
	146-GB Ultra3 SCSI 10,000 rpm Universal 1-inch disk drive	3R-A3841-AA
Ultra2 SCSI (LVD) **Tape Devices** (for use with DS-SL13R-xx Shelves)	AIT-351B, 35-GB tape drive embedded in hot-plug Universal carrier	3R-A2396-AA
	AIT-50, 50-GB tape drive embedded in hot-plug Universal carrier	3R-A2779-AA
	AIT-100, 2000-GB tape drive embedded in hot-plug Universal carrier	3R-A3621-AA
	DAT 40 internal tape drive kit (Q1553A)	3R-A4752-AA
	DAT 72 internal tape drive kit (Q1525A)	3R-A4544-AA
Step 7c - Tape Devices		
3U Rackmount Tape Drive Enclosure	3U LVD Rackmount Tape Drive Enclosure for use in H9Axx Series Cabinets, 0 drives, carbon black	274338-B21
	Rackmount kit for H9Axx Series Cabinet, carbon black – required for mounting 3U Rackmount Tape Drive Enclosure in H9Axx cabinets	3R-A3804-AA
	NOTE: The 3U Tape Drive Enclosure supports up to four internal half-height removable devices, or up to two full height devices. Select up to four AIT or DAT devices, or two DLT/SDLT devices with 3U Rackmount Tape Drive Enclosure (274338-B21), or select preconfigured configurations listed below.	

Options

Tape Drives for Use in 3U Rackmount Tape Drive Enclosure (Requires 3X-KZPCA-AA or 3X-KZPEA-DB LVD Adapter)	AIT 35/70-GB 3U internal tape drive, carbon black	216884-B21
	AIT 50/100-GB 3U internal tape drive, carbon black (157766-B22)	3R-A3753-AA
	DAT 20/40-GB 3U internal tape drive, carbon black (157769-B22)	3R-A3752-AA
	DLT8000 40/80-GB internal tape drive, carbon black	146196-B22
	SDLT 110/220-GB internal tape drive, carbon black	192106-B25
	SDLT 160/320-GB internal tape drive, carbon black	257319-B21
Preconfigured Configurations	AIT 50-GB, 3U rackmount kit, carbon black	274333-B21
	DLT 40/80-GB, 3U rackmount kit, carbon black	274332-B21
	DLT 40/80-GB, dual-drive, 3U rackmount kit, carbon black	274335-B21
	SDLT 110/220-GB, single drive, 3U rackmount kit, carbon black	274331-B21
	SDLT 110/220-GB, dual-drive, 3U rackmount kit, carbon black	274334-B21
5U Rackmount Tape Drive Enclosure (Requires 3X-KZPCA-AA or 3X-KZPEA-DB LVD Adapter)	5U Rackmount Tape Drive Enclosure (Requires 3X-KZPCA-AA or 3X-KZPEA-DB LVD Adapter)	274339-B21
	Rackmount Kit for H9Axx Series Cabinet, carbon black – required for mounting 5U Rackmount Tape Drive Enclosure in H9Axx cabinets	254795-001
	NOTE: The 5U Rackmount Tape Drive Enclosure supports four full-height devices; select up to four DLT or SDLT devices with 274339-B21, or select preconfigured configurations listed below.	
Tape Drives for Use in 5U Tape Drive Enclosure	DLT8000 40/80-GB tape drive, carbon black	146196-B22
	SDLT 110/220-GB tape drive, carbon black	192106-B25
	SDLT 160/320-GB tape drive, carbon black	257319-B21
Preconfigured Configurations	SDLT 110/220-GB Tape Array III, 5U rackmount kit, carbon black	274336-B21
	DLT 40/80-GB Tape Array III, 5U rackmount kit, carbon black	274337-B21
	DLT Tape Array III Model 0 enclosure, U.S.	168047-001
	Same as above, International	168047-B31
	Same as above, Japan	168047-291
AIT Tabletop Tape Drives	AIT 35/70-GB 8-mm LVD tabletop tape drive, North America carbon black; requires LVD adapter	216885-001
	Same as above, International	216885-B31
	Same as above, Japan	216885-291
	AIT 50/100-GB 8-mm SCSI tabletop tape drive with 120V North American power cord, carbon black; requires Ultra2 (LVD) adapter	157767-002
	Same as above, International	157767-B32
	Same as above, Japan	155767-292
AIT Hot-plug Tape Drives	AIT 35/70-GB hot-plug LVD Universal tape drive, uses two slots in 43xxx shelves	3R-A2396-AA
	AIT 50/100-GB hot-plug LVD Universal tape drive, uses two slots in or 43xxx shelves	3R-A2779-AA
	AIT-100, 2000-GB tape drive embedded in hot-plug Universal carrier	3R-A3621-AA
AIT Autoloaders	AIT 35-GB tabletop autoloader, 8 cartridge, U.S.	292355-001
	Same as above, International	292355-B31
	AIT 35-GB rackmount autoloader, 8 cartridge, U.S.	280349-001
	Same as above, International	280349-B31
	AIT Rail kit for rackmount autoloader	284930-001

Options

AIT Tape Libraries	SSL2020 AIT tabletop library with one AIT 50-GB drive and 20 slots, LVD	175195-B21
	SSL2020 AIT tabletop library with two AIT 50-GB drives and 20 slots, LVD	175195-B22
	SSL2020 AIT rackmount library with one AIT 50-GB drive and 20 slots, LVD	175196-B21
	SSL2020 AIT rackmount library with two AIT 50-GB drives and 20 slots, LVD	175196-B22
DAT Tabletop Tape Drives	DAT 12/24-GB 4-mm narrow single-ended tabletop SCSI tape drive with 120V North American power cord; requires BN31W-xx SCSI cable	DS-TLZ10-DB
	DAT 20/40-GB 4-mm Wide Ultra2 (LVD) tabletop SCSI tape drive with 120V North American power cord, carbon black; requires Ultra2 (LVD) adapter	157770-002
	Same as above, International	157770-B32
	Same as above, Japan	157770-292
	DAT 40-GB LVD tabletop tape drive with North America power cord (Q1554A)	3R-A4753-AA
	Same as above, International (Q1555A)	3R-A4754-AA
	DAT 72-GB LVD tabletop tape drive with North America power cord (Q1525A)	3R-A4545-AA
	Same as above, International	3R-A4546-AA
DAT Hot-plug Tape Drives	DAT 40-GB hot-plug LVD tape drive (Q1546A), uses two slots in 43xxx shelves	3R-A4745-AA
	DAT 72-GB hot-plug LVD tape drive (Q1529A), uses two slots in 43xxx shelves	3R-A4747-AA
DAT Autoloaders	DAT 20/40-GB auto loader external; requires BN31W-xx SCSI cable and 3X-KZPCA-AA, 3X-KZPEA-DB, or 3X-DEPVZ-AA adapter, North America	166505-001
	Same as above, International	166505-B31
	Same as above, Japan	166505-291
DLT/SDLT Tabletop Tape Drives (Requires 3X-KZPCA-AA or 3X-KZPEA-DB LVD Adapter)	DLT8000 tabletop 40/80-GB DLT external tape drive, carbon black - U.S.	146197-B23
	Same as above – Japan	146197-292
	SDLT tabletop 110/220-GB external tape drive, carbon black- U.S.	192103-002
	Same as above – International	192103-B32
	Same as above – Japan	192103-292
	SDLT tabletop 160/320-GB external tape drive, carbon black - U.S.	257319-001
	Same as above - International	257319-B31
	Same as above - Japan	257319-291
Library Rackmount Kit for MSL5xxx Tape Libraries in H9Axx Cabinet Series	Rackmount kit for H9Axx Series cabinets – required for mounting MSL5000 series in H9Axx cabinets	254795-001
SDLT Tape Libraries	SDLT Tape Libraries require the use of either a 3X-KZPCA-AA or 3X-KZPEA-DB adapter; Tru64 UNIX 5.1B requires a minimum level of PK4	
StorageWorks MSL5026SL SDLT 110/220-GB Tape Library	MSL5026SL, SDLT tabletop library with one 110/220-GB SDLT tape drive, LVD; graphite	302511-B21
	MSL5026SL, SDLT tabletop library with two 110/220-GB SDLT tape drives, LVD; graphite	302511-B22
	MSL5026SL, SDLT rackmount library with one 110/220-GB SDLT tape drive, LVD; graphite – requires rackmount kit (254795-001)	302512-B21
	MSL5026SL, SDLT rackmount library with two 110/220-GB SDLT tape drives, LVD; graphite – requires rackmount kit (254795-001)	302512-B22

