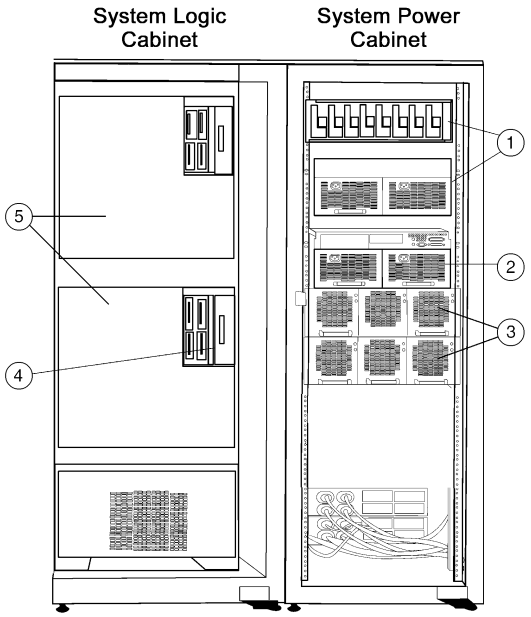
Overview

At A Glance

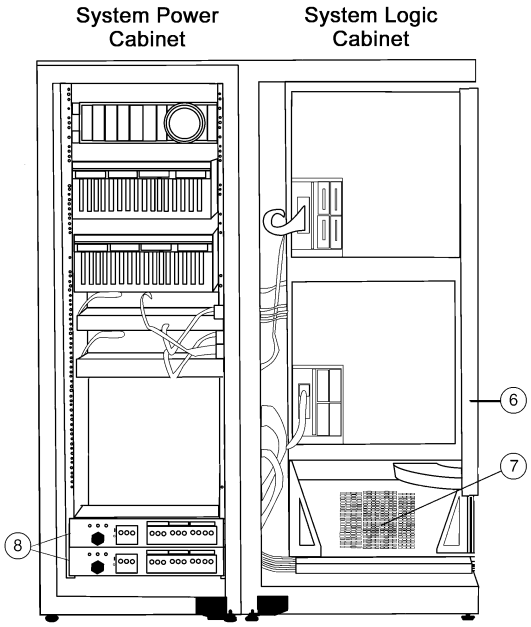
AlphaServer™ GS160 systems include:

- One 1224-MHz CPU module; up to 16 (upgradeable to 32) 1224-MHz Alpha 21264 processors supported
- Optional Compaq Capacity on Demand (CCoD) 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 12.8-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.

NOTE: Certain restrictions and exclusions may apply. For details, consult the Product Information Centre at 1-888-882-6672.



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

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	One 5.25-inch half height 600-MB CD-ROM drive
	Hard Drives	One 18.2-GB 10,000 rpm SCSI disk drive
Internal Disk Expansion	Total Internal Drive Bays	Up to 14 36-GB drives (504 GB) can be mounted in optional storage shelves in system power cabinet
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 iPlanet Web Server Enterprise Edition 4.0 **NOTE**: Tru64 UNIX refers to versions 4.0G, 5.1, 5.1A, or later. Refer to the "Supported Options List" – http://www.compaq.com/alphaserver/products/options.html – for any unique limitations based on OS version. **NOTE**: This website is available in English only. 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, or later. Refer to the "Supported Options List" – http://www.compaq.com/alphaserver/products/options.html – for any unique limitations based on OS version. **NOTE**: This website is available in English only. 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. **NOTE**: Certain restrictions and exclusions may apply. For details, consult the Product Information Centre at 1-888-882-6672.	

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:

- *CarePaq*™ Priority Service Plan
- 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.

Step 2 – Select base system *(continued)*

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

Compaq Capacity on Demand (CCoD) CPUs

- AlphaServer GS160 base systems can be configured with optional Compaq Capacity on Demand (CCoD) 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 CCoD CPUs – must adhere to the limits shown in the above table. Refer to the Compaq Capacity on Demand Program described in the "Upgrades" section.

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

Step 4 – Select Memory Options *(continued)*

Memory Configuration Examples – Configuring a QBB 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 an 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.

Step 5 – Evaluate Configuration Requirements to Support Optional Partitioning *(continued)*

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

- 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.

1600W 48V power supply	H7506-BA

Step 6 – Configure Packaging Options *(continued)*

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 BA36R or DS-SL13R-xx *StorageWorks*™ shelf, or
- One or two StorageWorks BA36R or DS-SL13R-xx shelves
- Mixed configurations of BA36R and DS-SL13R-xx shelves are supported, but cannot be factory integrated.

