

# QUICKSPECS

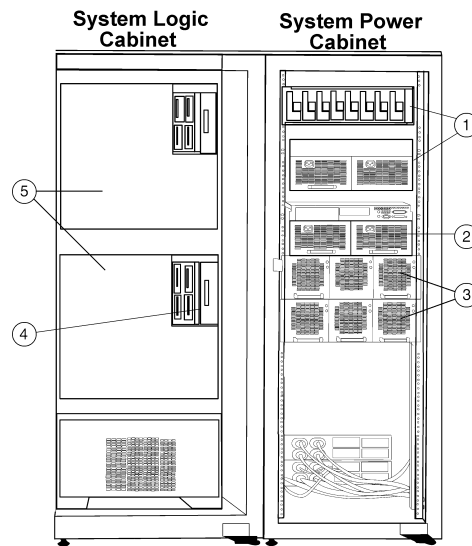
Compaq AlphaServer GS160

## Overview

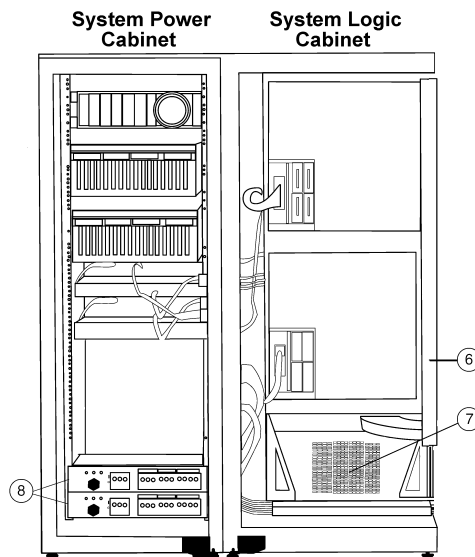
### AT A GLANCE

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 support delivered by Compaq 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 fan

## 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
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### 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 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.

## *Systems/Options*

### **Step 1 – Assess Application Requirements**

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- 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.
- 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**

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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:**

- 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.

## Systems/Options

### Step 2 – Select base system (continued)

#### AlphaServer GS160 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
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

## Options

### 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.

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.

## Options

### Step 4 – Select Memory Options *(continued)*

		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 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 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 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.

### Options

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

##### Optimizing System Resources

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

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

Configure active QBBs symmetrically, each with CPUs, memory, and PCI drawers.

Configure the I/O adapters so that each active QBB has direct access to the most frequently accessed data.

##### System Software Required for 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 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.

## Options

### 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 6b – Internal System Expansion

- 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 StorageWorks shelf, or
- One or two StorageWorks BA36R shelves

#### Internal StorageWorks Expansion

- System power cabinet provides space for up to two forward facing BA36R-RC/RD StorageWorks shelves; each shelf can hold a maximum of two 5.25" devices and one 3.5" device or seven 3.5" devices
- 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



## Options

### Step 6 – Configure Packaging Options *(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

#### 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 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 1<sup>st</sup> 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

## Options

### 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 combination of StorageWorks shelves and PCI drawers.
  - If no PCI drawers are configured, cabinet supports up to eight BA36R StorageWorks shelves.
  - If one PCI drawer is configured, cabinet supports up to five BA36R StorageWorks shelves.
  - If two PCI drawers are configured, cabinet supports up to four BA36R StorageWorks shelves.
  - If three PCI drawers are configured, cabinet supports up to two BA36R StorageWorks shelves.
  - If four PCI drawers are configured, the cabinet supports one BA36R StorageWorks shelf.

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 Controllers

- Tru64 UNIX 4.0G or Tru64 UNIX V5.1 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-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.

## Options

### Step 7 – Internal Storage (continued)

#### PCI UltraSCSI Controllers (continued)

	Maximum # Supported						
	Tru64 UNIX V4.0G/V5.1			OpenVMS V7.2-1H1			
	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	26	13	26	26	13	DS-KGPSA-CA
Fibre Channel cable (BNGBX-xx) xx=02, 05, 15, 30, 50 meters, y=1, 2, 3, 4, 5							234457-B2
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	24	12	26	24	12	KZPBA-CB
VHDCI male-to-68-pin HD male UltraSCSI cable xx=01, 02, 03, 05, 10, 20 meters							BN38C-xx

#### 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/](http://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

## Options

### Step 7 – Internal Storage (continued)

#### HSG60 Fibre Channel Controllers

HSG60 Fibre Channel controllers for MA6000 and ESA12000 are supported under Tru64 UNIX V4.0G, Tru64 UNIX V5.1, and OpenVMS V7.2-1H1.

HSG60 Fibre Channel controllers require ACS software kit, QB-6J4AB-SA for Tru64 UNIX or QB-6J4AC-SA for OpenVMS.