Options

StorageWorks MSL5026S2 SDLT 160/320-GB Tape Library	MSL5026S2, SDLT rackmount library with 0 drives, LVD; graphite – requires rackmount kit (254795-001)	293472-B21
	MSL5026S2, SDLT rackmount library with one 160/320-GB SDLT tape drive, LVD; graphite – requires rackmount kit (254795-001)	293472-B22
	MSL5026S2, SDLT rackmount library with one 160/320-GB SDLT tape drive, LVD; graphite – requires rackmount kit (254795-001)	293472-B23
	MSL5026S2, SDLT rackmount library with one 160/320-GB SDLT tape drive, Fibre Channel Interface; graphite – requires rackmount kit (254795-001)	293472-B24
	MSL5026S2, SDLT rackmount library with two 160/320-GB SDLT tape drives, Fibre Channel Interface; graphite – requires rackmount kit (254795-001)	293472-B25
	MSL5026S2, SDLT tabletop library with one 160/320-GB SDLT tape drive, LVD; graphite	293473-B21
	MSL5026S2, SDLT tabletop library with two 160/320-GB SDLT tape drives, LVD; graphite	293473-B21
	MSL5000 SDLT2 upgrade drive, all	293475-B21
StorageWorks MSL5052SL SDLT 110/220-GB Tape Library	MSL5052, 0 drives, LVD, rackmount	255102-B21
	MSL5052SL SDLT tabletop library with two 110/220-GB tape drives, LVD	249490-B21
	MSL5052SL SDLT rackmount library with two 110/220-GB tape drives, LVD – requires rackmount kit (254795-001)	249491-B21
	MSL5052SL SDLT 110/220-GB drive field upgrade, LVD	231823-B22
StorageWorks MSL5052S2 SDLT 160/320-GB Tape Library	MSL5052S2, SDLT rackmount library with two 160/320-GB SDLT tape drives, LVD; graphite – requires rackmount kit (254795-001)	293474-B21
	MSL5052S2, SDLT rackmount library with two 160/320-GB SDLT tape drives, Fibre Channel Interface; graphite – requires rackmount kit (254795-001)	293474-B24
	MSL5052S2, SDLT tabletop library with two 160/320-GB SDLT tape drives, LVD; graphite	293476-B21
MSL6000 with LTO Gen2 Tape Libraries	MSL6000 LTO Gen2 add-on drive	330729-B21
	MSL6030 with 0 drives, LTO, LVDS, rackmount	330731-B21
	MSL6030 with one drive, LTO2, LVDS, rackmount	330731-B22
	MSL6030 with two drives, LTO2, LVDS, rackmount	330731-B23
	MSL6030 with one drive, LTO2, Fibre, rackmount	330731-B24
	MSL6030 with two drives, LTO2, Fibre, rackmount	330731-B25
	MSL6030 with one drive, LTO2, LVDS, tabletop	330788-B21
	MSL6030 with two drives, LTO2, LVDS, tabletop	330788-B22
	MSL6060 with 0 drives, LTO, LVDS, rackmount	331196-B23
	MSL6060 with two drives, LTO2, LVDS, rackmount	331196-B21
	MSL6060 with two drives, LTO2, Fibre, rackmount	331196-B22
	MSL6060 with two drives, LTO2, LVDS, tabletop	331195-B21
StorageWorks ESL9322S2 SDLT 160/320-GB Tape Library	ESL9322S2 SDLT tape library, with two 160/320-GB SDLT tape drives, 222 slots	293409-B22
	ESL9322S2 SDLT tape library, with eight 160/320-GB SDLT tape drives, 222 slots	293409-B28
	ESL9322S2 SDLT tape library, with two 160/320-GB SDLT tape drives, 322 slots	293410-B22
	ESL9322S2 SDLT tape library, with eight 160/320-GB SDLT tape drives, 322 slots	293410-B28
	ESL9000 SDLT2 LVD upgrade drive	293414-B21

Options

StorageWorks ESL9595SL SDLT 110/220-GB Tape Library	ESL9595SL SDLT tape library, 0 drives, 400 slots	274672-B21
	ESL9595SL SDLT tape library, two 110/220-GB SDLT tape drives, 400 slots	274672-B22
	ESL9595SL SDLT tape library with 16 110/220-GB SDLT tape drives, 400 slots	274672-B28
	ESL9595SL SDLT tape library with 0 drives, 500 slots	281627-B21
	ESL9595SL SDLT tape library with two 110/220-GB SDLT tape drives, 500 slots	281627-B22
	ESL9595SL SDLT tape library with 16 110/220-GB SDLT tape drives, 500 slots	281627-B28
	ESL9595SL SDLT tape library, 0 drives, 595 slots	281628-B21
	ESL9595SL SDLT tape library with two 110/220-GB SDLT tape drives, 595 slots	281628-B22
	ESL9595SL SDLT tape library with 16 drives 110/220-GB SDLT tape drives, 595 slots	281628-B28
StorageWorks ESL9595S2 SDLT 160/320-GB Tape Library	ESL9595S2 SDLT2 tape library, two 160/320-GB tape drives, 400 slots	293411-B22
	ESL9595S2 SDLT2 tape library with 16 160/320-GB tape drives, 400 slots	293411-B28
	ESL9595S2 SDLT2 tape library with two 160/320-GB tape drives, 500 slots	293412-B22
	ESL9595S2 SDLT2 tape library with 16 160/320-GB tape drives, 500 slots	293412-B28
	ESL9595S2 SDLT2 tape library with two 160/320-GB tape drives, 595 slots	293413-B22
	ESL9595S2 SDLT2 tape library with 16 160/320-GB tape drives, 595 slots	293413-B28
	ESL9000 SDLT2 LVD upgrade drive	293414-B21
ESL9000 with LTO Gen2 Tape Libraries	ESL9322 library with 0 drives	330832-B21
	ESL9595 library with 0 drives	330833-B21
	ESL9000 Ultrium 460 drive upgrade kit	330834-B21
	ESL9000 SDLT 110 drive upgrade kit	330837-B21
	ESL9322 222 to 322 slot upgrade kit	330840-B21
	ESL9000 5-MB memory module	330841-B21
	ESL9595 400 to 500 slot upgrade kit	330842-B21
	ESL9595 500 to 595 slot upgrade kit	330842-B22
	ESL9595 400 to 595 slot upgrade kit	330842-B23

Step 7d – External Storage

External Storage Arrays

- ESA 10000 Storage is supported on Tru64 UNIX and OpenVMS systems.
- SW800 CI Storage Arrays (HSJ5x product set) are supported on OpenVMS systems.
- Complete ordering and configuring information is available at http://www.hp.com/products/StorageWorks/ (Only Tru64 UNIX and OpenVMS operating systems options are supported.)

Storage Array Controllers

The following controllers are used in StorageWorks array packaging:

Options

Enterprise Virtual Array 5000	The Enterprise Virtual Array 5000 (EVA5000) is the mid to high-range member of the HP StorageWorks virtual disk array enabled by VeraStor technology. The EVA5000 is designed for the data center where there is a critical need for ever-increasing capacity/replication requirements, performance demands, and business continuance needs. Support is provided for HP StorageWorks Continuous Access, HP StorageWorks Business Copy, and HP OpenView Storage Operations Management Software. The EVA5000 is a full 2-Gb end-to-end Fibre Channel Array, which operates in 1-Gb, 2-Gb, or mixed 1-Gb/2-Gb SAN fabrics. The EVA5000 is available in pre-defined configurations with controllers and expansion configurations without controllers. There is also a pre-defined configuration that is optimized for the High Performance Technical Computing (HPTC) environments. For ordering information and configuration rules, refer to the EVA5000 QuickSpecs at: http://h18000.www1.hp.com/products/quickspecs/11006_div/11006_div.HTML	
Enterprise Virtual Array 3000	The Enterprise Virtual Array 3000 (EVA3000) is the mid-range member of the HP StorageWorks virtual disk array enabled by VeraStor technology. The EVA3000 is designed for the data center where there is a critical need for ever-increasing capacity/replication requirements, performance demands, and business continuance needs. Support is provided for HP StorageWorks Continuous Access, HP StorageWorks Business Copy, and HP OpenView Storage Operations Management Software. The EVA3000 is a full 2-Gb end-to-end Fibre Channel Array, which operates in 1-Gb, 2-Gb, or mixed 1-Gb/2-Gb SAN fabrics. The EVA3000 is available in one of four integrated "independent bundle" configurations, which include one pair of HSV100 controllers, two Fibre Channel enclosures, and 8 to 16 Fibre Channel hard drives (bundle dependent). For ordering information and configuration rules, refer to the EVA3000 QuickSpecs at: http://h18000.www1.hp.com/products/quickspecs/11619_div/11619_div.HTML	
Modular SAN Array 1000 (msa 1000)	Modular SAN Array 1000, supported on Tru64 UNIX and two-node clusters (maximum); supported with DS-KGPSA-CA and DS-KGPSA-DA adapters; requires connection via a switch - no direct connect; no support for FC arbitrated loop Tru64 UNIX V5.1A requires Patch Kit 4: T64V51AB21AS0004-20030206.tar Tru64 UNIX V5.1B requires Patch Kit 1: T64V51BB03AS0001-20021229.tar For product and ordering information, refer to http://h18000.www1.hp.com/products/quickspecs/11621_div/11621_div.HTML	3R-A4328-AA
StorageWorks Disk Array Family	NOTE: The HP StorageWorks Disk Array Family, specifically the XP128 and XP1024, are supported on AlphaServer GS160 systems. For product and ordering information, refer to the following Web pages: http://www.hp.com/products1/storage/products/disk_arrays/highend/xp1024/index.html http://www.hp.com/products1/storage/products/disk_arrays/highend/xp128/index.html The following part numbers have been assigned for reference purposes only:	

3R-A4417-AA	A7876A	XP128 Disk Array Control Frame
3R-A4418-AA	A7906A	XP1024 Disk Array Control Frame

Step 7e – Fibre Channel Options

Network Storage Routers	Network Storage Routers enable multiple host servers to communicate with a SCSI tape device over a Fibre Channel link. For configuration details, refer to Switches, Hubs, and Interconnects QuickSpecs at: http://www.compaq.com/products/quickspecs/North_America/10490.html	
	NSR M2402 Two Fibre Channel x 4 HVD FC to SCSI Data Router, Tru64 UNIX and OpenVMS (262654-B21)	3R-A3741-AA
	NSR M2402 Two Fibre Channel x 4 LVD FC to SCSI Data Router, Tru64 UNIX and OpenVMS (262653-B21)	3R-A3740-AA
	NSR e1200-160 One Fibre Channel x 2 LVD FC to SCSI Data Router, Tru64 UNIX and OpenVMS	330728-B21
	NSR e2400-160 Two Fibre Channel x 42 LVD FC to SCSI Data Router, Tru64 UNIX and OpenVMS	330839-B21
	NSR N1200 One Fibre Channel x 2 LVD FC to SCSI Data Router, Tru64 UNIX and OpenVMS, (280823-B21)	3R-A3747-AA
Fibre Channel Data Routers	1 Fibre Channel x 2 HVD data router (163082-B21)	3R-A2673-AA
	1 Fibre Channel x 2 LVD data router (163083-B21)	3R-A2774-AA
	2 x 4 LVD Fiber Channel to SCSI Network Storage Router (262653-B21)	3R-A3740-AA
	2 x 4 HVD Fiber Channel to SCSI Network Storage Router (262654-B21)	3R-A3741-AA