Internal StorageWorks Expansion	• System power cabinet provides space for up to two forward facing storage shelves. There are two configuration options: – Up to two BA36R-RC/RD StorageWorks shelves; each shelf holds a maximum of two 5.25-inch devices and one 3.5-inch device or seven 3.5-inch devices – Up to two DS-SL13R-xx Ultra3 SCSI (LVD) shelves; each shelf supports a maximum of 14 Ultra3 disk drives	
Configuring BA36R StorageWorks Shelves	• Each UltraSCSI StorageWorks shelf requires a SCSI controller and a SCSI cable to connect controller to shelf • StorageWorks drives are listed in a subsequent section	
	UltraSCSI single-channel SE StorageWorks shelf includes 16-bit I/O personality module (DS-BA35X-FA), 180 W ac power supply, dc fans, and RETMA rackmounting hardware; supports 16-bit UltraSCSI devices and some 8-bit narrow SCSI devices depending on compliance with minimum revision levels	BA36R-RC
	UltraSCSI dual-channel SE StorageWorks shelf, includes 16-bit I/O personality module (DS-BA35X-FB), 180 W ac power supply, dc fans, and RETMA rackmounting hardware; supports 16-bit UltraSCSI devices and some 8-bit narrow SCSI devices depending on compliance with minimum revision levels	BA36R-RD
	UltraSCSI StorageWorks Differential personality card; installs in BA36R-RC and is cabled to the KZPBA-CB or 3X-KZPBA-CC; field installed only	DS-BA35X-DA
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-metre cables; DS-KZPCC-xx RAID controllers require BN37A-02 2-metre cables. • Ultra3 shelves connected to 3X-KZPCA-AA adapters in an attached expander cabinet require BN38C-10 10-metre cables; DS-KZPCC-xx RAID controllers require BN37A-10 10-metre cables. • Ultra3 shelves connected to 3X-KZPCA-AA adapters in a remote expander cabinet require 10 20-metre 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 rack-mount shelf, International except Japan	DS-SL13R-AA
	StorageWorks Model 4314R Ultra3 SCSI (LVD) single-bus universal drive rack-mount shelf, Japan	DS-SL13R-AJ
	StorageWorks Model 4354R Ultra3 SCSI (LVD) split-bus universal drive rack-mount shelf, International except Japan	DS-SL13R-BA
	StorageWorks Model 4354R Ultra3 SCSI (LVD) split-bus universal drive rack-mount 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.

Step 6 – Configure Packaging Options *(continued)*

Step 6b – Internal System Expansion *(continued)*

Power Option for BA36R Shelves	• Additional power supply provides N+1 power for StorageWorks shelves; power supply uses 3.5-inch slot in StorageWorks shelf reducing total number of devices supported by one • StorageWorks drives are listed in a subsequent section	
	180W redundant power supply for StorageWorks shelf, includes power cord	CK-BA35X-HH
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-AA
	Redundant power supply for 4314R Ultra3 (LVD) StorageWorks shelf, International	DS-SE2UP-AI
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 has been 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.	
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 6 – Configure Packaging Options *(continued)*

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, but cannot be factory configured.

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-metre I/O cables.
- 3X-H9A20-AD/AE/AF cabinets may be placed up to 6 metres 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-metre 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

PCI UltraSCSI 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 CDROM 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, 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, 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	
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 Fibre Channel adapter, (uses one PCI slot); requires Fibre Channel cable with LC connector for adapter	62	26	13	26	26	4	DS-KGPSA-DA
Fibre Channel SC-SC cable, (BNGBX-xx) xx=02, 03, 05, 10, 15, 30, 50 metres							BNGBX-xx
Fibre Channel SC-LC cable, 2-metre (2976), 5-metre (2977), 15-metre (2978), 30-metre (3458), 50-metre (3459)							3R-Axxxx-AA
Fibre Channel LC-LC cable, 2-metre (2979), 5-metre (2980), 15-metre (2981), 30-metre (3454), 50-metre (3455)							3R-Axxxx-AA
PCI 1-port UltraSCSI single-ended host adapter (uses one PCI slot)	8	8	8	8	8	8	KZPBA-CA
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 metres (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
NOTE: * = 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.							
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 metres							BN38C-xx

Step 7 – Storage *(continued)*

PCI UltraSCSI Adapters and Controllers *(continued)*

	Maximum # Supported						
	Tru64 UNIX			OpenVMS			
	Per System	Per QBB	Per PCI Drawer	Per System	Per QBB	Per PCI Drawer	
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; maximum cable length is 12 metres.	-	-	-	4	4	4	3X-KZPEA-DB
68-pin VHDCI male-to-VHDCI male UltraSCSI cable; xx=02, 03, 04, for 6, 12, and 24 metres respectively							3X-BC56J-xx
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 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 metres							BN37A-xx

NOTE: ** = Requires a Graphics Adapter or Graphical Display Station for its configuration utility (other than the base system console).

NOTE: Use 2-metre cable to connect adapters, controllers, and shelves within the GS320 power cabinet.
Use 10-metre cable to connect adapters, controllers to shelves in attached H9A20 expander cabinets.
Use 10- to 25-metre cables to connect adapters, controllers to shelves in remote expander cabinets.

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 metres	BNCIA-xx

Step 7a – Internal Storage

UltraSCSI Storage Devices (for use with BA356)	9.1-GB 10,000 rpm 16-bit UltraSCSI disk drive SBB	DS-RZ1DD-VW
	18.2-GB 10,000 rpm 16-bit UltraSCSI disk drive SBB	DS-RZ1ED-VW
	36.4-GB 10,000 rpm 16-bit UltraSCSI disk drive SBB	DS-RZ1FC-VW
UltraSCSI Tape Devices (for use with BA356)	12/24-GB 4 mm DAT SCSI tape drive in 3.5-inch StorageWorks carrier	DS-TLZ10-VA
	20/40-GB DLT SCSI tape drive in 5.25-inch StorageWorks carrier	TZ88N-VA
	40/80-GB DLT SCSI tape drive in 5.25-inch StorageWorks carrier	DS-TZ90N-VW
Ultra3 SCSI (LVD) Storage Devices (for use with DS-SL13R-xx)	18.2-GB Ultra3 SCSI 10,000 rpm universal 1-inch disk drive	3R-A0585-AA
	18.2-GB Ultra3 SCSI 15,000 rpm universal 1-inch disk drive	3R-A1543-AA
	36.4-GB Ultra3 SCSI 10,000 rpm universal 1-inch disk drive	3R-A0919-AA
	36.4-GB Ultra3 SCSI 15,000 rpm universal 1-inch disk drive	3R-A3079-AA
	72.8-GB Ultra3 SCSI 10,000 rpm universal 1-inch disk drive	3R-A3050-AA
Ultra2 SCSI (LVD) Tape Devices (for use with DS-SL13R-xx)	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
	SDT-10,000, 20/40-GB DAT tape drive embedded in hot plug universal carrier	3R-A2780-AA

