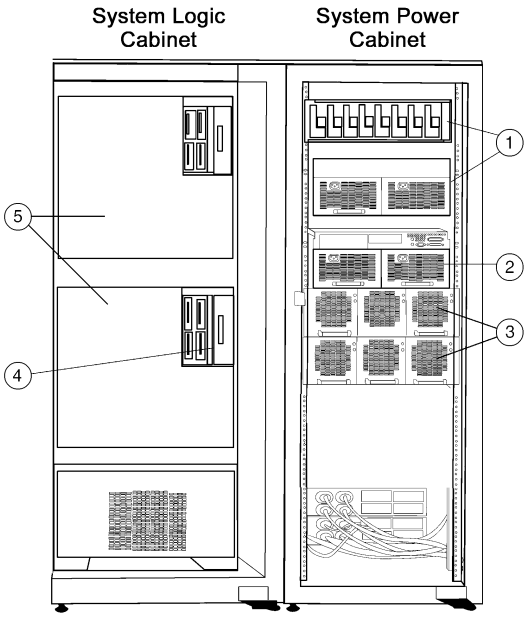
Overview

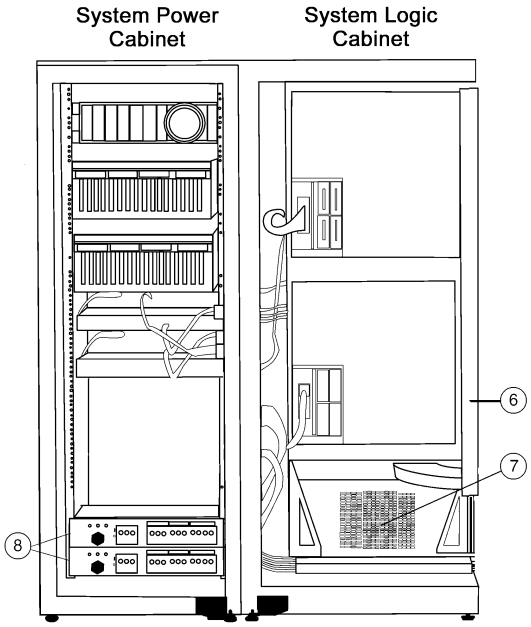
At A Glance

AlphaServer GS160 systems include:

- One 731-MHz CPU module; up to 16 (upgradeable to 32) 731-MHz Alpha 21264 processors supported
- Optional Compaq Capacity on Demand (CCoD) SMP processors for non-disruptive performance growth
- 4-MB of on-board cache per processor
- Advanced crossbar switch with 6.4-GB/s of memory bandwidth per building block; up to 25.6-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 channels with 12.8-GB/s 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
- 9.1-GB SCSI-3 disk drive
- 600-MB CD-ROM drive
- Enhanced reliability with ECC-protected memory, processor cache and system data paths
- Security of RAID storage, hot-swap CPUs, and online repair of I/O buses
- 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, 1-year hardware, on-site next business day and 90-day software, telephone advisory support delivered by Compaq Global Services



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

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Standard Features

Processor	Up to 16 Alpha 21264 6/731-MHz CPUs (one CPU per module)		
Cache Memory	64K I and D caches on-chip; 4-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 6.4-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 12.8-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.		
	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” half height 600-MB CD-ROM drive	
	Hard Drives	One 9.1-GB 7200 rpm SCSI-3 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 pre-installed software, Base license, Unlimited User license, Server Extension license, Open Source Internet Solutions, and iPlanet Web Server Enterprise Edition 4.0 OpenVMS systems include pre-installed software, Base license and Enterprise Integration Server License Package Revision V3.0A 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 Compaq Global Services including a 1-year on-site hardware warranty. Software warranty is 90-day telephone advisory. Training, consulting, network integration, software support, comprehensive system maintenance and guaranteed uptime services are also available for customers requiring higher levels of service and support.		

Step 1 – Assess Application Requirements

- Selection of system components must be made in the context of total application requirements. Although the configuration of system components must be done in steps (for example, base packages, CPUs, memories, etc.), these steps cannot be done in isolation.
- The order in which requirements are assessed is also important, since one requirement may impact others. Before proceeding, it would be useful to assess the total application requirements in the following order:
- What level of availability is required?
  - If no single points of failure are allowed, then the solution should be configured as a 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.

Notes: 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) and one 731-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.