Fibre Channel Switches

HP supports three product lines of Fibre Channel switch products that may be used to build SAN fabrics. Each product line provides certain advantages that apply to specific applications. For more information on specific switch models and selection, please refer to Chapter 2 in the SAN Design Guidelines: http://www.hp.com/go/SANDesignGuide

The B-Series product line includes a wide range of Fibre Channel switches, described as "SAN switches" and "Core switches." Products in this family include switches from the HP StorageWorks SAN Switch 2/16 to the HP StorageWorks Core Switch 2/64. This product line includes switches with 8, 16, 32, and 64 ports, including both full-function and entry-level models. The HP StorageWorks Core Switch 2/64 includes a pair of independent 64-port switches in a single chassis with a high level internal redundancy.

The C-Series product line includes the Cisco MDS 9506 and 9509 Multi-layer Directors and the Cisco MDS 9216, 9120, and 9140 Multi-layer Fabric Switches. The MDS 9506 is supported with 224 ports, over seven modular chassis consisting of both 16-port and 32-port modules. The MDS 9506 is supported with 128 ports, over four modular chassis consisting of both 16-port and 32-port modules. The MDS 9216 has a basic configuration with 16 ports. It has an expansion slot that supports either a 16- or a 32-port card, for 32 or 48 ports in total.

The M-Series Fabric product line includes a wide range of Fibre Channel switches described as "Directors" and "Edge switches." A partial list of products in this family includes the HP StorageWorks Director 2/140 and the HP StorageWorks Edge Switch 2/32. This product line includes switches with 16, 24, 32, 64, and 140 ports internal microcode. The HP StorageWorks Director 2/64 and 2/140 switches have a high level of internal redundancy.

For part number and configuration information, see the SAN infrastructure switch information at http://www.hp.com/go/san

Step 8 - Networks and Communications

- One Fast Ethernet adapter included in base systems. Connection of system to Ethernet requires twisted-pair cable.

PCI LAN Communications Controllers

- Requires 3X-DWWPA-AA /BA PCI shelf mount box
- Each adapter/controller uses one PCI slot
- A maximum of 16 network adapters - 3X-DE602-xx, DEGPA-xx, 3X-DEFPA-xx - are supported per system or hardware partition.

NOTE: "Per System" quantities apply to systems or to each hardware partition. The 3X-DE602-xx included in base system must be included in these calculations. Operating System limitations may further limit the maximum number of configurable options.

	Maximum # Supported						
	Tru64 UNIX			OpenVMS			
	Per System	Per QBB	Per PCI Drawer	Per System	Per QBB	Per PCI Drawer	
10/100-Mbit Fast Ethernet Adapter							
PCI Dual-port 10/100 UTP Fast Ethernet adapter and base module	8	8	8	8	8	8	3X-DE602-BB
PCI Dual-port Fast Ethernet "TX" add-on daughter card	8	8	4	8	8	6	3X-DE602-TA
Single-port multi-mode fiber (MMF) add-on daughter card	8	8	8	8	8	8	3X-DE602-FA
Category 5 cross-over cable for point-to-point, unshielded xx=01, 03, 04, 07, 0E for 1, 3, 4, 7, 0.5 meters							BN24Q-xx
Category 5 cross-over cable for point-to-point, shielded xx=01, 03, 04, 07, 0E for 1, 3, 4, 7, 0.5 meters							BN28Q-xx
Category 5 straight through for system to repeater or hub, unshielded, xx=01, 03, 04, 07, 0E, 0B for 1, 3, 4, 7, 0.5, 0.2 meters							BN25G-xx
Twisted pair, shielded cable, xx=01, 03, 04, 07, 0E for 1, 3, 4, 7, 0.5 meters							BN26M-xx

FDDI Controllers							
PCI FDDIcontroller, fiber, single-attachment station multimode fiber, requires BN34x SC type connecting cable	8	8	8	8	8	8	3X-DEFPA-AC
PCI FDDIcontroller, fiber, dual-attachment station multimode fiber, requires BN34x SC type connecting cable	8	8	8	8	8	8	3X-DEFPA-DC
Multimode fiber optic duplex cable, SC connector-to-ST connector, xx=01, 03, 10, 20, 30, 2E, 4E for 01, 03, 10, 20, 30, 2.5, 4.5 meters							BN34A-xx
Multimode fiber optic duplex cable, SC connector-to-SC connector, xx=01, 03, 10, 20, 30, 2E, 4E for 01, 03, 10, 20, 30, 2.5, 4.5 meters							BN34B-xx
Multimode fiber optic duplex cable, SC connector-to-MIC connector, xx=01, 03, 10 for 01, 03, 10 meters							BN34D-xx
PCI FDDIcontroller, copper, dual-attachment station UTP, requires BN26x or BN25H connecting cables	8	8	8	8	8	8	3X-DEFPA-MC
PCI FDDIcontroller, copper, single-attachment station UTP, requires BN26x or BN25H connecting cables	8	8	8	8	8	8	3X-DEFPA-UC
8-pin MP-to-8-pin MP, screened, EIA/TIA category 5 cable							BN26M-xx
8-pin MP-to-8-pin MP, screened, crossover, EIA/TIA category 5 cable, 3 meters							BN26S-03
3-meter unshielded twisted pair RJ45 connectors							BN25H-03

Options

Gigabit Ethernet Adapters							
For maximum performance, HP recommends configuring two DEGPA-SA adapters (or less) per PCI drawer, however, eight adapters per PCI drawer may be configured to achieve maximum connectivity.							
PCI Gigabit Ethernet adapter, does not support network boot (BN34B)	8/16*	8/16*	8	16	16	8	DEGPA-SA (EOL 12/04) 3X-DEGXA-SA
PCI-to-Gigabit Ethernet UTP adapter (32-/64-bit) does not support network boot uses BN 24Q, BN28Q, BN25Q, BN26M cables	4	4	4	4	4	4	DEGPA-TA (EOL 12/04) 3X-DEGXA-TA
Multimode fiber optic duplex cable, SC connector-to-SC connector, xx=01, 03, 10, 20, 30, 2E, 4E for 01, 03, 10, 20, 30, 2.5, 4.5 meters							BN34B-xx
Category 5 cross-over cable for point-to-point, unshielded, xx=01, 03, 04, 07, 0E for 1,3,4, 7, 0.5 meters							BN24Q-xx
Category 5 cross-over cable for point-to-point, shielded xx=01, 03, 04, 07, 0E for 1,3,4, 7, 0.5 meters							BN28Q-xx
Category 5 straight through for system to repeater or hub, unshielded, xx=01, 03, 04, 07, 0E, 0B for 1,3,4, 7, 0.5, 0.2 meters							BN25G-xx
Twisted pair, shielded cable, xx=01, 03, 04, 07, 0E for 1,3,4, 7, 0.5 meters							BN26M-xx
* NOTE: Tru64 UNIX V5.1 is required to support 16 adapters per System/Drawer. Tru64 UNIX 4.0G supports eight adapters per system/drawer.							

ATM Adapters							
For maximum performance, HP recommends configuring four 3X-DAPCA-FA adapters (or less) per PCI drawer; however, eight adapters per PCI drawer may be configured to achieve maximum connectivity.							
PCI-to-ATMworks 155-Mbit adapter, fiber, uses BN34B cable	8	8	8	8	8	8	3X-DAPBA-FA
Multimode fiber optic duplex cable, SC connector-to-SC connector, xx=01, 03, 10, 20, 30, 2E, 4E for 01, 03, 10, 20, 30, 2.5, 4.5 meters							BN34B-xx

Synchronous Controllers							
PCI 2-port intelligent synchronous controller (OpenVMS/Tru64 UNIX systems require a WAN/X.25 Kit. Refer to the latest option QuickSpecs for further information	4	4	4	10	10	10	3X-PBXDD-AA
PCI 4-port intelligent synchronous controller (OpenVMS/Tru64 UNIX systems require a WAN/X.25 Kit. Refer to the latest option QuickSpecs for further information.	4	4	4	10	10	10	3X-PBXDD-AB
DataFire SYNC 2000 EIA-530 single-port cable							3X-BC34G-06
DataFire SYNC 2000 V.11/x.21 single-port cable							3X-BC34S-06
DataFire SYNC 2000 V.35 single-port cable							3X-BC34T-06
DataFire SYNC 2000 V.24/EIA232 single-port cable							3X-BC34L-06

Step 9 - MEMORY CHANNEL

- Up to two PCI System Area Network controllers supported on a GS160 partition
- Two-node clusters can be configured by ordering a CCMAB-BA for each node and one BN39B-04 or BN39B-10 cable; cable connects directly to CCMAB-AABA in each node.
- For a two-node cluster that will not be rebooted when adding additional members, order one CCMAB-BA adapter and one BN39B-04 or BN39B-10 cable for each node, and one CCMHB-AA hub for the cluster.
- For three or four node clusters, order one CCMAB-BA adapter and one BN39B-04 or BN39B-10 cable for each node and one CCMHB-AA hub for the cluster
- CCMHB-AA includes four CCMLB-AA line cards and supports up to four nodes; expansion up to eight system nodes can be achieved by adding up to four additional CCMLB-AA line cards
- If two or more CCMAB-BA controllers are configured in each node (dual rail), a second CCMHB-AA hub is required
- If using a MEMORY CHANNEL adapter module (54-24962-01) prior to revision D02, up to two MEMORY CHANNEL adapters can be placed on a PCI bus, however, no additional PCI devices can be placed on the same PCI bus, and the remaining slots must be left empty