Step 7 – Storage *(continued)*

Ultra2 SCSI (LVD) Rackmount Tape Devices

3U Rackmount Tape Enclosure	SDLT 110/220-GB, dual-drive, 3U rackmount kit, carbon black	274334-B21
	SDLT 110/220-GB, single drive, 3U rackmount kit, carbon black	274331-B21
	Model 0 (no drives installed) 3U rackmount kit, carbon black	274338-B21
	DLT 40/80-GB, dual-drive, 3U rackmount kit, carbon black	274335-B21
	DLT 40/80-GB, 3U rackmount kit, carbon black	274332-B21
	AIT50, 3U rackmount kit, carbon black	274333-B21
	Rackmount kit for H9Axx Series Cabinet (3U)	3R-A3804-AA
Tape Drives for Use in 3U Rackmount Tape Enclosure	DLT 40/80-GB carbon black, internal	146196-B22
	SDLT 110/220-GB carbon black, internal	192106-B25
	SDLT 160/320-GB carbon black, internal	257319-B21
	DAT 20/40-GB DDS4 carbon black, internal	157769-B22
	AIT 35/70-GB carbon black, internal	216884-B21
	AIT 50/100-GB carbon black, internal	157766-B22
5U Rackmount Tape Enclosure	DLT 40/80-GB Tape Array III, four drives in 5U rackmount kit, carbon black	274337-B21
	SDLT 110/220-GB Tape Array III, four drives in 5U rackmount kit, carbon black	274336-B21
	Model 0 (no drives installed) 5U rackmount kit	274339-B21
	Alpha Rail Kit Tape Array III, 5U	254795-001
Tape Drives for Use in 5U Tape Enclosure	DLT 40/80-GB carbon black, internal	146196-B22
	SDLT 110/220-GB carbon black, internal	192106-B25
	SDLT 160/320-GB carbon black, internal	257319-B21
AIT Autoloader	AIT35-GB autoloader, 8 cartridge, rackmount, carbon black	282175-002
	Rail kit for AIT autoloader	284930-001

Tape Libraries

StorageWorks ESL9326 SL SDLT 110/220-GB Tape Library	ESL9326SL SDLT tape library with six SDLT 110/220 tape drives, 326 slots; requires 3X-KZPCA-AA adapter	234615-B21
	ESL9326SL SDLT tape library with eight SDLT 110/220 tape drives, 326 slots; requires 3X-KZPCA-AA adapter	234615-B22
	ESL9326SL SDLT tape library with 16 SDLT 110/220 tape drives, 326 slots; requires 3X-KZPCA-AA adapter	234615-B26
StorageWorks ESL9595 SDLT 110/220-GB Tape Library	ESL9595 SDLT tape library with 0/2/16 SDLT 110/200-GB drives, and 400 slots; requires 3X-KZPCA-AA adapter	274672-B21/B22/B28
	ESL9595 SDLT tape library with 0/2/16 SDLT 110/200-GB drives, and 500 slots; requires 3X-KZPCA-AA adapter	281627-B21/B22/B28
	ESL9595 SDLT tape library with 0/2/16 SDLT 110/200-GB drives, and 595 slots; requires 3X-KZPCA-AA adapter	281628-B21/B22/B28
StorageWorks ESL9198SL SDLT 110/220-GB Tape Library	ESL9198SL SDLT tape library with four 110/220-GB SDLT tape drives, 198 slots; requires 3X-KZPCA-AA adapter	234618-B21
	ESL9198SL SDLT tape library with eight 110/220-GB SDLT tape drives, 198 slots; requires 3X-KZPCA-AA adapter	234618-B22

Step 7 – Storage *(continued)*

Tape Libraries *(continued)*

StorageWorks ESL9198DLX 40/80-GB Tape Library	ESL9198 DLX Enterprise tape libraries with two 40/80-GB tape drives, 198 slots; requires 3X-KZPCA-AA adapter	194993-B22
	ESL9198 DLX Enterprise tape libraries with four 40/80-GB tape drives, 198 slots; requires 3X-KZPCA-AA adapter	194993-B24
	ESL9198 DLX Enterprise tape libraries with eight 40/80-GB tape drives, 198 slots; requires 3X-KZPCA-AA adapter	194993-B28
StorageWorks MSL5026SL 110/220-GB Tape Library	MSL5026 rackmount, 0 drives, 26 media slots	231979-B21
	MSL5026SL rackmount, one SDLT drive, 26 media slots, LVD	231892-B21
	MSL5026SL rackmount, two SDLT drives, 26 media slots, LVD	231892-B22
StorageWorks MSL5052SL 110/220-GB Tape Library	MSL5052 rackmount, 0 drives, 52 media slots	255102-B21
	MSL5052SL rackmount with two SDLT drives, 52 media slots, LVD	249491-B21
	Field upgrade SDLT 110/220-GB drive, LVD	231823-B22
Library Rackmount for MSL5xxx Tape Libraries in H9Axx Cabinet Series	Alpha Rail Kit, tape array III, U.S.	254795-001

Compatible Storage Devices

The following tape drives are compatible with the AlphaServer GS160:

- TZ88, TSZ07, TLZ09, TKZ62, TKZ63, TKZ90, TLZ9L, TL800, TL891, TL892, TL890, TL893, TL894, TL895, TL896, DS-TLZ10-VA, TSZ20, TSZ08, DLT7000, AIT35, TZ89N

Step 7b – External Storage

External Storage Arrays

- ESA 12000 Storage Arrays and RAID Array 8000 (HSG80/HSZ80 product set) are supported on Tru64 UNIX and OpenVMS systems.
- 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.compaq.com/products/StorageWorks/
  NOTE: This website is available in English only.
  (Only Tru64 UNIX and OpenVMS operating systems options are supported.)