AlphaServer GS160 (731-MHz) Base Systems

Model	OS	System Boxes / QBBs Included	Total CPUs Supported	Input Power	Order No.
Model 8	Tru64 UNIX	1 / 2	8	120/208V	DA-160BC-AA
Model 8	Tru64 UNIX	1 / 2	8	380-415V	DA-160BC-AB
Model 8	OpenVMS	1 / 2	8	120/208V	DY-160BC-AA
Model 8	OpenVMS	1 / 2	8	380-415V	DY-160BC-AB

Step 2 – Select base system *(continued)*

AlphaServer GS160 (731-MHz) Base Systems *(continued)*					
Model	**OS**	**System Boxes / QBBs Included**	**Total CPUs Supported**	**Input Power**	**Order No.**
Model 16	Tru64 UNIX	2 / 4	16	120/208V	DA-160CC-AA
Model 16	Tru64 UNIX	2 / 4	16	380-415V	DA-160CC-AB
Model 16	OpenVMS	2 / 4	16	120/208V	DY-160CC-AA
Model 16	OpenVMS	2 / 4	16	380-415V	DY-160CC-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, 6/731-MHz with 4-MB on-board cache, Tru64 UNIX	3X-KN8AA-AD
GS160/320 SMP upgrade CPU, 6/731-MHz with 4-MB on-board cache, OpenVMS	3X-KN8AA-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 6/731-MHz CPU module with 4-MB on-board cache, Tru64 UNIX SMP license, and CCoD program license	3X-KN8CA-AD
GS160/320 CCoD SMP CPU, includes one 6/731-MHz CPU module with 4-MB on-board cache, OpenVMS SMP license, and CCoD program license	3X-KN8CA-AE

Step 4 – Select Memory Options

- Memory options are engineered specifically for use with this series and include additional components that 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)	-	-	-	-
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 V4.0G or Tru64 UNIX V5.1 or an instance of OpenVMS V7.2-1H1. Each partition is allocated its own dedicated "shared-nothing" set of hardware resources: QBB(s), CPU module(s), memory module(s), and I/O.
- 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) and one console hub (3X-DS8AA-AA) are required 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 6/731-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 H9A20-AA/AB/AC 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 V4.0G, Tru64 UNIX V5.1, or OpenVMS V7.2-1H1). 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-160CC-Ax and 15 3X-KN8AA-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-160CC-Ax and 15 3X-KN8AA-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-AA

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" devices and one 3.5" device or seven 3.5" devices – Up to two DS-SL13R-xx Ultra3 SCSI (LVD) shelves; each shelf supports a maximum of 14 Ultra3 disk drives	
	• Mixed configurations of BA36R and DS-SL13R-xx shelves are supported, but cannot be factory integrated.	
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; 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-CE 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 or DS-KZPCC-CE RAID controllers and SCSI cables to connect controller to shelf	
	• Ultra3 shelves connected to 3X-KZPCA-AA adapters in the power cabinet require BN38C-02 2-meter cables; DS-KZPCC-CE RAID controllers require BN37A-02 2-meter cables.	
	• Ultra3 shelves connected to 3X-KZPCA-AA adapters in an attached expander cabinet require BN38C-10 10-meter cables; DS-KZPCC-CE RAID controllers require BN37A-10 10-meter cables.	
	• Ultra3 shelves connected to 3X-KZPCA-AA adapters in a remote expander cabinet require 10-20 meter BN38C-xx cables, depending upon physical cabinet location; DS-KZPCC-CE 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, US	DS-SL13R-AA
	StorageWorks Model 4314R Ultra3 SCSI (LVD) single-bus universal drive rack-mount shelf, International	DS-SL13R-AB
	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, US	DS-SL13R-BA
	StorageWorks Model 4354R Ultra3 SCSI (LVD) split-bus universal drive rack-mount shelf, International	DS-SL13R-BB
	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" 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 H9A20-AB/AC 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.	
	• 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.) 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. One 3X-KFWHA-AA and one cable pair are mandatory per PCI drawer.	
	• Maximum one additional drawer in the system power cabinet, see "External Expansion Cabinets" for more details.	
	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 H9A20-AA/AB/AC expansion cabinets. Up to four H9A20-AA/AB/AC cabinets are supported.
- H9A20-AA/AB/AC 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.

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	H9A20-AA
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	H9A20-AB
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	H9A20-AC

- 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 H9A20-AA when 120V input power is required. In all other cases, the H9A20-AC is preferred because of the ability to support dual AC input.
- H9A20-AA/AB/AC cabinets may be joined to GS160 systems. PCI drawers placed in these cabinets require 7-m I/O cables.
- H9A20-AA/AB/AC cabinets may be placed up to 6 meters from the system cabinet. Multiple expander cabinets may be connected to one another or placed separately. Each group of free-standing H9A20 cabinets requires an end-panel trim kit (CK-H9A20-AA).
- PCI drawers placed in remote cabinets require 10-m I/O cables.