Tru64 UNIX Systems (V5.1 and later) in Clusters using MEMORY CHANNEL Interconnect	• Each system in the cluster requires a TruCluster Server software license (QL-6BRAQ-AA) • Alternately a TruCluster Plus Software package including licenses for: TruCluster Server, Logical Storage Manager, and AdvFS Utilities can be ordered (QP-6R9AQ-AA)
OpenVMS Systems in Clusters using MEMORY CHANNEL Interconnect	• Requires OpenVMS V7.2-1H1 or later and OpenVMS Cluster license (QL-MUZAQ-AA)
MEMORY CHANNEL Fiber Optic Cable Option	• In cases where nodes must be separated by a longer distance than standard copper cables allow, the CCMFB option converts the output of the standard CCMAB controller or CCMLB line card to single-mode fiber optic cable. The fiber optic connection may be up to 2,000 meters long between two CCMAB controllers connected in virtual hub mode, or 3,000 meters between a CCMAB controller and a CCMHB hub. (The connection from the CCMHB hub to a second system may also be 3,000 meters). The CCMFB option requires a second PCI slot in the system from which it draws power only. It is normally connected to the corresponding CCMAB controller with the short BN39B-01 cable. The CCMFB is also used in the CCMHB hub where it occupies a slot normally used by the CCMLB line card, limiting expansion to four radial fiber optic connections. • The CCMHB-BA hub expansion box provides additional slots for up to eight fiber optic connections. Two standard length, single-mode fiber optic cables are available (BN34R-10 and BN34R-31); however, users normally provide this connection. Customers should reference the TIA/EIA 568-A Commercial Building Telecommunications Cabling Standard, Section 12.3.4. Fiber optic connectivity is completely transparent to the systems using it and has no performance impact. • Up to two CCMHB-AA hubs may be mounted in a 3X-H9A20-AD expansion cabinet by utilizing a 2T-MAVRK-AA rack-mounting kit for each hub. A second MEMORY CHANNEL Hub (CCMHB-AA or CCMHM-BA) mounted in an expansion cabinet reduces the amount of StorageWorks shelves by one.

Options

MEMORY CHANNEL Controller	PCI System Area Network controller, maximum two per system, two per node	CCMAB-BA
	System Area Network hub with four line cards; includes BN19P-2E power cord for Canada, Japan, and U.S. operations; country-specific power cord for other regions is required	CCMHB-AA
	MEMORY CHANNEL hub expansion box with no line cards	CCMHB-BA
	MEMORY CHANNEL hub rack-mounting kit	2T-MAVRK-AA
	Expansion line card for CCMHB hub	CCMLB-AA
	1-meter cable for CCMAB and CCMHB	BN39B-01
	4-meter cable for CCMAB and CCMHB	BN39B-04
	10-meter cable for CCMAB and CCMHB	BN39B-10
	Copper-to-single mode fiber optic converter	CCMFB-BA
Country-specific Power Cords for Standalone MEMORY CHANNEL Hubs	Australia, New Zealand	BN19H-2E
	Central Europe	BN19C-2E
	Denmark	BN19K-2E
	Egypt, India	BN19S-2E
	Ireland, United Kingdom	BN19A-2E
	Israel	BN18L-2E
	Italy	BN19M-2E
	Switzerland	BN19E-2E
Power Cord for MEMORY CHANNEL Hubs Rackmounted in 3X-H9A20- ADAE/AF Cabinets	IEC 320 power cord (one mandatory per hub)	BN35S-02
	NOTE: MEMORY CHANNEL hubs mounted in 3X-H9A20-AD cabinets do not require additional power cords.	

Step 10 - System Console Support

System Management Console

- AlphaServer GS160 systems require the ability to log console messages, provide remote access for service and support, and, in some cases, manage multiple hardware partitions. The system management console is mandatory if the customer has no other means to provide these capabilities.
- PC-based system management console is required for system power-up, diagnostics, console partitioning, and console display and logging for use with AlphaServer GS80/160/320 systems.
- Includes network interface cards, universal modem, console software, 101-key keyboard, mouse, and console documentation kit
- A monitor is required for use with the system management console. Choose monitor listed in Step 12.
- Systems configured with redundant consoles or employing hardware partitioning require the ability to connect multiple consoles. A console hub is mandatory if the customer has no other means to provide these capabilities.
- A console printer is recommended, but not required.

PC-based Windows 2000 system management console in a mini-tower package, includes network interface cards and console software, U.S./Canada/Japan	3X-DS8DA-AA
PC-based Windows 2000 system management console in mini-tower package, includes network interface cards and console software, Europe	3X-DS8DA-AB
Console hub for use with system management console, includes console concentrator, cables, and universal power supply; mounts in system cabinet and communicates with the system management console over Ethernet using the Telnet protocol.	3X-DS8AA-AA

System Management Console - ConsoleWorks Upgrade Licenses

- System management consoles include ConsoleWorks, which support s up to 8 partitions on a single system
- Support for additional GS Series partitions on a second GS system require the purchase of an add on license for 2, 4, or 8 partitions on that system
- Use of a single console for management of multiple GS systems requires use of a multiple port Ethernet Hub such as HP Procurve Series

AlphaServer GS System Management, 2 Partition ConsoleWorks License from TECSys Development LP	QM-6K4AA-AB
AlphaServer GS System Management, 2 Partition ConsoleWorks License from TECSys Development LP	QM-6K4AA-AC
AlphaServer GS System Management, 8 Partitions ConsoleWorks License from TECSys Development LP	QM-6K4AA-AD

Options

System Management Hardware/Software - Optional Support

Alternately, the GS160 can utilize the ES47, ES80, and GS1280 System Management software. This can significantly enhance and simplify monitoring and control of the system, especially in mixed environments. The software, which runs on a separate Intel or Alpha system, consists of two major components:

1. Alpha Management Station (AMS) - for monitoring and control of multiple GS Alpha Systems. AMS offers the highest level of server management functionality for a single or multi-platform environment. The AMS software requires the following hardware in order to operate:

   - Tru64 UNIX platform with 512-MB memory, 4-GB disk space, and two network interface cards running Tru64 UNIX V5.1B or later.
   - Intel IA-32 platform running Linux, 500-MHz CPU or faster, 256-MB memory, 4-GB disk space, and one network interface card.

2. Alpha Management Utility (AMU) - for monitoring and control of a single GS160 Alpha System. The AMU is a GUI based application that provides a sophisticated, yet user-friendly graphics interface. The AMU is a Web-based utility, which allows a user local and remote access from a browser. The AMU software requires one of the following hardware platforms in order to operate:

   - Intel IA-32 platform running Windows 2000 or later, 500-MHz CPU or faster, 256-MB memory, 4-GB disk space, and one network interface card.
   - Intel IA-32 platform running Linux, 500-MHz CPU or faster, 256-GB memory, 4-GB disk space, and one network interface card.
   - Tru64 UNIX platform running V5.1B or later, 512-MB memory, 4-GB disk space, and one network interface card.
   - OpenVMS platform running V7.3-1 or later, 512-MB memory, 4-GB disk space, and one network interface card.

- Both the AMS and AMU software require Internet Explorer 5.5 or later or Netscape 4.76 or later.
- AMS/AMU software kits and instructions may be downloaded from: http://ftp.digital.com/pub/Digital/Alpha/firmware/interim/ams/index.html

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System Management Console - Modem Localization Kits

System management consoles include one adapter kit

- 3X-DS8xA-AA/BA includes a localization kit for use in US, Canada, Japan, Mexico, Brazil, Argentina, Peru, and Taiwan
- 3X-DS8xA-AB/BB includes a localization kit for use in Great Britain, Ireland, Hong Kong, Singapore, and Malaysia

In all other cases, the appropriate localization kit is required:

Australia	3R-A1608-AA
Austria	3R-A1607-AA
Belgium	3R-A1609-AA
China	3R-A1594-AA
Denmark	3R-A1596-AA
Finland, Norway	3R-A1597-AA
France	3R-A1598-AA
Germany	3R-A1595-AA
Greece	3R-A1606-AA
India	3R-A1600-AA
Italy	3R-A1601-AA
Netherlands	3R-A1602-AA
New Zealand	3R-A1603-AA
Sweden, Iceland	3R-A1604-AA
Switzerland	3R-A1610-AA

Options

System Management Console - Country-specific Power Cords	• System management console includes a line cord for use in North America. Order a country-specific line cord if required	
	Australia, New Zealand	BN19H-2E
	Central Europe	BN19C-2E
	Denmark	BN19K-2E
	Egypt, India	BN19S-2E
	Ireland, United Kingdom	BN19A-2E
	Israel	BN18L-2E
	Italy	BN19M-2E
	Japan	3X-BN46F-02
	North America	BN26J-1K
	Switzerland	BN19E-2E

Step 11 - Graphics Support

- Graphics support for an AlphaServer GS160 can be provided through use of a graphics adapter

3D Labs Oxygen 32-MB PCI graphics card, maximum one per system or hardware partition	SN-PBXGF-AB

Step 12 - Monitors, Keyboards, Mouse

- Graphics monitors other than those listed below can be used if compatible with SVGA graphics ordered with system.
- Selection of video extension cable and country-specific power cord is mandatory for all monitors; order power cord as appropriate.
- Add or order appropriate keyboard and mouse
- Monitors will ship with, but not be integrated with systems.