Storage Array Controllers

The following controllers are used in StorageWorks array packaging:

HSZ80 RAID Controllers

- HSZ80 UltraSCSI RAID controllers for RA8000 and ESA12000 are supported under Tru64 UNIX and OpenVMS.
- HSZ80 UltraSCSI RAID controllers require platform kit 400569-001 for Tru64 UNIX or 400571-001 for OpenVMS. PCMCIA software kit, 400566-001/QB-678AA-SA, also required for each controller.
- HSZ80 UltraSCSI controllers require KZPBA-CB/3X-KZPBA-CC adapters and BN38C cables (and UltraSCSI hubs if used).

NOTE: For system integration of the following options, contact CustomSystems.

DS-HSZ80-AH UltraSCSI controller, includes 64-MB cache expandable to 128 MB	400564-B21
DS-HSZ80-AJ UltraSCSI controller, includes 256-MB cache expandable to 512 MB	400565-B21
64-MB cache upgrade for HSx80 (DS-HSDIM-AB)	380673-B21
256-MB cache upgrade for HSx80 (DS-HSDIM-AC)	380674-B21

Step 7b – External Storage *(continued)*

Storage Array Controllers *(continued)*

HSG80 Fibre Channel Controllers

- HSG80 Fibre Channel controllers for RA8000, MA8000, ESA12000, EMA12000 are supported under Tru64 UNIX and OpenVMS.
- HSG80 Fibre Channel controllers require platform kit 380553-001/QB-65RAB-SA for Tru64 UNIX or 380555-001/QB-65RAC-SA for OpenVMS. Software kit, 128697-B21 HSG80 ACS V8.4F or 128698-B21 V8.4P also required for each HSG80 ordered.
- HSG80 Fibre Channel controllers require DS-KGPSA-CA or DS-KGPSA-DA Fibre Channel adapters, BNGBX cables, and fiber hubs or switches (see Fibre Channel Hubs, Switches and Components)

NOTE: For system integration of the following options, contact CustomSystems.

DS-HSG80-BH Fibre Channel controller, includes 64-MB cache expandable to 128 MB	380671-B21
DS-HSG80-BJ Fibre Channel controller, includes 256-MB cache expandable to 512 MB	380672-B21
64-MB cache upgrade for HSx80 (DS-HSDIM-AB)	380673-B21
256-MB cache upgrade for HSx80 (DS-HSDIM-AC)	380674-B21

HSV110 Enterprise Virtual Storage Array Fibre Channel Controllers

- HSV110 Enterprise Virtual Storage Array Fibre Channel Controllers are only supported with a minimum of Tru64 UNIX V5.1 at this time
- HSV110 Storage Controllers require a platform kit for Tru64 UNIX V5.1 – 250193-B21
  SAN VCS Controller Software kit -- 250203-B22, also required for each controller pair

NOTE: For system integration of the following options, contact CustomSystems.

• DS-SV110-AA EVA 12000 42U (2C + 6D), 60 Hz	234345-B21
• DS-SV110-AB EVA 12000 42U (2C + 6D), 50 Hz	234345-B22
• DS-SV110-BA EVA 12000 42U (2C + 12D), 60 Hz	234346-B21
• DS-SV110-BB EVA 12000 42U (2C + 12D), 50 Hz	234346-B22
• DS-SV110-EA EVA 12000 42U (8C + 8D), 60 Hz	239782-001
• DS-SV110-EB EVA 12000 42U (8C + 8D), 50 Hz	249977-B21

HSJ54 CI Storage Array Controller

- HSJ54 CI Storage Array controllers are supported under OpenVMS V7.2-1H1 with CIPCA-BA CI controllers; QB-5C4AA-SA software kits required for each external cache (one for HSJ50, two for HSJ52, four for HSJ54).
- HSJ54 CI Storage Array controllers require star couplers (SC008-AB, -AC or -AD) with CIPCA-BA adapters and BNCIA cables.
- Controllers require KZPBA or CIPCA SCSI adapters or controllers, as appropriate.

NOTE: For system integration of the following option, contact CustomSystems.

Quad 512-MB cache CI array controller with cache batteries	HSJ54-AJ

UltraSCSI Hubs

- UltraSCSI hubs are supported with KZPBA-CB/3X-KZPBA-CC PCI differential SCSI adapters.

UltraSCSI hub with three differential ports, no single-ended ports, consists of two host ports and one storage port in 3.5-inch SBB, UltraSCSI cables not included	DS-DWZZH-03
UltraSCSI hub with five differential ports, no single ended ports, consists of four host ports and one storage port in 5.25-inch SBB, UltraSCSI cables not included	DS-DWZZH-05