End-panel trim kit for remote H9A20-AA/AB/AC cabinets	CK-H9A20-AA
I/O module cables for connection between I/O module and master or expansion PCI drawers mounted in H9A20-AA/AB/AC 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 H9A20-AA/AB/AC expansion cabinets; two cables (BN39B-07 or BN39B-10) are mandatory per PCI drawer.	BN39B-10

Step 7 – Internal Storage

PCI UltraSCSI Adapters and Controllers

- Tru64 UNIX 4.0G or Tru64 UNIX V5.1/5.1A supports a maximum of 64 total SCSI controllers per operating system instance (hardware partition). Support for these controller quantities will be phased-in. OpenVMS 7.2-1H1 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-ROM connected to the STD-IO), 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, DS-KZPCC-CE, DS-KGPSA-CA Fibre Channel, and two embedded master PCI components per master PCI drawer. OpenVMS includes the following devices in this count: KZPBA-CA, KZPBA-CB, 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 1 PCI slot); requires Fibre Channel cable*	26/62	26/26	13	26	26	13	DS-KGPSA-CA
Fibre Channel cable (BNGBX-xx) x=1 (02m), 2 (05m), 3 (15m), 4 (30m), 5 (50m)							234457-B2x
PCI 1-port UltraSCSI single-ended host adapter (uses 1 PCI slot)	8	8	8	8	8	8	KZPBA-CA
PCI 1-port UltraSCSI differential host adapter* (uses 1 PCI slot); requires BN38C-xx cable	24/62	24/26	12/13	24	24	12	KZPBA-CB
VHDCI male-to-68-pin HD male UltraSCSI cable xx=02, 03, 05, 10, 20 meters (use -02 for connecting SCSI adapter to SCSI devices when both the PCI shelf and StorageWorks shelf are in the system cabinet or in an adjacent expansion cabinet; use -05, -10, and -20 for connecting SCSI adapter to SCSI devices when the PCI shelf and StorageWorks shelf are in two different cabinets)							BN38C-xx
* Tru64 UNIX V5.1 is required to support 62 adapters per partition and 13 adapters per PCI drawer.							
PCI 1-port Ultra 2 (LVD) SCSI adapter, 32-bit, single-channel (uses 1 PCI slot); includes internal 68-pin and external 68-pin HD connectors; requires BN38C-xx cable to connect adapter to Ultra2 or Ultra3 shelf; HSZxx RAID controllers not supported. Support for this option requires B4171 module version "-AD" or higher and firmware release 5.9B, or higher – requires Tru64 UNIX V5.1A.	8	8	8	8	8	8	3X-KZPCA-AA
68-pin HD male-to-VHDCI male UltraSCSI cable; xx=02, 03, 05, 10, 20 m							BN38C-xx
PCI 3-channel Ultra2 (LVD) SCSI RAID controller, 64-MB cache, (uses 1 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. Support for this option requires B4171 module version "-AD" or higher and firmware release 5.9B, or higher.	8	8	8				DS-KZPCC-CE
68-pin VHDCI male-to-VHDCI male UltraSCSI cable; xx=02, 03, 05, 10, 20 m							BN37A-xx
Use 2-meter cable to connect adapters, controllers, and shelves within the GS320 power cabinet							
Use 10- meter cable to connect adapters, controllers to shelves in attached H9A20 expander cabinets							
Use 10-25-meter cables to connect adapters, controllers to shelves in remote expander cabinets							

Options

Step 7 – Internal Storage *(continued)*

CI Adapters (OpenVMS only)	PCI CI adapter, maximum 26 per system or hardware partition (12 per QBB, six per PCI); requires two PCI slots	CIPCA-BA
	Computer interconnect cable set, connects CIPCA to star coupler; select length xx=10, 20, 45 meters	BNCIA-xx

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 Arrays and RAID Array 7000 (HSZ70 product set) are supported on Tru64 UNIX and OpenVMS systems.
- Modular Array 6000 Storage Arrays (HSG60 product set) are 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 www.compaq.com/products/StorageWorks/
  (Only Tru64 UNIX and OpenVMS operating systems options are supported.)