Keyboard or Mouse Extension Cable	6-foot (1.8-meter) keyboard or mouse extension cable (order two cables to extend both keyboard and mouse)	3X-BC34A-06
Video Extension Cable	6-foot (1.8-meter) video extension cable	BN39C-02
Mouse	3-button mouse – carbon	3R-A4565-AA

Options

Carbon/Silver Monitors	V7550 17-inch (16-inch viewable image size) flat-faced shadow mask color monitor, two-tone (carbon/silver), 0.25mm dot pitch, VGA to 1024 x 768 @85 Hz, MPRII/TCO99/Energy Star compliant, Northern Hemisphere with North America power cord, VGA cable	3R-A4002-AA
	Same as above, with Euro power cord	3R-A4201-AA
	Same as above, APD, no power cord	3R-A4202-AA
	Same as above, Southern Hemisphere, with Australia/New Zealand power cord	3R-A4203-AA
	S7500 17-inch (16-inch viewable image size) FST multi-frequency color monitor, 2-tone (carbon/silver), 0.24-mm dot pitch, VGA to 1024 x 768 @ 85 Hz, MPRII/TCO 99/Energy Star Compliant, Northern Hemisphere with PRC power cord CCIB, VGA cable	3R-A4800-AA
	P930 19-inch (18-inch viewable image size) auto-scanning color monitor, Diamondtron NF, 0.24-mm aperture grille pitch, VGA to 1600 x 1200 @85 Hz, MPRII/TCO 99/Energy Star Compliant, Northern Hemisphere with North America power cord, VGA cable	3R-A4215-AA
	Same as above, with Euro power cord	3R-A4391-AA
	Same as above, Taiwan, with North America power cord	3R-A4392-AA
	Same as above, Southern Hemisphere, 0.25 to 0.27 mm aperture grille pitch, with Australia/New Zealand power cord	3R-A4393-AA
	S9500 19-inch (18-inch viewable image size) FST multi-frequency color monitor, 2-tone (carbon/silver), 0.24-mm dot pitch, VGA to 1280 x 1024 @ 85 Hz, MPRII/TCO 99/Energy Star Compliant, Northern Hemisphere with PRC power cord CCIB, VGA cable	3R-A4801-AA
	P1130 21-inch (19.8-inch viewable image size) FD Trinitron auto-scanning color monitor, 0.24-mm aperture grille pitch, VGA to 1792 x 1344 @85Hz, dual video input, USB Hub, MPRII/TCO 99/Energy Star Compliant, Northern Hemisphere with North America power cord, VGA cable	3R-A4216-AA
	Same as above, with Euro power cord	3R-A4396-AA
	Same as above, Taiwan, no power cord	3R-A4397-AA
	Same as above, with PRC power cord, CCIB	3R-A4400-AA
	Same as above, Southern Hemisphere, with Australia/New Zealand power cord	3R-A4398-AA
Carbon/Silver Flat Panel Monitors	L2035, 20-inch (20.1-inch viewable image area) flat panel monitor 0.255mm pixel pitch, 1600 x 1200 @60 Hz, A + D, TCO 03, Energy Star compliant, four video input connectors, (VGA, DVI-I, composite video and s-video), North America power cord, VGA and DVI-I cables	3R-A5056-AA
	L2035, 20-inch (20.1-inch viewable image area) flat panel monitor 0.255mm pixel pitch, 1600 x 1200 @60 Hz, A + D, TCO 03, Energy Star compliant, four video input connectors, (VGA, DVI-I, composite video and s-video), Euro power cord, VGA and DVI-I cables	3R-A5057-AA
	L1530, 15-inch (15-inch viewable image size) TFT flat panel monitor, 0.297-mm pixel pitch, 1024 x 768 @60 Hz, multi-mode support, MPRII/TCO99/Energy Star compliant, two video input connectors (one VGA and one DVI-I), North America power cord, VGA and DVI-I cables	3R-A4857-AA
	L1530, 15-inch (15-inch viewable image size) TFT flat panel monitor, 0.297-mm pixel pitch, 1024 x 768 @60 Hz, multi-mode support, MPRII/TCO99/Energy Star compliant, two video input connectors (one VGA and one DVI-I), Euro power cord, VGA and DVI-I cables	3R-A4858-AA
Monitor Power Cords	Australia, New Zealand	BN19H-2E
	Central Europe	BN19C-2E
	Denmark	BN19K-2E
	Egypt, India	BN19S-2E
	Ireland, United Kingdom	BN19A-2E
	Italy	BN19M-2E
	Japan	3X-BN46F-02
	North America	BN26J-1K
	Switzerland	BN19E-2E

Options

Keyboards

- Select a keyboard and mouse
- Select an opal OpenVMS keyboard for use with VT5xx text terminals
- All keyboards listed may not be available in all geographies

	Opal	Carbon	
Keyboard/Language	OpenVMS	Tru64 UNIX	OpenVMS
U.S./English keyboard	LK461-A2	3R-A4362-AA	3X-LK463-A2
Arabic keyboard	-	3R-A4348-AA	-
Belgian keyboard	LK461-AB	3R-LA4349-AA	3X-LK463-AB
BHCSY keyboard	-	3R-A4350-AA	-
Canadian/English keyboard	LK461-AQ	-	3X-LK463-AQ
Canadian/French keyboard	LK461-AC	3R-A4351-AA	3X-LK463-AC
Cyrillic keyboard (Russian)	LK461-BT	3R-A4352-AA	3X-LK463-BT
Czech keyboard	LK461-BV	3R-A4353-AA	3X-LK463-BV
Danish keyboard	LK461-AD	3R-A4354-AA	3X-LK463-AD
Dutch keyboard	LK461-AH	3R-A4355-AA	3X-LK463-AH
Finnish keyboard	LK461-AF	3R-A4356-AA	3X-LK463-AF
French keyboard	LK461-AP	3R-A4357-AA	3X-LK463-AP
German keyboard	LK461-AG	3R-A4358-AA	3X-LK463-AG
Greek keyboard	LK461-BH	3R-A4359-AA	3X-LK463-BH
Hebrew keyboard	LK461-AT	3R-A4360-AA	3X-LK463-AT
Hungarian keyboard	LK461-BQ	3R-A4361-AA	3X-LK463-BQ
International keyboard	-	3R-A4362-AA	-
Italian keyboard	LK461-AI	3R-A4363-AA	3X-LK463-AI
Japanese keyboard	-	3R-A4364-AA	-
Korean keyboard	-	3R-A4365-AA	-
Latin-American keyboard	-	3R-A4366-AA	-
Norwegian keyboard	LK461-AN	3R-A4367-AA	3X-LK463-AN
Polish keyboard	LK461-BP	3R-A4368-AA	3X-LK463-BP
Portuguese keyboard	LK461-AV	3R-A4369-AA	3X-LK463-AV
Romanian keyboard	LK461-BL	-	3X-LK463-BL
Simplified Chinese keyboard	-	3R-A4370-AA	-
Slovak keyboard	LK461-CZ	3R-A4371-AA	3X-LK463-CZ
Spanish keyboard	LK461-AS	3R-A4372-AA	3X-LK463-AS
Swedish keyboard	LK461-AM	3R-A4373-AA	3X-LK463-AM
Swiss/French keyboard	LK461-AK	3R-A4374-AA	3X-LK463-AK
Swiss/German keyboard	LK461-AL	-	3X-LK463-AL
Traditional Chinese keyboard	-	3R-A4375-AA	-
Thai keyboard	-	3R-A4376-AA	-
Turkish Q keyboard	LK461-BU	3R-A4377-AA	3X-LK463-BU
Turkish/F keyboard	LK461-BW	-	3X-LK463-BW
UK keyboard	-	3R-A4378-AA	-
Yugoslavian keyboard	LK461-BY	-	3X-LK463-BY

Step 13 - System Software

- Media and documentation required for first system on site
- Software Processor Code = Q

Tru64 UNIX

- Tru64 UNIX base systems include pre-installed software, Base license, Unlimited User license, Server Extension license, Internet Express, and Secure Web Server

When using Tru64 UNIX V5.1 or later	Tru64 UNIX media and online documentation on CD-ROM	QA-6ADAA-H8
	Tru64 UNIX full hard copy documentation	QA-6ADAA-GZ
	TruCluster Plus Software Package with licenses for TruCluster Server, Logical Storage Manager, and AdvFS Utilities	QP-6R9AQ-AA
	TruCluster Server license	QL-6BRAQ-AA
	Logical Storage Manager License	QL-2GVAQ-AA
	AdvFS Utilities License	QL-0EGAQ-AA
	Advanced Server for Tru64 UNIX, 25 client concurrent use license	QL-5U29M-3D
	Advanced Server for Tru64 UNIX, 50 client concurrent use license	QL-5U29M-3E
	Advanced Server for Tru64 UNIX, 100 client concurrent use license	QL-5U29M-3F
	Advanced Server for Tru64 UNIX, 250 client concurrent use license	QL-5U29M-3G
	Advanced Server for Tru64 UNIX, 500 client concurrent use license	QL-5U29M-3H
	Layered products media and documentation for Tru64 UNIX on CD-ROM	QA-054AA-H8
	DECnet/OSI end-system license for Tru64 UNIX	QL-MTJAQ-AA
	DECnet/OSI extended function license for Tru64 UNIX	QL-MTKAQ-AA