Step 7b – External Storage *(continued)*

Storage Array Controllers *(continued)*

Fibre Channel Hubs, Switches, and Components	**NOTE**: For system integration of the following options, contact CustomSystems.	
	Fibre Channel SAN Switch, 8 ports, 2 Gb, with Fabric Operating Software	258707-B21 DS-DSGGD-AC
	Fibre Channel SAN Switch, 16 ports, 2 Gb with Fabric Operating Software	283056-B21 DS-DSGGD-AD
	Fibre Channel SAN Switch, 16 ports, 2 Gb with Fabric Operating Software, two power supplies	287055-B21 DS-DSGGD-BA
	Unmanaged Fibre Channel 7-port Storage Hub, North America (Tru64 UNIX only)	234453-001 DS-SWXHB-07
	Fibre Channel 7-port Storage Hub, International (Tru64 UNIX only)	234453-B31 DS-SWXHB-17
	Fibre Channel 7-port Storage Hub, Japan (Tru64 UNIX only)	234453-291 DS-SWXHB-J7
	Fibre Channel Storage Hub 7-port Universal mount kit	136127-B21 DS-SWXHX-07
	Long wave GBIC	127508-B21 DS-DSGGA-MA
	Short wave optical GBIC	380561-B21 DS-DSGGA-SA
	Fibre Channel 3 GBIC connection kit	380579-B21 DS-DXGK1-SA
	Fibre Channel 2 GBIC connection kit	380596-B21 DS-DXGK2-SA
	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
McData 64-port Fibre Channel SAN Director Class Switch	SAN Director 64 (1 Gb) 32 ports, base model	DS-DMGGD-AA
	SAN Director Connectivity Manager Kit	DS-DMGGO-AA
	SAN Director 64 Long-wave 4-port module kit	DS-DMGGD-AC
	SAN Director 64 Short-wave 4-port module kit	DS-DMGGD-AD
	SAN Director 64 Combo, Long – 1 port/Short – 3 ports – Wave Module Kit	DS-DMGGD-AE

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-AA
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 metres							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 metres							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 metres							BN25G-xx
Twisted pair, shielded cable, xx=01, 03, 04, 07, 0E for 1, 3, 4, 7, 0.5 metres							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 metres							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 metres							BN34B-xx
Multimode fiber optic duplex cable, SC connector-to-MIC connector, xx=01, 03, 10 for 01, 03, 10 metres							BN34D-xx
PCI FDDI controller, copper, dual-attachment station UTP, requires BN26x or BN25H connecting cables	8	8	8	8	8	8	3X-DEFPA-MC
PCI FDDI controller, 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 metres							BN26S-03
3-metre unshielded twisted pair RJ45 connectors							BN25H-03

Step 8 – Networks and Communications *(continued)*

	Maximum # Supported						
	Tru64 UNIX			OpenVMS			
	Per System	Per QBB	Per PCI Drawer	Per System	Per QBB	Per PCI Drawer	
Gigabit Ethernet Adapter							
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
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
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 metres							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 metres							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 metres							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 metres							BN25G-xx
Twisted pair, shielded cable, xx=01, 03, 04, 07, 0E for 1, 3, 4, 7, 0.5 metres							BN26M-xx
NOTE: * = Tru64 UNIX V5.1 is required to support 16 adapters per System/QBB. Tru64 UNIX 4.0G supports eight adapters per System/QBB.							
ATM Adapters							
For maximum performance, Compaq 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
PCI-to-ATMworks 155-Mbit adapter, UTP uses BN25G and BN26M cables	8	8	8	8	8	8	3X-DAPBA-UA
PCI-to-ATMworks 622-Mbit adapter, fiber uses BN34B cable	8	8	8	8	8	8	3X-DAPCA-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 metres							BN34B-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 metres							BN25G-xx
Category 5 straight through for system to repeater of hub, shielded xx=01, 03, 04, 07, 0E for 1, 3, 4, 7, 0.5 metres							BN26M-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 are supported on GS160 partition.
- Two-node clusters can be configured by ordering a CCMAB-AA for each node and one BN39B-04 or BN39B-10 cable, cable connects directly to CCMAB-AA in each node.
- For three or four node clusters, order one CCMAB-AA 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-AA 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 forTruCluster Server, Logical Storage Manager, and AdvFS Utilities can be ordered (QP-6R9AQ-AA)
Tru64 UNIX Systems (V4.0G) in Clusters using MEMORY CHANNEL Interconnect	• Requires Tru64 UNIX V4.0G with TruCluster V1.6 • Each system node in a MEMORY CHANNEL cluster requires a TruCluster Production Server (QB-3RLAQ-AA) or TruCluster MEMORY CHANNEL (QB-4ZCAQ-AA) software license • TruCluster MEMORY CHANNEL license (QB-4ZCAQ-AA), normally used for high performance technical computing applications, not required if systems include a TruCluster Production Server license (QB-3RLAQ-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 metres long between two CCMAB controllers connected in virtual hub mode, or 3,000 metres between a CCMAB controller and a CCMHB hub. (The connection from the CCMHB hub to a second system may also be 3,000 metres). 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 an 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.

Step 9 – MEMORY CHANNEL *(continued)*

MEMORY CHANNEL Controller	PCI System Area Network controller, maximum two per node	CCMAB-AA
	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-metre cable for CCMAB and CCMHB	BN39B-01
	4-metre cable for CCMAB and CCMHB	BN39B-04
	10-metre cable for CCMAB and CCMHB	BN39B-10
	Copper-to-single mode fiber optic converter	CCMFB-AA

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	BN35M-02
	Switzerland	BN19E-2E

Power Cord for MEMORY CHANNEL Hubs Rackmounted in 3X-H9A20- AE/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 Microsoft® Windows® NT® system management console in tower-package, includes network interface cards and console software	3X-DS8BA-AA
	PC-based Windows 2000 system management console in tower package, includes network interface cards and console software	3X-DS8DA-AA
	PC-based Windows system management console in mini-tower-package, includes network interface cards and console software, for use in Europe	3X-DS8BA-AB
	PC-based Windows 2000 system management console in mini-tower package, includes network interface cards and console software, Europe	3X-DS8DA-AB
	PC-based Windows NT system management console in desktop package, includes network interface cards and console software, for use in U.S./Canada/Japan	3X-DS8BA-BA