Storage Array Controllers

The following controllers are used in StorageWorks array packaging:

HSZ70 RAID Array Controllers	• HSZ70 UltraSCSI RAID Array controllers for RA7000 and ESA10000 are supported under Tru64 UNIX V4.0G, Tru64 UNIX V5.1, and OpenVMS V7.2-1H1.	
	• HSZ70 UltraSCSI RAID controllers require QB-5SBAB-SA/SB for Tru64 UNIX or QB-5SBAC-SA/SB for OpenVMS. Also required is 380566-B21/DS-HS35X-BC external cache.	
	• HSZ70 UltraSCSI controllers require KZPBA-CB adapters and BN38C cables (and UltraSCSI hubs if used).	
	Note: For system integration of the following option, contact Compaq CustomSystems.	
	DS-HSZ70-AH UltraSCSI controller includes 64-MB cache expandable to 128-MB	116271-B21
HSZ80 RAID Controllers	• HSZ80 UltraSCSI RAID controllers for RA8000 and ESA12000 are supported under Tru64 UNIX V4.0G, Tru64 UNIX V5.1, and OpenVMS V7.2-1H1.	
	• 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 adapters and BN38C cables (and UltraSCSI hubs if used).	
	Note: For system integration of the following options, contact Compaq 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
HSG60 Fibre Channel Controllers	• HSG60 Fibre Channel controller for MA6000 is supported under Tru64 UNIX V4.0G, Tru64 UNIX V5.1, and OpenVMS V7.2-1H1.	
	• HSG60 Fibre Channel controller requires ACS software kit, QB-6J4AB-SA for Tru64 UNIX or QB-6J4AC-SA for OpenVMS.	
	• HSG60 Fibre Channel controller requires DS-KGPSA-CA 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 Compaq CustomSystems.	
	HSG60 Fibre Channel controller, includes 256-MB cache	174134-B21
	256-MB cache upgrade for HSG60	380674-B21

Step 7 – Internal Storage *(continued)*

Storage Array Controllers *(continued)*

HSG80 Fibre Channel Controllers	• HSG80 Fibre Channel controllers for RA8000, MA8000, ESA12000, EMA12000 are supported under Tru64 UNIX V4.0G, Tru64 UNIX V5.1, and OpenVMS V7.2-1H1.	
	• 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 KGPSA-CB or DS-KGPSA-CA 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 Compaq 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
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 Compaq CustomSystems.	
	Quad 512-MB cache CI array controller with cache batteries	HSJ54-AJ
UltraSCSI Hubs	• UltraSCSI hubs are supported with KZPBA-CB 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″ 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″ SBB, UltraSCSI cables not included	DS-DWZZH-05
	UltraSCSI hub with nine differential ports, no single ended ports, consists of eight host ports and one storage port in 5.25″ SBB, UltraSCSI cables not included	DS-DWZZH-09
Fibre Channel Hubs, Switches, and Components	Note: For system integration of the following options, contact Compaq *Custom*Systems.	
	Fibre Channel SAN Switch, 8 ports with Fabric Operating Software	158222-B21
	Fibre Channel SAN Switch, 16 ports with Fabric Operating Software	158223-B21
	Unmanaged Fibre Channel 7-port Storage Hub, North America	234453-001
	Fibre Channel 7-port Storage Hub, International	234453-B31
	Fibre Channel 7-port Storage Hub, Japan	234453-291
	Fibre Channel Storage Hub 7-port Universal mount kit	136127-B21
	Long wave GBIC	127508-B21
	Short wave optical GBIC	380561-B21
	Fibre Channel 3 GBIC connection kit	380579-B21
	Fibre Channel 2 GBIC connection kit	380596-B21

Options

Step 7 – Internal Storage *(continued)*

UltraSCSI Storage Devices	36.4-GB 10,000 rpm 16-bit UltraSCSI disk drive SBB	DS-RZ1FC-VW
	18.2-GB 10,000 rpm 16-bit UltraSCSI disk drive SBB	DS-RZ1ED-VW
	18.2-GB 7,200 rpm 16-bit UltraSCSI disk drive SBB	DS-RZ1EA-VW
	9.1-GB 10,000 rpm 16-bit UltraSCSI disk drive SBB	DS-RZ1DD-VW
	9.1-GB 7,200 rpm 16-bit UltraSCSI disk drive SBB	DS-RZ1DA-VW
Ultra3 SCSI (LVD) Storage Devices	9.1-GB Ultra3 SCSI 10,000 rpm universal 1.0" disk drive	3R-A0584-AA
	9.1-GB Ultra3 SCSI 15,000 rpm universal 1.0” disk drive	3R-A1542-AA
	18.2-GB Ultra3 SCSI 10,000 rpm universal 1.0" disk drive	3R-A0585-AA
	18.2-GB Ultra3 SCSI 15,000 rpm universal 1.0” disk drive	3R-A1543-AA
	36.4-GB Ultra3 SCSI 10,000 rpm universal 1.0" disk drive	3R-A0919-AA
Tape Devices	12/24-GB 4mm DAT SCSI tape drive in3.5″ StorageWorks carrier	DS-TLZ10-VA
	20/40-GB DLT SCSI tape drive in 5.25″ StorageWorks carrier	TZ88N-VA
	40/80-GB DLT SCSI tape drive in 5.25″ StorageWorks carrier	DS-TZ90N-VW
Tape Libraries	ESL9326DX DLT Tape Enterprise Library, 40/80-GB drives (0 drive configuration)	146205-B21
	ESL9326DX Tape Enterprise Library, 40/80-GB drives, Bxx = -B23 (6 drives), -B24 (8 drives), -B25 (10 drives), -B26 (12 drives), -B27 (14 drives), -B28 (16 drives)	161265-Bxx
	ESL9326DX 40/80-GB DLT Add-on Drive	161268-B21
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 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 eight network adapters – 3X-DE602-AA, DEGPA-SA, 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-AA included in base system must be included in these calculations.