When using Tru64 UNIX V4.0G	Tru64 UNIX media and online documentation on CD-ROM	QA-MT4AA-H8
	Tru64 UNIX full hard copy documentation	QA-MT4AA-GZ
	StorageWorks software package with licenses for Logical Storage Manager and AdvFS Utilities	QB-5RXAQ-AA
	TruCluster Available Server license	QL-05SAQ-AA
	TruCluster Production Server license	QB-3RLAQ-AA
	Tru64 UNIX Driver for MEMORY CHANNEL license	QB-4ZCAQ-AA
	Advanced Server for Tru64 UNIX, 25 Client Concurrent License	QL-5U29M-3D
	Advanced Server for Tru64 UNIX, 50 Client Concurrent License	QL-5U29M-3E
	Advanced Server for Tru64 UNIX, 100 Client Concurrent License	QL-5U29M-3F
	Advanced Server for Tru64 UNIX, 250 Client Concurrent License	QL-5U29M-3G
	Advanced Server for Tru64 UNIX, 500 Client Concurrent License	QL-5U29M-3H
	Layered products media and documentation for Tru64 UNIX on CD-ROM	QA-054AA-H8
	DECnet/OSI end-system license	QL-MTJAQ-AA
	DECnet/OSI extended function license	QL-MTKAQ-AA

Options

OpenVMS

- OpenVMS system base packages include Base license and HP Enterprise Integration Server for OpenVMS License Package Revision V3.0A
- OpenVMS Concurrent Use licenses provide the right to interactively use the operating system by the specified number of concurrent users on a designated OpenVMS system. OpenVMS Concurrent Use licenses can be moved from one system to another at user discretion and can be shared in a mixed OpenVMS VAX and OpenVMS Alpha cluster.

Concurrent Use 1-user license	QL-MT3AA-3B
Concurrent Use 2-user license	QL-MT3AA-3C
Concurrent Use 4-user license	QL-MT3AA-3D
Concurrent Use 8-user license	QL-MT3AA-3E
Concurrent Use 16-user license	QL-MT3AA-3F
Concurrent Use 32-user license	QL-MT3AA-3G
Concurrent Use 64-user license	QL-MT3AA-3H
Concurrent Use 128-user license	QL-MT3AA-3J
Concurrent Use 256-user license	QL-MT3AA-3K
Traditional unlimited-user license	QL-MT2AQ-AA
OpenVMS V7.2-1H1 media and online documentation on CD-ROM	QA-MT1AU-H8
OpenVMS media and documentation on CD-ROM	QA-MT1AA-H8
OpenVMS base hard copy documentation	QA-09SAA-GZ
Layered products media and documentation for OpenVMS on CD-ROM; includes HP Enterprise Integration Server for OpenVMS media and documentation	QA-03XAA-H8
DECnet/OSI end-system license	QL-MTFAQ-AA
DECnet/OSI extended-function license	QL-MTGAQ-AA
Cluster License for OpenVMS Alpha	QL-MUZAQ-AA

Options

OpenVMS Galaxy - OpenVMS Galaxy Licensing Requirements

For more details about OpenVMS Galaxy licensing requirements, refer to the Software Product Description for the Galaxy Software Architecture on OpenVMS Alpha: SPD 70.44.xx – OpenVMS Update 05 is required.

- One OpenVMS Base Operating System License (included in base system) is mandatory for AlphaServer GS160 configured as an OpenVMS Galaxy system.
- One SMP Extension License (included in SMP CPU upgrade) is mandatory for each CPU after the first CPU.
- For each AlphaServer GS160 CPU in an OpenVMS Galaxy, one OpenVMS Galaxy License is mandatory.
- HP layered products are licensed as follows:
  - One capacity license per system
  - One user license per use
- Up to two instances of OpenVMS are supported in OpenVMS Galaxy configurations on AlphaServer GS160 systems.

For more information about OpenVMS Galaxy requirements, configurations, and procedures, refer to the OpenVMS Alpha Galaxy Guide. The latest version is always available at http://www.openvms.hp.com/gsseries/index.html

Galaxy 1-CPU License	QL-66XAA-3B
Galaxy 2-CPU License	QL-66XAA-3C
Galaxy 4-CPU License	QL-66XAA-3D
Galaxy 8-CPU License	QL-66XAA-3E
Galaxy 16-CPU License	QL-66XAA-3F

Example: 16-CPU GS160 system in which all processors are licensed for OpenVMS with two hard partitions (one 4-CPU SMP and one 12-CPU Galaxy):

- Base system order would include a DY-160CB-Ax and 15 3X-KN8AB-AE SMP upgrade CPUs
- Add one QL-66XAA-3D Galaxy 4-CPU License and one QL-66XAA-3E Galaxy 8-CPU license for a total of 12 Galaxy licenses for the 12-CPU hard partition with Galaxy.

No other licenses are required for OpenVMS on the SMP instance in the second hard partition with 4 CPUs.

Step 14 - Hardware and Software Support Services

- Installation or Installation and Startup is required for all AlphaServer GS160 systems.
- Select one of the optional HP Care Pack Service Packages described below that best supports the customer's operational requirements for system availability.

HP Care Pack Services

- HP Care Pack Services are available for AlphaServer systems running Tru64 UNIX or OpenVMS operating systems. HP Care Pack Services are designed for customers who require support beyond that provided by the hardware product warranty with coverage for both Principal server systems and SSPs (Subsequent System Packages) - that meet a full range of customer support requirements.

Program Features – Principal Server

HP Support Plus

- HP Support Plus offers combined hardware and software services in one package, providing support during standard HP office hours.

HP Support Plus 24

- HP Support Plus 24 offers combined hardware and software services in one package to help enhance the availability and performance of your IT infrastructure 24x7.

Options

HP Proactive 24

- HP Proactive 24 (P24) is a combined hardware and software support solution designed to help you get more from your IT investment. P24 improves the effectiveness, performance, and availability of the technologies in your IT infrastructure.

HP Critical Service

- HP Critical Service (CS) is a comprehensive hardware and software support solution, designed for organizations running business critical applications. CS provides a combination of proactive and reactive services for mission critical environments with little or nor tolerance for downtime.

SSPs
(Subsequent System Packages)

- For HP Support Plus and Support Plus 24
- HW Support at same level as corresponding package for Principal server
- License Subscription: HP O/S (where applicable)
- Telephone support through Principal server covered by full support package

Installation

- Pre-installation review
- Unpacking of equipment
- Assemble and test
- Basic product usage info
- No software installation added

Installation & Startup HP O/S

- Pre-installation review
- Unpacking of equipment
- Assemble and test
- Basic product usage info
- Install operating systems
- Product configuration
- Print and network access
- Orientation

Program Features – Additional Services

Model/HP Care Pack Services	Principal Server 1 year	Principal Server 3 years	Subsequent Systems 1 year	Subsequent Systems 3 years
AlphaServer GS160 Model 8 (sold via legacy Order Management System)				
HP Support Plus	FP-W0103-12	FP-W0103-36	FP-W2103-12	FP-W2103-36
HP Support Plus 24	FP-W0203-12	FP-W0203-36	FP-W2203-12	FP-W2203-36
Installation	FP-WINST-16	FP-WINST-16	FP-WINST-16	FP-WINST-16
Installation & Startup	FP-WSTAR-16	FP-WSTAR-16	FP-WSTAR-16	FP-WSTAR-16
AlphaServer GS160 Model 16 (sold via legacy Order Management System)				
HP Support Plus	FP-W0104-12	FP-W0104-36	FP-W2104-12	FP-W2104-36
HP Support Plus 24	FP-W0204-12	FP-W0204-36	FP-W2204-12	FP-W2204-36
Installation	FP-WINST-16	FP-WINST-16	FP-WINST-16	FP-WINST-16
Installation & Startup	FP-WSTAR-16	FP-WSTAR-16	FP-WSTAR-16	FP-WSTAR-16

Options

AlphaServer GS160 Model 8 (sold via Fusion Order Management System)				
	1-year Package ID#	Option ID#	3-year Package ID#	Option ID#
HP Support Plus	HA109A1	6K6	HA109A3	6K6
HP Support Plus 24	HA110A1	6K6	HA110A3	6K6
HP Proactive 24	HA111A1	6K6	HA111A3	6K6
HP Critical Service	HA112A1	6K6	HA112A3	6K6
AlphaServer GS160 Model 16 (sold via Fusion Order Management System)				
	1-year Package ID#	Option ID#	3-year Package ID#	Option ID#
HP Support Plus	HA109A1	6K7	HA109A3	6K7
HP Support Plus 24	HA110A1	6K7	HA110A3	6K7
HP Proactive 24	HA111A1	6K7	HA111A3	6K7
HP Critical Service	HA112A1	6K7	HA112A3	6K7

NOTE:

- AlphaServer GS160 systems include one-year hardware warranty with 5 x 9, on-site Next Business Day response.
- HP Care Pack Services include support for new HP branded hardware options internal to the AlphaServer enclosure plus a monitor (17-inch or less excluding flat panel models).
- External storage devices/cabinets carry their own level of warranty and should be quoted separately for uplifted warranty services
- In addition to the HP Care Pack Services shown above, other service packages are available for separate hardware and software support
- In addition to the HP Care Pack Services shown above, other service packages are available for separate hardware and software support. For more information on Hardware and Software Upfront Services and other HP service options available for AlphaServers, please consult your Sales Account Manager, HP Services Principal, or visit: http://www.hp.com/hps/

Software - Americas and Asia Pacific Only

- Systems include 90-day Conformance to SPD; select optional Software Support Services if required.
- Software service for Tru64 UNIX include advisory and remedial software support with new version license rights for Tru64 UNIX Base, unlimited users, and Server Extensions
- Software service for OpenVMS include advisory and remedial software support with new version license rights for OpenVMS Base and Enterprise Integration Package