Step 10 – System Console Support *(continued)*

System Management Console *(continued)*	PC-based Windows 2000 system management console in desktop package, includes network interface cards and console software, U.S./Canada/Japan	3X-DS8DA-BA
	PC-based Windows NT system management console in desktop package, includes network interface cards and console software, for use in Europe	3X-DS8BA-BB
	PC-based Windows 2000 system management console in desktop package, includes network interface cards and console software, Europe	3X-DS8DA-BB
	Console hub for use with system management console, includes a console concentrator, cables, and universal power supply; mounts in the system power 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, 4 Partition ConsoleWorks License from TECSys Development LP	QM-6K4AA-AC
	AlphaServer GS System Management, 8 Partition ConsoleWorks License from TECSys Development LP	QM-6K4AA-AD

System Management Console – Modem Localization Kits	System management consoles include one adapter kit • 3X-DS8xA-AA/BA includes a localization kit for use in U.S., 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

Step 10 – System Console Support *(continued)*

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	BN35M-02
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 VX1 32-MB PCI graphics card, maximum one per system or hardware partition	SN-PBXGF-AB

Step 12 – Monitors, Keyboards and 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-metre keyboard or mouse extension cable (order two cables to extend both keyboard and mouse)	3X-BC34A-06
Video Extension Cable	6-foot/1.8-metre video extension cable	BN39C-02
Mouse	3-button mouse – opal	SN-PBQWS-WA
	3-button mouse – carbon	3R-A3480-AA

Step 12 – Monitors, Keyboards and Mouse *(continued)*

Carbon/Silver Monitors	P720 17-inch (16-inch viewable image size) auto-scanning colour monitor, Diamondtron NF, 0.25 mm aperture grille pitch, VGA to 1280 x 1024 @85 Hz, MPRII/TCO 99/Energy Star Compliant, Northern Hemisphere with NA power cord, VGA cable	3R-A3388-AA 244373-001
	Same as above, with Euro-power cord	3R-A3389-AA 244373-021
	Same as above, APD, no power cord	3R-A3390-AA 244373-B24
	Same as above, PRC, with power cord, CCIB	3R-A3391-AA 244373-AA1
	Same as above, Southern Hemisphere, with Australia/New Zealand power cord	3R-A3392-AA 244373-011
	P920 19-inch (18-inch viewable image size) auto-scanning colour 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 NA power cord, VGA cable	3R-A3393-AA 244375-001
	Same as above, with Euro power cord	3R-A3394-AA 244375-021
	Same as above, PRC, with power cord, CCIB	3R-A3396-AA 244375-AA1
	Same as above, Southern Hemisphere, 0.25 to 0.27 mm aperture grille pitch, with Australia/New Zealand power cord	3R-A3397-AA 244375-011
	P1220 22-inch (20-inch viewable image size) auto-scanning colour monitor, Diamondtron NF, 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 NA power cord, VGA cable	3R-A3398-AA 244374-001
	Same as above, with Euro power cord	3R-A3399-AA 244374-021
	Same as above, APD, no power cord	3R-A3400-AA 244374-B24
	Same as above, PRC, with power cord, CCIB	3R-A3401-AA 244374-AA1
	Same as above, Southern Hemisphere, with Australia/New Zealand power cord	3R-A3402-AA 244374-011
Carbon/Silver Flat Panel Monitors	TFT8030, 18.1-inch (18-inch viewable image size) TFT flat panel monitor, 0.28 mm pixel pitch, 1280 x 1024 @75 Hz, multi-mode support, MPRII/TCO99/Energy Star compliant, six video input connectors (two VGA, two DVI-I, one S-video, and one C-video), NA power cord, VGA and DVI-I cables	3R-A3511-AA 234362-001
	TFT5030, 15.1-inch (15-inch viewable image size) TFT flat panel monitor, 0.30 mm pixel pitch, 1024 x 768 @75 Hz, multi-mode support, MPRII/TCO99/Energy Star compliant, two video input connectors (one VGA and one DVI-I), NA power cord, VGA and DVI-I cables	3R-A3353-AA 228134-001
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	BN35M-02
	Japan	3X-BN46F-02
	North America	BN26J-1K
	Switzerland	BN19E-2E