	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 meters							BN24Q-xx
Category 5 cross-over cable for point-to-point, shielded xx=01, 03, 04, 07, 0E for 1,3,4, 7, 0.5 meters							BN28Q-xx
Category 5 straight through for system to repeater or hub, unshielded, xx=01, 03, 04, 07, 0E, 0B for 1,3,4, 7, 0.5, 0.2 meters							BN25G-xx
Twisted pair, shielded cable, xx=01, 03, 04, 07, 0E for 1,3,4, 7, 0.5 meters							BN26M-xx
FDDI Controllers							
PCI FDDIcontroller, fiber, single attachment station multimode fiber, requires BN34x SC type connecting cable; maximum six DEFPA-AC/DC per system	8	8	8	8	8	8	3X-DEFPA-AC
PCI FDDIcontroller, fiber, dual attachment station multimode fiber, requires BN34x SC type connecting cable; maximum six DEFPA-AC/DC per system	8	8	8	8	8	8	3X-DEFPA-DC
Multimode fiber optic duplex cable, SC connector-to-ST connector, xx=01, 03, 10, 20, 30, 2E, 4E for 01, 03, 10, 20, 30, 2.5, 4.5 meters							BN34A-xx
Multimode fiber optic duplex cable, SC connector-to-SC connector, xx=01, 03, 10, 20, 30, 2E, 4E for 01, 03, 10, 20, 30, 2.5, 4.5 meters							BN34B-xx
Multimode fiber optic duplex cable, SC connector-to-MIC connector, xx=01, 03, 10 for 01, 03, 10 meters							BN34D-xx
PCI FDDI controller, copper, dual-attachment station UTP, requires BN26x or BN25H connecting cables; maximum six DEFPA-UC/MC per system	8	8	8	8	8	8	3X-DEFPA-MC
PCI FDDI controller, copper, single-attachment station UTP, requires BN26x or BN25H connecting cables; maximum six DEFPA-UC/MC per system	8	8	8	8	8	8	3X-DEFPA-UC
8-pin MP-to-8-pin MP, screened, EIA/TIA category 5 cable							BN26M-xx
8-pin MP-to-8-pin MP, screened, crossover, EIA/TIA category 5 cable, 3 meters							BN26S-03
3-meter unshielded twisted pair RJ45 connectors							BN25H-03
Gigabit Ethernet Adapter							
For maximum performance, Compaq 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	16	16	8	16	16	8	DEGPA-SA

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	
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	8	8	8	8	8	8	3X-DAPBA-FA
PCI-to-ATMworks 155-Mbit adapter, UTP	8	8	8	8	8	8	3X-DAPBA-UA
PCI-to-ATMworks 622-Mbit adapter, fiber	8	8	8	8	8	8	3X-DAPCA-FA
Synchronous Controllers							
PCI 2-port intelligent synchronous controller (OpenVMS systems require a minimum of X.25 V1.5) with Kits: DEC-AXPVMS-WANDD-V0105-1-1.PCSI, DEC-AXPVMS-X25-V0105-1-1.PCSI; requires BC33x-xx cable	-	-	-	10	10	10	3X-PBXDD-AA
PCI 4-port intelligent synchronous controller (OpenVMS systems require a minimum of X.25 V1.5) with Kits: DEC-AXPVMS-WANDD-V0105-1-1.PCSI, DEC-AXPVMS-X25-V0105-1-1.PCSI; requires BC33x-xx cable	-	-	-	10	10	10	3X-PBXDD-AB