Recommended Factory Integration Services

Value-added Implementation Services (VIS) provides systems integration and delivery services. VIS services, including system integration, extended burn-in, custom documentation, and on-site services can be custom-quoted for the full range of AlphaServer configurations.These pre-packaged services are offered for systems shipped to North America and Japan. For similar services in Europe, e-mail specific requirements to: customsystems.europe@hp.com
Pre-packaged VIS services are recommended for popular AlphaServer GS160 system configurations that include up to one storage array:

- Basic Integration Service (YT-CSSIT-V1) System integration, testing, extended burn-in, custom documentation, and installation of a single operating system instance
- Partioning Service (YT-CSSIT-P1) Configuration of additional instances of an operating system
- System integration, testing, extended burn-in, and custom documentation of hardware-partitioned systems

Options

Basic Integration Service	Systems integration and delivery services related to the configuration of the first and/or only instance of an operating system on a single AlphaServer GS160 platform. Includes the following: • Staging and Integration of the AlphaServer GS160 • Software load of a single instance of an operating system and current revisions of firmware • Hardware configuration, custom placement, and integration of internal options of the server per customer specifications • Installation of a single instance of either Tru64 UNIX or OpenVMS Operating System • Configuration, exercise, and test of up to one intelligent RAID array controller and associated disks per customer requirements • Testing of the system and its components for a full 100 hour burn-in • Mini-CCD (Custom Configuration Documentation) containing equipment listing, system environmental information, and software version levels	YT-CSSIT-V1
Partitioning Service	Configuration of multiple, non-clustered instances of a second or subsequent operating system on a single AlphaServer GS160 platform. This service is ordered along with the required YT-CSSIT-V1. Order one (1) YT-CSSIT-P1 option for the second hardware partition and for each additional hardware partition on an AlphaServer GS160 system. Includes the following: • Technical edit of order to guide component selection and option placement • Software load of an instance of an operating system on a hardware/software partition • Configuration and hardware integration (as described above) of the server partition per specifications • Partition testing with the system and its components during the 100 hour burn-in	YT-CSSIT-P1
Extra RAID Pair Service	Configuration of additional Intelligent RAID controller pairs beyond the internal and external RAID controller pairs included within the scope of the prerequisite YT-CSSIT-V1 and/or optional YT-CSSIT-P1 services on the same single AlphaServer GS160 platform. The following services are included in the optional YT-CSSIT-R1 Extra RAID Pair Service per each additional pair of Intelligent RAID controllers configured: • Technical edit of order to guide component selection and option placement • Configuration of the disks of the additional controller pair per customer specifications • Hardware configuration verification • Custom disk placement and verification • Installation of current revisions of firmware • Configuration, exercise and testing of up to one pair of additional intelligent array controller pair and associated disk drives for each YT-CSSIT-R1 • Controller and disk testing with the system and its components during the 100 hour burn-in	YT-CSSIT-R1
Clustering Service	Configuration of a single cluster instance for AlphaServer GS160 platforms. This is a per-cluster service and is ordered along with the prerequisite YT-CSSIT-V1 services. • Technical edit of order to guide component selection and option placement • Configuration of a cluster per specifications • Hardware and software configuration verification • Installation of either Tru64 UNIX TruCluster software or OpenVMS cluster software and configuration of node functions • Installation of current revisions of firmware • Cluster failover testing with the system and its components during the full 100 hour burn-in	YT-CSSIT-R1
Full Custom Configurations	The Integration Service Packages address the most-common customer requirements. For a wider range of configurations, customers can also choose additional customized services based upon a Statement of Work agreement. This includes: cluster add-on nodes, larger storage configurations, custom option support, custom system packaging, mixed operating system partitions, and configured multi-system clusters. Contact your Custom Solutions provider or Sales Representative for these services.	

Step 15 - Recommended Online Power Protection Solution for AlphaServer GS160

- A dual-AC power option provides the capability to connect to two separate synchronized AC feeds: a primary AC feed and a secondary AC feed. The feeds can be direct from the power utility, or they can be a combination of utility feeds and UPS or generator feeds. The preferred (primary) feed is chosen and set by the user. In the event of failure of the primary feed, the switch will automatically transfer the load to the secondary feed without power interruption. The selected AC feed can also be switched manually.
- The option cabinet must be positioned adjacent to the system power cabinet and it is bolted to it.
- Power requirements for the dual AC power option are identical to the system to which it is connected.
- The dual-AC switch option can be factory configured or installed as a field upgrade.
- The primary and secondary 3-phase AC sources must be nominally of the same level, frequency and phase rotation. To ensure virtually uninterrupted transfers between the two AC sources, the two input sources must be synchronized, typically within 5 to 15 electrical degrees. Questions regarding the dual-AC option can be answered by an environmental specialist at 1-800-354-9000.
- The primary and secondary 3-phase AC sources must have a THD of less than 10%.

The dual-AC power option consists of two component types:

- One AC switch configured within an H9A20 cabinet (3X-H7512-AC/AD). The cabinet has dedicated mounting space for a second AC switch that is not included.
- A second electronic AC switch (3X-H7512-BA/BB) that mounts within the 3X-H7512-AC/AD cabinet.
- AlphaServer G160 Model 8 systems require the 3X-H7512-AC/AD, only.
- AlphaServer GS160 Model 16 systems require both the 3X-H7512-AC/AD and the 3X-H7512-BA/BB.

NOTE: 3X-H9A20-AE/AF expansion cabinets include N+1 power on separate power controllers and may be directly connected to two different AC feeds.

Black dual AC transfer switch for use with AlphaServer GS160 Model 8 systems - may be upgraded with 3X-H7512-BA for use with AlphaServer GS160 Model 16 and AlphaServer GS320 systems, for use in U.S./Canada, 120/208V	3X-H7512-AC
Black dual AC transfer switch for use with AlphaServer GS160 Model 8 systems- may be upgraded with 3X-H7512-BB for use with AlphaServer GS160 Model 16 and AlphaServer GS320 systems, for use in Europe, 380-415V	3X-H7512-AD
Dual AC transfer switch upgrade for use with AlphaServer GS160 Model 16 and GS320 systems; requires 3X-H7512-AC, for use in U.S./Canada, 120/208V	3X-H7512-BA
Dual AC transfer switch upgrade for use with AlphaServer GS160 Model 16 and GS320 systems; requires 3X-H7512-AD, for use in Europe, 380-415V	3X-H7512-BB

Upgrades

AlphaServer GS160 System Hardware Expansion

AlphaServer GS160 systems are field-upgradeable to support up to 32 CPUs. In all cases, the resultant system is functionally the same as:

- An AlphaServer GS160 Model 8 can be internally upgraded to an AlphaServer GS160 Model 16 by adding two quad building blocks.
- An AlphaServer GS160 Model 16 can be upgraded to an AlphaServer GS320 Model 24 by adding an additional system logic cabinet containing two quad building blocks.
- An AlphaServer GS320 Model 24 can be internally upgraded to an AlphaServer GS320 Model 32 by adding two quad building blocks.
- Refer to the AlphaServer GS320 QuickSpecs for additional upgrade capabilities.

System expansion hardware to upgrade an AlphaServer GS160 Model 8 to an AlphaServer GS160 Model 16. Includes two quad building blocks, crossbar switch upgrade, and associated power supplies and cabling.	DH-160CH-AX
System expansion hardware to upgrade an AlphaServer GS160 Model 8 to an AlphaServer GS160 Model 16. Includes two quad building blocks, crossbar switch upgrade, and associated power supplies and cabling.	DH-320DH-BX
System expansion hardware to upgrade an AlphaServer GS320 Model 24 to an AlphaServer GS320 Model 32. Includes two quad building blocks and associated power supplies and cabling.	DH-320EH-AX

AlphaServer GS160 731-MHz or 1001-MHz to 1224-MHz System Hardware Upgrades

AlphaServer GS160 731-MHz and 1001-MHz systems are field upgradeable to 1224-MHz systems.

System Speed Hardware

- Upgrades require the return of the replaced System Box and SMP Modules

System Upgrade Hardware to upgrade a 731-MHz or 1001-MHz Tru64 UNIX AlphaServer GS160 to 1224-MHz - includes a dual QBB system box upgrade to 16 MB of cache, eight 1224-MHz CPU modules, and Tru64 UNIX Licenses.	DH-160CA-AU
System Upgrade Hardware to upgrade a 731-MHz or 1001-MHz OpenVMS AlphaServer GS160 to 1224-MHz - includes a dual QBB system box upgrade to 16 MB of cache, eight 1224-MHz CPU modules, and OpenVMS Licenses.	DH-160CA-BU

FRU Level Upgrade

- Contact HP Services for detailed information

System Box Level Upgrade to upgrade existing 4-MB or 8-MB cache capable System Box to 16-MB cache capable system Box	3X-BA51A-GU
GS160/320 SMP upgrade CPU, 6/1224-MHz with 16-MB on-board cache, Tru64 UNIX	3X-KN8AC-AD
GS160/320 SMP upgrade CPU, 6/1224-MHz with 16-MB on-board cache, OpenVMS	3X-KN8AC-AE

Global Clock Module Upgrade

GS80/160 Model M8 2-port Clock Module Upgrade - required for AlphaServer GS160 731-MHz system upgrades.	3X-WFCLK-AA
GS160/320 Model M16 10-port Clock Module Upgrade - required for AlphaServer GS160 731-MHz system upgrades.	3X-WFCLK-CA

NOTE: When ordering an upgrade, blue cabinet users with 731-MHz EV67 CPUs, who are planning on discontinuing use of the 731-MHz CPUs (not mixing them with higher speed CPUs) must order the specified clock option based on GS160 Model.