Step 12 – Monitors, Keyboards and Mouse *(continued)*

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-LKQ48-AA	3X-LK462-A2
Arabic keyboard	-	3R-LKQ48-BR	-
Belgian keyboard	LK461-AB	3R-LKQ48-AB	3X-LK462-AB
BHCSY keyboard	-	3R-LKQ48-AX	-
Canadian/English keyboard	LK461-AQ	-	3X-LK462-AQ
Canadian/French keyboard	LK461-AC	3R-LKQ48-AC	3X-LK462-AC
Cyrillic keyboard (Russian)	LK461-BT	3R-LKQ48-BT	3X-LK462-BT
Czech keyboard	LK461-BV	3R-LKQ48-BV	3X-LK462-BV
Danish keyboard	LK461-AD	3R-LKQ48-AD	3X-LK462-AD
Dutch keyboard	LK461-AH	3R-LKQ48-AH	3X-LK462-AH
Finnish keyboard	LK461-AF	3R-LKQ48-AF	3X-LK462-AF
French keyboard	LK461-AP	3R-LKQ48-AP	3X-LK462-AP
German keyboard	LK461-AG	3R-LKQ48-AG	3X-LK462-AG
Greek keyboard	LK461-BH	3R-LKQ48-BH	3X-LK462-BH
Hebrew keyboard	LK461-AT	3R-LKQ48-AT	3X-LK462-AT
Hungarian keyboard	LK461-BQ	3R-LKQ48-BQ	3X-LK462-BQ
International keyboard	-	3R-LKQ48-BA	-
Italian keyboard	LK461-AI	3R-LKQ48-AI	3X-LK462-AI
Japanese keyboard	-	3R-LKQ48-AJ	-
Korean keyboard	-	3R-LKQ48-BK	-
Latin-American keyboard	-	3R-LKQ48-AR	-
Norwegian keyboard	LK461-AN	3R-LKQ48-AN	3X-LK462-AN
Polish keyboard	LK461-BP	3R-LKQ48-BP	3X-LK462-BP
Portuguese keyboard	LK461-AV	3R-LKQ48-AV	3X-LK462-AV
Romanian keyboard	LK461-BL	-	3X-LK462-BL
Simplified Chinese keyboard	-	3R-LKQ48-CV	-
Slovak keyboard	LK461-CZ	3R-LKQ48-CZ	3X-LK462-CZ
Spanish keyboard	LK461-AS	3R-LKQ48-AS	3X-LK462-AS
Swedish keyboard	LK461-AM	3R-LKQ48-AM	3X-LK462-AM
Swiss/French keyboard	LK461-AK	3R-LKQ48-AK	3X-LK462-AK
Swiss/German keyboard	LK461-AL	-	3X-LK462-AL
Traditional Chinese keyboard	-	3R-LKQ48-BI	-
Thai keyboard	-	3R-LKQ48-CB	-
Turkish keyboard	LK461-BU	3R-LKQ48-BU	3X-LK462-BU
Turkish/French keyboard	LK461-BW	-	3X-LK462-BW
UK keyboard	-	3R-LKQ48-AE	-
Yugoslavian keyboard	LK461-BY	-	3X-LK462-BY

Options

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 iPlanet Web Server Enterprise Edition 4.0	
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 Available 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 for Tru64 UNIX	QL-MTJAQ-AA
	DECnet/OSI extended function license for Tru64 UNIX	QL-MTKAQ-AA

Step 13 – System Software *(continued)*

OpenVMS

- OpenVMS base systems include Base license and Compaq Enterprise Integration Server 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 Compaq 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

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

- One OpenVMS Base Operating System License (included in the base system) is mandatory for AlphaServer GS160 configured as an OpenVMS Galaxy system.
- One SMP Extension License (included in the 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.
- Compaq layered products are licensed as follows:
  - One capacity license per system
  - One user license per use
- Up to four 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.compaq.com/gsseries/index.html
NOTE: This website is available in English only.

Options

Step 13 – System Software *(continued)*

OpenVMS Galaxy – OpenVMS Galaxy Licensing Requirements *(continued)*	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 are required for all AlphaServer GS160 systems.
- Select one of the optional CarePaq Priority Service Packages described below that best supports the customer's operational requirements for system availability.

CarePaq Priority Services

- CarePaq Priority Services are available for AlphaServer systems running Tru64 UNIX or OpenVMS operating systems. Priority Services are designed for the growing number of customers who need support beyond the basic warranty. Five packages are offered - Priority, Priority Silver, Priority Gold, and Priority Executive with coverage for both Principal servers systems and SSPs (Subsequent System Packages) – that meet a full range of customer support requirements.

Program Features – Principal Server

Priority

- 9 x 5 HW/SW support
- 4-hour response on-site hardware support
- 2-hour response for Bronze software support
- License Subscription for Compaq O/S software and embedded L/P (i.e., EIS for OpenVMS, unlimited users, and server extensions for Tru64 UNIX)
- Condist update distribution for OpenVMS or Tru64 UNIX and their layered products. (Layered products not included on Condist can be ordered separately.)

Priority Silver

- 24 x 7 HW Support. Named Engineer, 4-hour response
- 24 x 7 Silver SW Support - Named Account Rep, one-hour response Monday – Friday, 8AM-5PM local time; 2-hour response remaining hours
- License Subscription for Compaq O/S software and embedded L/P (i.e., EIS for OpenVMS, unlimited users, and server extensions for Tru64 UNIX)
- Condist update distribution for OpenVMS or Tru64 UNIX and their layered products. (Layered products not included on Condist can be ordered separately.)
- Technical newsletter and SW activity review
- Proactive Patch Notification
- One (1) System Healthcheck per year

Options

Step 14 – Hardware and Software Support Services *(continued)*

Program Features – Principal Server *(continued)*

Priority Gold	• 24 x 7 HW support with Named Engineer, 4-hour response for on-site support • 24 x 7 Gold SW support - Named Account Rep • 30-minute callback (critical); 1-hour callback (non-critical) • License Subscription for Compaq O/S software and embedded L/P (i.e., EIS for OpenVMS, unlimited users, and server extensions for Tru64 UNIX) • Condist update distribution for OpenVMS or Tru64 UNIX and their layered products. (Layered products not included on Condist can be ordered separately.) • Technical newsletter, SW activity review and 10 hours Upgrade impact planning • Proactive Revision Management • Two (2) System Healthchecks per year • Mandatory pre-qualification required
Priority Gold Executive	• 24 x 7 HW support with Named Engineer, two-hour response for on-site support • 24 x 7 Gold SW support - Named Account Rep • 30-minute callback (critical); one-hour callback (non-critical) • License Subscription for Compaq O/S software and embedded L/P (i.e., EIS for OpenVMS, unlimited users, and server extensions for Tru64 UNIX) • Software update distribution on CD-ROM: OpenVMS or Tru64 UNIX and their layered products (Layered products not included on Condist can be ordered separately.) • Technical newsletter, SW activity review and 10 hours Upgrade impact planning • Proactive Revision Management • Two (2) System Healthchecks per year • Customer site must be within 25 miles of a Compaq service location • Mandatory pre-qualification required