Step 9 – MEMORY CHANNEL

- Up to two PCI System Area Network controllers are supported on GS160 system or hardware partition
- Two-node clusters can be configured by ordering a CCMAB-AA for each system and one BN39B-04 or BN39B-10 cable, cable connects directly to CCMAB-AA in each system
- For three or four system clusters, order one CCMAB-AA adapter and one BN39B-04 or BN39B-10 cable for each system 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 system, a second CCMHB-AA hub is required for clusters with more than two nodes; in two-node clusters the CCMAB-AA may be directly connected
- One or two MEMORY CHANNEL adapters can be placed on a PCI bus segment; however, no other devices can be placed on the same segment, 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)
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 meters long between two CCMAB controllers connected in virtual hub mode, or 3,000 meters between a CCMAB controller and a CCMHB hub. (The connection from the CCMHB hub to a second system may also be 3,000 meters). The CCMFB option requires a second PCI slot in the system from which it draws power only. It is normally connected to the corresponding CCMAB controller with the short BN39B-01 cable. The CCMFB is also used in the CCMHB hub where it occupies a slot normally used by the CCMLB line card, limiting expansion to four radial fiber optic connections.
	• The CCMHB-BA hub expansion box provides additional slots for up to eight fiber optic connections. Two standard length, single-mode fiber optic cables are available (BN34R-10 and BN34R-31); however, users normally provide this connection. Customers should reference the TIA/EIA 568-A Commercial Building Telecommunications Cabling Standard, Section 12.3.4. Fiber optic connectivity is completely transparent to the systems using it and has no performance impact.
	• Up to two CCMHB-AA hubs may be mounted in an H9A20-AA 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 system, two per QBB, two per PCI drawer, two per PCI segment	CCMAB-AA
	System Area Network hub with four line cards; includes BN19P-2E power cord for Canada, Japan, and US 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-m cable for CCMAB and CCMHB	BN39B-01
	4-m cable for CCMAB and CCMHB	BN39B-04
	10-m 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	BN19M-2E
	Switzerland	BN19E-2E
Power Cord for MEMORY CHANNEL Hubs Rackmounted in H9A20-AB/AC Cabinets	IEC 320 power cord (one mandatory per hub)	BN35S-02
	(Note: MEMORY CHANNEL hubs mounted in H9A20-AA 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, Compaq 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 system management console in tower-package, includes network interface cards and Compaq console software.	3X-DS8BA-AA
	PC-based system management console in mini-tower-package, includes network interface cards and Compaq console software, for use in Europe	3X-DS8BA-AB
	PC-based system management console in desktop package, includes network interface cards and Compaq console software, for use in US/Canada/Japan	3X-DS8BA-BA
	PC-based system management console in desktop package, includes network interface cards and Compaq console software, for use in Europe	3X-DS8BA-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

Step 10 – System Console Support *(continued)*

System Management Console – Modem Localization Kits	System management consoles include one adapter kit	
	• 3X-DS8BA-AA/BA includes a localization kit for use in US, Canada, Japan, Mexico, Brazil, Argentina, Peru, and Taiwan	
	• 3X-DS8BA-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

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		
	ELSA Gloria synergy graphics with 8-MB SGRAM 1600 x 1200, 2D/3D graphic accelerator, maximum one per system	SN-PBXGK-BB

Options

Step 12 – Monitors

- 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 keyboard or mouse extension cable (order two cables to extend both keyboard and mouse)	3X-BC34A-06
Video Extension Cable	1.8-meter video extension cable	BN39C-02
Monitors	V570 15-inch (13.8-inch viewable image size) multiple-scan color monitor with Invar Shadow Mask, VGA to 1024 x 768 @ 75 Hz, 0.28mm AG, TCO99; Northern Hemisphere with NA power cord	3R-A3082-AA
	Same as above with Eurocord	3R-A3083-AA
	Same as above, APD, no power cord	3R-A3084-AA
	V500 15-inch (13.8-inch viewable image size) auto-scanning color monitor, VGA to 1024 x 768 @75 Hz, 0.28mm FST, MPRII Southern Hemisphere with Australia/New Zealand power cord	3R-VRQV5-11
	P710 17-inch (16-inch viewable image size) auto-scanning color monitor, Diamondtron NF, 0.25mm aperture grille pitch, VGA to 1280 x 1024 @ 75 Hz, TCO 99; Northern Hemisphere with NA power cord	3R-A2936-AA
	Same as above, APD, no power cord	3R-A2260-AA
	Same as above, PRC with power cord, CCIB	3R-A3335-AA
	Same as above, Northern Hemisphere, with Power Factor Correction and Eurocord, 220V only	3R-A2261-AA
	Same as above, Southern Hemisphere, with Australia/New Zealand power cord	3R-A2263-AA
	TFT8020 18-inch (18.1-inch viewable image size) flat panel monitor, 0.28mm DP, 1280 x 1024 @ 75 Hz, TCO 99, US power cord	3R-A0852-AA
	P910 19-inch (18-inch viewable image size) auto-scanning color monitor, Diamondtron NF, 0.25mm aperture grille pitch, VGA to 1280 x 1024 @ 85 Hz, TCO 99; Northern Hemisphere with NA power cord	3R-A2935-AA
	Same as above, PRC with power cord, CCIB	3R-A3334-AA
	Same as above, Northern Hemisphere, with power factor correction and Eurocord, 220V only	3R-A2265-AA
	Same as above, Southern Hemisphere, with Australia/New Zealand power cord	3R-A2267-AA
	P1100 21-inch (19.8-inch viewable image size) auto-scanning color monitor, 0.28mm aperture grille pitch VGA to 1600 x 1200 @ 85 Hz, Southern Hemisphere with Australia/New Zealand power cord	3R-VRQP1-23
	P1210 22-inch (20-inch viewable image size) auto-scanning color monitor, Diamondtron NF, 0.24mm aperture grille pitch, VGA to 1600 x 1200 @ 85 Hz, TCO 99 with power factor correction, Northern Hemisphere with NA power cord	3R-A2934-AA
	Same as above with Eurocord	3R-VRQP2-24
	Same as above, APD, no power cord	3R-A2268-AA
	Same as above, PRC with power cord, CCIB	3R-A3333-AA