AlphaServer 731-MHz GS160 System Hardware Appearance Upgrades

- AlphaServer trim panel can be ordered to change external top gun blue skins to carbon black

AlphaServer GS160 top gun blue to carbon black conversion skin kit	CK-GSBCK-AB
H9A20-AA/AB/AC Expansion Cabinet GS160 top gun blue to carbon black conversion skin kit	CK-GSBCK-AD

HP Capacity on Demand (CoD) Program

AlphaServer GS160 customers can add additional CPU capacity on demand without waiting to purchase the resource when it is required and without re-booting their system. The HP Capacity on Demand Program, outlined below, is a two-part process.

Upgrades

Part 1

- Customer purchases a system with Tru64 UNIX or OpenVMS CoD SMP CPU(s) (3X-KN8CA-AD or 3X-KN8CA-AE), or customer purchases Tru64 UNIX or OpenVMS CoD SMP CPU(s) for field installation within an installed AlphaServer GS160 system.
- When purchasing the CoD CPU(s), the customer signs a CoD program agreement to purchase the CPU module(s) within 18 months or upon "first use" of the module(s)
- A blank copy of the agreement is available through your local HP representative or call 1-800-282-6672 -- Full program terms are outlined in this agreement.

Part 2

- The customer will be invoiced for the CPU module(s) upon notification by the customer of "first use" or expiration of the 18-month period.

NOTE: CoD CPUs are field installed. Field installation on existing systems is not included in the CPU option price.

GS160/320 CoD SMP CPU, includes one 6/1224-MHz CPU module with 16-MB on-board cache and Tru64 UNIX SMP license for use under the CoD program terms	3X-KN8CC-AD
GS160/320 CoD SMP CPU, includes: one 6/1224-MHz CPU module with 16-MB on-board cache and OpenVMS SMP license for use under the CoD program terms	3X-KN8CC-AE

TechSpecs

		GS160 Model 8	GS160 Model 16
Physical Characteristics	Dimensions (H x W x D)	67 x 55.1 x 39.4 in (170 x 140 x 100 cm)	67 x 55.1 x 39.4 in (170 x 140 x 100 cm)
	Shipping Dimensions	76.5 x 44 x 48 in (195 x 112 x 122 cm)	76.5 x 44 x 48 in (195 x 112 x 122 cm)
	NOTE: The GS160 is shipped in two cabinets, which are joined in the field. The dimensions and weights shown represent the largest of the cabinets.		
	Weight Maximum Configuration	868 lb (393 kg)	868 lb (393 kg)
	Maximum Shipping Weight	1,400 lb (634 kg)	1,590 lb (721 kg)
Heat dissipation	Minimally configured system (system and power cabinet)	2,100 W/7200 Btu/hr	3,500 W/12000 Btu/hr
	NOTE: Minimally configured system contains two or four power supplies, single CPU module, single memory module, single system I/O module, minimally configured PCI shelf, and one disk drive.		
	Fully configured system (system and power cabinet)	4,200 W/14,300 Btu/hr	6,600 W/22,500 Btu/hr
	NOTE: Fully configured Model 8 systems include three power supplies, eight CPU modules, eight memory modules, four system I/O modules, two PCI shelves, and a single storage shelf with six disk drives. Fully configured Model 16 systems include six power supplies, 16 CPU modules, 16 memory modules, eight system I/O modules, two PCI shelves, and a single storage shelf with six disk drives.		
	Fully configured system (system and power cabinet with two I/O expansion cabinets)	8,900 W/30,400 Btu/hr	11,200 W/38,200 Btu/hr
	NOTE: "Fully configured expanded systems" consist of the above "fully configured system" plus two expansion cabinets, each includes three PCI shelves, four StorageWorks shelves, and 24 disk drives.		
Clearances		Operating	Service
	Front	29.5 in (75 cm)	29.5 in (75 cm)
	Rear	29.5 in (75 cm)	29.5 in (75 cm)
	Left Side	None	None
	Right Side	None	None
Environmental		Operating	Non-Operating
	Temperature	41° to 95° F (5° to 35° C)	–40° to 151° F (–40° to 66° C)
	Humidity	10% to 90%	10% to 95%
	Altitude	0 to 10,000 ft (0 to 3 km)	40,000 ft (12.2 km)
	Vibration	5 to 500 Hz @ .1G maximum	

TechSpecs

Regulatory	**Agency approvals**	UL Listed to UL1950
		cUL Listed to CAN/C22.2 No. 950-M89
		FCC Part 15 (Class A)
		CE Declaration
	Reviewed to	EN 60950 1922/A4:1997, European Norm
		AS/NZS 3260:1993, Australian/New Zealand Standard
		73/23/EEC, Low Voltage Directive
		IEC950, 2nd Ed., 4th Amend.

Power Requirements NOTE: Power system provides near unity power factor that allows full utilization of the input line current (Watts = VA).

	GS160 Model 8		
	U.S./Canada	Japan	Europe
Nominal voltage(s)	120/208V	202V	380 to 415V
Frequency range	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz
Phases	1 circuit	1 circuit	1 circuit
	3-phase star	3-phase delta	3-phase star
	3-wire+ N+ GND	4-wire mid-GND or	3-wire+ N+ GND
		3-wire junction GND	
Maximum input current/circuit	17A	18A	10A
Rating	30A	30A	32A
Surge current	225A peak	220A peak	150A peak
Total Volt-Amps	4,400VA	4,400VA	4,400VA
Power cord length	15 ft (4.5 m)	15 ft (4.5 m)	15 ft (4.5 m)
NOTE: GS160 Model 8 includes a second power cord for future expansion, but only one power cord is required.			
Power cap (system)	1 DEC 12-12314-00	1 DEC 12-12314-00	1 DEC 12-14379-06
Receptacle (site)	1 DEC 12-12315-01	1 DEC 12-12315-01	1 Hubbell 532R6W
(industry equivalent)	1 NEMA L21-30R	1 NEMA L21-30R	1 IEC 309 (32A)
	GS160 Model 16		
	U.S./Canada	Japan	Europe
Nominal voltage(s)	120/208V	202V	380 to 415V
Frequency range	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz
Phases	2 circuits	2 circuits	2 circuits
	3-phase star	3-phase delta	3-phase star
	3-wire+ N+ GND	4-wire mid-GND or	3-wire+ N+ GND
		3-wire junction GND	
Maximum input current/circuit	21A	21A	13A
Rating	30A	30A	32A
Surge current	170A peak	160A peak	170A peak
Total Volt-Amps	6800VA	6800VA	6800VA
Power cord length	15 ft (4.5 m)	15 ft (4.5 m)	15 ft (4.5 m)
NOTE: GS160 Model 8 includes a second power cord for future expansion, but only one power cord is required.			
Power cap (system)	2 DEC 12-12314-00	2 DEC 12-12314-00	2 DEC 12-14379-06
Receptacle (site)	2 DEC 12-12315-01	2 DEC 12-12315-01	2 Hubbell 532R6W
(industry equivalent)	2 NEMA L21-30R	2 NEMA L21-30R	2 IEC 309 (32A)

H9A20 I/O Expander Cabinet

Physical Characteristics	Dimensions (H x W x D)	67 x 24 x 39.4 in (170 x 60 x 100 cm)
	Shipping Dimensions	76.5 x 44 x 48 in (195 x 92 x 122 cm)
	Weight Maximum Configuration	700 lb (320 kg)
	Shipping Weight Maximum Configuration	830 lb (380 kg)

Clearances		Operating	Service
	Front	29.5 in (75 cm)	29.5 in (75 cm)
	Rear	6.0 in (15 cm)	29.5 in (75 cm)
	Left Side	None	None
	Right Side	None	None

Environmental		Operating	Non-Operating
	Temperature	41° to 95° F (5° to 35° C)	–40° to 151° F (–40° to 66° C)
	Humidity	10% to 90%	10% to 95%
	Altitude	0 to 10,000 ft (0 to 3 km)	40,000 ft (12.2 km)
	Vibration	5 to 500 Hz @ .1G maximum	

Heat dissipation	Minimally configured cabinet	250 W/850 Btu/hr
	NOTE: Minimally configured expander cab contains a minimally configured PCI shelf and one disk drive	
	Fully configured cabinet	2,400 W/8,200 Btu/hr
	NOTE: Fully configured expander cab contains three PCI shelves and 24 disk drives	

Power Requirements	NOTE: The US/Canada model supports nominal input voltages of 115-117V. The Japan and Europe models support nominal input voltages of 200-240V.

TechSpecs

	U.S./Canada	Japan	Europe
Cabinet	3X-H9A20-AD	3X-H9A20-AF	3X-H9A20-AE
Nominal voltage(s)	120V	200 to 240V	220 to 240V
Frequency range	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz
Phases	2 circuits	2 circuits	2 circuits
	1-phase	1-phase	1-phase
	2-wire+ GND	2-wire+ GND	2-wire+ GND
Dual AC source support	No	Yes	Yes
NOTE: 3X-H9A20-AE/AF expansion cabinets are recommended for use with dual AC sources			
Maximum input current/circuit	22A	12A	11A
Rating	30A	30A	32A
Surge current	150A peak	150A peak	170A peak
Total Volt-Amps	2600VA	2600VA	2600VA
Power cord length	15 ft (4.5 m)	15 ft (4.5 m)	15 ft (4.5 m)
Power cap (system)	2 DEC 12-11193-00	2 DEC 12-16886-00	2 DEC 12-14379-07
Receptacle (site)	2 DEC 12-11194-00	2 DEC 12-19658-01	2 Hubbell 332R6W
(industry equivalent)	2 NEMA L5-30R	2 NEMA L6-30R	2 IEC 309 (32A)

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