HSG60 Fibre Channel controllers require KGPSA-CB or DS-KGPSA-CA Fibre Channel adapters, BNGBX cables, and fiber hubs or switches (see Fiber 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

#### HSG80 Fibre Channel Controllers

- HSG80 Fibre Channel controllers for RA8000 and ESA12000 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 Fiber 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

#### HSJ5x CI Storage Array Controllers

- HSJ5x 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).

- HSJ5x 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 options, contact Compaq *CustomSystems*.

32-MB cache 6-channel CI array controller with cache battery	HSJ50-AF
64-MB cache 6-channel CI array controller with cache battery	HSJ50-AH
128-MB cache 6-channel CI array controller with cache battery	HSJ50-AJ
Dual 64-MB cache CI array controller with cache batteries	HSJ52-AF
Dual 128-MB cache CI array controller with cache batteries	HSJ52-AH
Dual 256-MB cache CI array controller with cache batteries	HSJ52-AJ
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
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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
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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
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## Options

### Step 7 – Internal Storage *(continued)*

#### Fibre Hubs, Switches, and Components

**Note:** For system integration of the following options, contact Compaq *CustomSystems*.

12-port fibre hub, S.W.	295573-B22
8-port fibre switch	380591-B21
16-port fibre switch, S.W. OP	380578-B21
8-port fibre switch	158222-B21
16-port fibre switch, S.W. OP	158223-B21
Long wave GBIC	127508-B21
Unmanaged FC 7-port hub	234453-001
FC 7-port hub, International	234453-B31
FC 7-port hub, Japan	234453-291
FC 7-port hub mount kit	136127-B21
Short wave optical GBIC	380561-B21
FC 3 GBIC connection kit	380579-B21
FC 2 GBIC connection kit	380596-B21

#### Storage Devices

36.4-GB 7,200 rpm 16-bit UltraSCSI disk drive SBB	DS-RZ1FB-VW
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

#### Tape Devices

32/64-GB DAT tape loader in StorageWorks carrier	TLZ9L-VA
12/24-GB 4mm DAT SCSI tape drive in 3.5" StorageWorks carrier	DS-TLZ10-VA
20/40-GB DLT SCSI tape drive in 5.25" StorageWorks carrier	TZ88N-VA
35/70-GB DLT SCSI tape drive in 5.25" StorageWorks carrier	DS-TZ89N-VW

#### 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

## Options

### 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	
<b>10/100Mbit Fast Ethernet Adapter</b>							
PCI Dual Base 10/100 Fast Ethernet adapter (338456-B21)	8	8	8	8	8	8	3X-DE602-AA
Single-port multi-mode fiber 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
<b>FDDI Controllers</b>							
PCI FDDIcontroller, fiber, single attachment station multimode fiber, requires BN34x SC type connecting cable; maximum six DEFPA-AC/DC/UC/MC 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/UC/MC 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-AC/DC/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-AC/DC/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-m unshielded twisted pair RJ45 connectors							BN25H-03

## Options

### Step 8 – Networks and Communications *(continued)*

#### 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	8	8	8	8	8	8	DEGPA-SA
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#### 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	-	-	-	3X-DAPBA-FA
PCI-to-ATMworks 155-Mbit adapter, UTP	8	8	8	-	-	-	3X-DAPBA-UA
PCI-to-ATMworks 622-Mbit adapter, fiber	8	8	8	-	-	-	3X-DAPCA-FA

### Step 9 – MEMORY CHANNEL

- Up to two PCI System Area Network controllers are supported on GS160 with Console Firmware V5.5-x or later
- 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)

- Each system in the cluster requires a TruCluster Server software license (QL-6BRAQ-AA)

#### Tru64 UNIX Systems (V4.0G)

- 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

- Requires OpenVMS V7.2-1H1 or later and OpenVMS Cluster license (QL-MUZAA-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. Each CCMHB-AA hub mounted in an expansion cabinet replaces the space that is available for one PCI drawer.

## Options

### 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-AA/AB/AC Cabinets

IEC 320 power cord (one mandatory per hub)	BN35S-02
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Note: MEMORY CHANNEL hubs mounted in H9A20-AA cabinets do not require additional power cords.