Options

Step 12 – Monitors *(continued)*

Monitor Power Cords	Australia, New Zealand	BN19H-2E
	Central Europe	BN19C-2E
	Denmark	BN19K-2E
	Egypt, India	BN19S-2E
	Ireland, United Kingdom	BN19A-2E
	Italy	BN19M-2E
	Japan	3X-BN46F-02
	North America	BN26J-1K
	Switzerland	BN19E-2E

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, Open Source Internet Solutions, 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
	StorageWorks software package with licenses for Logical Storage Manager and AdvFS Utilities	QB-5RXAQ-AA
	TruCluster Server license	QL-6BRAQ-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 extended function license for Tru64 UNIX	QL-MTJAQ-AA
	DECnet/OSI end-system 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 Galaxy OpenVMS Galaxy Licensing Requirements	For more details about OpenVMS Galaxy licensing requirements, refer to the Software Product Description for the Compaq 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	
	Compaq Galaxy 1-CPU License	QL-66XAA-3B
	Compaq Galaxy 2-CPU License	QL-66XAA-3C
	Compaq Galaxy 4-CPU License	QL-66XAA-3D
	Compaq Galaxy 8-CPU License	QL-66XAA-3E
	Compaq Galaxy 16-CPU License	QL-66XAA-3F
	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-MTHAQ-AA
	Cluster License for OpenVMS Alpha	QL-MUZAQ-AA

Options

Step 13 – System Software *(continued)*

OpenVMS Galaxy **OpenVMS Galaxy Licensing Requirements** *(continued)*	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-160CC-Ax and 15 3X-KN8AA-AE SMP upgrade CPUs • Add one QL-66XAA-3D Compaq Galaxy 4-CPU License and one QL-66XAA-3E Compaq Galaxy 8-CPU license for a total of 12 Compaq Galaxy licenses for the 12-CPU hard partition with Galaxy. No other licenses are required for OpenVMS on the SMP instance in the second hard partition with 4 CPUs.

Step 14 – Hardware and Software Support Services

- Installation or Installation and Startup is required for all AlphaServer GS160 systems.
- Select one of the optional 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 Compaq AlphaServer systems running Compaq 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 24, 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	• 9x5 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 24	• 24x7 HW/SW support • Named HW engineer • 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	• 24x7 HW Support. Named Engineer, 4-hour response • 24x7 Silver SW Support - Named Account Rep, 1-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	• 24x7 HW support with Named Engineer, 4-hour response for on-site support
	• 24x7 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	• 24x7 HW support with Named Engineer, two-hour response for on-site support
	• 24x7 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 24, 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	• Pre-installation review
	• Unpacking of equipment
	• Assemble and test
	• Basic product usage info
	• No software installation added
Installation & Startup Compaq O/S	• Pre-installation review
	• Unpacking of equipment
	• Assemble and test
	• Basic product usage info
	• Install operating systems
	• Product configuration
	• Print and network access
	• Orientation