Program Features – Additional Services

SSPs (Subsequent System Packages)	• For Priority, Priority Silver, Priority Gold, and Priority Gold Executive • HW Support at same level as corresponding package for Principal server • License Subscription: Compaq O/S (where applicable) • Telephone support through Principal server covered by full support package
Installation	• Preinstallation review • Unpacking of equipment • Assemble and test • Basic product usage info • No software installation added
Installation & Startup Compaq O/S	• Preinstallation review • Unpacking of equipment • Assemble and test • Basic product usage info • Install operating systems • Product configuration • Print and network access • Orientation

Options

Step 14 – Hardware and Software Support Services *(continued)*

Program Features – Additional Services *(continued)*

Model/CarePaq Priority Service	Principal Server 1 year	Principal Server 3 years	Subsequent Systems 1 year	Subsequent Systems 3 years
AlphaServer GS160 Model 8				
Priority	FM-W01E3-12	FM-W01E3-36	FM-W21E3-12	FM-W21E3-36
Priority Silver	FM-W04E3-12	FM-W04E3-36	FM-W24E3-12	FM-W24E3-36
Priority Gold	FM-W08E3-12	FM-W08E3-36	FM-W28E3-12	FM-W28E3-36
Priority Gold Exec.	FM-W09E3-12	FM-W09E3-36	FM-W29E3-12	FM-W29E3-36
Installation	FM-WINSE-16	FM-WINSE-16	FM-WINSE-16	FM-WINSE-16
Installation & Startup	FM-WSTAE-16	FM-WSTAE-16	FM-WSTAE-16	FM-WSTAE-16
AlphaServer GS160 Model 16				
Priority	FM-W01E4-12	FM-W01E4-36	FM-W21E4-12	FM-W21E4-36
Priority Silver	FM-W04E4-12	FM-W04E4-36	FM-W24E4-12	FM-W24E4-36
Priority Gold	FM-W08E4-12	FM-W08E4-36	FM-W28E4-12	FM-W28E4-36
Priority Gold Exec.	FM-W09E4-12	FM-W09E4-36	FM-W29E4-12	FM-W29E4-36
Installation	FM-WINSE-16	FM-WINSE-16	FM-WINSE-16	FM-WINSE-16
Installation & Startup	FM-WSTAE-16	FM-WSTAE-16	FM-WSTAE-16	FM-WSTAE-16

NOTE:

- AlphaServer GS160 systems include one-year hardware warranty with 5 x 9, on-site Next Business Day response.
- New Compaq hardware options internal to the AlphaServer enclosure receive the same warranty or service level as purchased with the server.
- External storage devices/cabinets carry their own level of warranty and should be quoted separately for uplifted warranty services
- In addition to the CarePaq Priority Services, uplifted warranty Supplemental Services are available for separate hardware and software support. For more information on other Compaq hardware and software service options available for AlphaServers, consult your Sales Account Manager or visit
  English: http://www.compaq.ca/English/service/services.htm
  French: http://www.compaq.ca/Francais/service/servicesf.htm

NOTE: Certain restrictions and exclusions may apply. For details, consult the Product Information Centre at 1-888-882-6672.

Software – Americas and Asia Pacific Only

- Systems include 90-day Conformance to SPD and Telephone Advisory Support. Select optional Software Supplemental Support Services if required.
- Software service upgrades 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 upgrades for OpenVMS include advisory and remedial software support with new version license rights for OpenVMS Base and Enterprise Integration Package

Recommended Quickstart Services

AlphaServer GS160 Quickstart Service – Allows customers to quickly and correctly configure, and set-up their systems for optimal performance and best use of system management and system maintenance features. This 40-hour service will:

- Evaluate their requirements and current systems/applications environment
- Plan the server partitioning, storage layout, installation, and migration of the new system
- Perform installation and setup
- Provide initial system performance tuning
- Provide training in the use of the System Control Manager

GS160 Quickstart Evaluate and Plan — QS-GS1A9-CP

Step 14 – Hardware and Software Support Services *(continued)*

Program Features – Additional Services *(continued)*

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@compaq.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	
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

Step 14 – Hardware and Software Support Services *(continued)*

Program Features – Additional Services *(continued)*

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-C1
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 16 to an AlphaServer GS320 Model 24. Includes a black system logic cabinet with integrated cooling and associated power supplies and cabling. Cabinet attaches to the system logic cabinet of the AlphaServer GS160.	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

Upgrades

Compaq Capacity on Demand (CCoD) 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 Compaq Capacity on Demand Program, outlined below, is a two-part process.

Part 1

- Customer purchases a system with Tru64 UNIX or OpenVMS CCoD SMP CPU(s) (3X-KN8CA-AD or 3X-KN8CA-AE), or customer purchases Tru64 UNIX or OpenVMS CCoD SMP CPU(s) for field installation within an installed AlphaServer GS160 system.
- When purchasing the CCoD CPU(s), the customer signs a CCoD 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 Compaq representative or call 1-800-AT-COMPAQ (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: CCoD CPUs are field installed. Field installation on existing systems is not included in the CPU option price.

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

Technical Specifications

		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
	Shipping Weight Maximum Configuration	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	
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.	

Technical Specifications

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)

Technical Specifications

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.

	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

Technical Specifications

H9A20 I/O Expander Cabinet *(continued)*

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

	U.S./Canada	**Japan**	**Europe**
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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