Options

Step 14 – Hardware and Software Support 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	FP-W0103-12	FP-W0103-36	FP-W2103-12	FP-W2103-36
Priority 24	FP-W0203-12	FP-W0203-36	FP-W2203-12	FP-W2203-36
Priority Silver	FP-W0403-12	FP-W0403-36	FP-W2403-12	FP-W2403-36
Priority Gold	FP-W0803-12	FP-W0803-36	FP-W2803-12	FP-W2803-36
Priority Gold Exec.	FP-W0903-12	FP-W0903-36	FP-W2903-12	FP-W2903-36
Installation	FP-WINST-16	FP-WINST-16	FP-WINST-16	FP-WINST-16
Installation & Startup	FP-WSTAR-16	FP-WSTAR-16	FP-WSTAR-16	FP-WSTAR-16
AlphaServer GS160 Model 16				
Priority	FP-W0104-12	FP-W0104-36	FP-W2104-12	FP-W2104-36
Priority 24	FP-W0204-12	FP-W0204-36	FP-W2204-12	FP-W2204-36
Priority Silver	FP-W0404-12	FP-W0404-36	FP-W2404-12	FP-W2404-36
Priority Gold	FP-W0804-12	FP-W0804-36	FP-W2804-12	FP-W2804-36
Priority Gold Exec.	FP-W0904-12	FP-W0904-36	FP-W2904-12	FP-W2904-36
Installation	FP-WINST-16	FP-WINST-16	FP-WINST-16	FP-WINST-16
Installation & Startup	FP-WSTAR-16	FP-WSTAR-16	FP-WSTAR-16	FP-WSTAR-16

Note:

- For more information on other Compaq hardware and software service options available for AlphaServers, consult your Compaq Sales Account Manager or visit http://www.compaq.com/services/

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)*

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:	YT-CSSIT-V1
	• 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 Compaq Tru64 UNIX or Compaq 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	
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:	YT-CSSIT-P1
	• 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	

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

Extra RAID Pair Service	Configuration of additional Intelligent RAID controller pairs beyond the internal and external RAID controllers 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:	YT-CSSIT-R1
	• 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	
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.	YT-CSSIT-C1
	• 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 Compaq Tru64 UNIX TruCluster software or Compaq 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	
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 Compaq Custom Solutions provider or Compaq 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-AA/AB). 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-AA/AB cabinet.
- AlphaServer G160 Model 8 systems require the 3X-H7512-AA/AB, only.
- AlphaServer GS160 Model 16 systems require both the 3X-H7512-AA/AB and the 3X-H7512-BA/BB.

Note: H9A20-AB/AC expansion cabinets include N+1 power on separate power controllers and may be directly connected to two different AC feeds.

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 US/Canada, 120/208V	3X-H7512-AA
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-AB
Dual AC transfer switch upgrade for use with AlphaServer GS160 Model 16 and GS320 systems; requires 3X-H7512-AA, for use in US/Canada, 120/208V	3X-H7512-BA
Dual AC transfer switch upgrade for use with AlphaServer GS160 Model 16 and GS320 systems; requires 3X-H7512-AB, for use in Europe, 380-415V	3X-H7512-BB

Upgrades

AlphaServer GS160 System Hardware Upgrades

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-160CD-AX
System expansion hardware to upgrade an AlphaServer GS160 Model 16 to an AlphaServer GS320 Model 24. Includes a system logic cabinet with integrated cooling and associated power supplies and cabling. Cabinet attaches to the system logic cabinet of the AlphaServer GS160.	DH-320DD-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-320ED-AX

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.	
	Notes:	
	• CCoD CPUs are field installed. Field installation on existing systems is not included in the CPU option price.	
	• Minimum operating system requirements: Tru64 UNIX V4.0G, OpenVMS V7.2-1H1	
	GS160/320 CCoD SMP CPU, includes one 6/731-MHz CPU module with 4-MB on-board cache and Tru64 UNIX SMP license for use under the CCoD program terms	3X-KN8CA-AD
	GS160/320 CCoD SMP CPU, includes: one 6/731-MHz CPU module with 4-MB on-board cache and OpenVMS SMP license for use under the CCoD program terms	3X-KN8CA-AE

Technical Specifications

		GS160 Model 8	GS160 Model 16
Physical Characteristics	**Dimensions** (HxWxD)	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 lbs/393 kg	868 lbs/393 kg
	Shipping Weight Maximum Configuration	1,400 lbs/634 kg	1,590 lbs/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		
	US/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 3-phase star 3-wire+N+GND	1 circuit 3-phase delta 4-wire mid-GND or 3-wire junction GND	1 circuit 3-phase star 3-wire+N+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		
	US/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 3-phase star 3-wire+N+GND	2 circuits 3-phase delta 4-wire mid-GND or 3-wire junction GND	2 circuits 3-phase star 3-wire+N+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** (HxWxD)	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 lbs/320 kg
	Shipping Weight Maximum Configuration	830 lbs/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.

	H9A20 I/O Expander Cabinet		
	US/Canada	**Japan**	**Europe**
Option part number	H9A20-AA	H9A20-AC	H9A20-AB
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 1-phase 2-wire+GND	2 circuits 1-phase 2-wire+GND	2 circuits 1-phase 2-wire+GND
Dual AC source support	**No**	**Yes**	**Yes**
Note : H9A20-AB/AC 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)