### Step 10 – System Console Support

#### System Management Console

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



## Options

### 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

## Options

### Step 11 – Graphics Support

- Graphics support for 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

### 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.
- 15" Corporate Series auto-scan color monitor, VGA to 1024 x 768 @ 85 Hz; Northern Hemisphere without power cord 3R-VRQV5-24
- Same as above except Southern Hemisphere without power cord 3R-VRQV5-11
- 17" (16" viewable image size) professional series auto-scanning color monitor, flat definition Trinitron CRT, 0.25 mm aperture grill pitch, VGA to 1280 x 1024 at 75 Hz, TCO 99, MPR-II, Energy Star attached 1.8-m video cable; Northern Hemisphere without power cord 3R-VRQP7-24
- Same as above except Southern Hemisphere without power cord 3R-VRQP7-23
- 19" (18" viewable image size) professional series auto-scanning color monitor, flat definition Trinitron CRT, 0.25 mm aperture grill pitch, VGA to 1280 x 1024 at 75 Hz, TCO 99, MPR-II, Energy Star attached 1.8-m video cable; Northern Hemisphere without power cord 3R-VRQP9-24
- Same as above except Southern Hemisphere without power cord 3R-VRQP9-23
- 21" (19.6" viewable image size) auto-scanning color monitor, Trinitron CRT, 0.28 mm aperture grill pitch, VGA to 1600 x 1200 at 85 Hz NI, TCO 99, Energy Star, includes 1.8-m video cable; Northern Hemisphere without power cord 3R-VRQP1-24
- Same as above except Southern Hemisphere without power cord 3R-VRQP1-23

#### Video Extension Cable

- 1.8-m video extension cable; order one for each monitor BN39C-02

#### Monitor Power Cords

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

## Options

### 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-MTJQA-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-MTJQA-AA
DECnet/OSI extended function license for Tru64 UNIX	QL-MTKAQ-AA

#### 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

## Options

### Step 13 – System Software *(continued)*

#### 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

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.

## Options

### Step 14 – Hardware and Software Support Services

- Installation or Installation and Startup is required for all AlphaServer GS160 systems.
- Priority Plus Service Plans Packages are shown below.
- Other service levels are available. Consult a Compaq Customer Service Account Representative for assistance in selecting the support plan that is most appropriate. For more information on Compaq Services see: <http://www.compaq.com/services/>

#### Installation Services

GS160 Installation Service Package	FP-WINST-16
GS160 Installation Service and Start-Up Package	FP-WSTAR-16

#### GS160 Model 8 Priority Service Plan Packages

- Systems include 1-year hardware warranty, on-site, next day response. Select optional Priority Service Plan Package, as required:

	1-year Service	3-year Service
1-year Priority 24 Service	FP-W0203-12	FP-W0203-36
1-year Priority Plus Service	FP-W0303-12	FP-W0303-36
1-year Priority Premier Service	FP-W0503-12	FP-W0503-36
1-year Priority Executive Premier Service	FP-W0603-12	FP-W0603-36

#### GS160 Model 16 Priority Service Plan Packages

- Systems include 1-year hardware warranty, on-site, next day response. Select optional Priority Service Plan Package, as required:

1-year Priority 24 Service	FP-W0204-12	FP-W0204-36
1-year Priority Plus Service	FP-W0304-12	FP-W0304-36
1-year Priority Premier Service	FP-W0504-12	FP-W0504-36
1-year Priority Executive Premier Service	FP-W0604-12	FP-W0604-36

#### 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 set-up
- Provide initial system performance tuning
- Provide training in the use of the System Control Manager

GS160 Quickstart Evaluate and Plan	QS-GS1A9-CP
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## Options

### 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.

Two pre-packaged VIS services are recommended for popular AlphaServer GS160 system configurations that include up to one ESA12000 storage array:

- VIS Level 1: System integration, testing, extended burn-in, and custom documentation of non-partitioned systems
- VIS Level 2: System integration, testing, extended burn-in, and custom documentation of hardware-partitioned systems

#### VIS Level 1 and Level 2 Package Contents

	VIS Level 1 North America and Europe	VIS Level 2 North America only
Custom module placement and verification	Yes	Yes
Configuration, exercise, and test of one ESA 12000 external storage unit including up to 72 disk drives that are included in system order	Yes	Yes
Configure HSGxx or HSZxx controllers that are included in the system order	Yes	Yes
Configure RAID, mirror, or stripe sets to customer requirements	Yes	Yes
Configure hardware partitions	No	Yes; up to 4
Software load and installation of Tru64 UNIX or OpenVMS	Single Instance	Multiple Instances
100-hour full system burn-in	Yes	Yes
Custom Configuration Documentation	Yes	Yes

Level 1 Value-added Implementation Services for non-partitioned AlphaServer GS160 systems for North America and Europe YT-CSSIT-V1

Level 2 Value-added Implementation Services for partitioned AlphaServer GS160 systems for North America only YT-CSSIT-V2

For Level 2 services in Europe, e-mail specific requirements to: [customsystems.europe@compaq.com](mailto:customsystems.europe@compaq.com)

#### Full Custom Configurations

VIS Level 1 and Level 2 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.

## Options

### 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 12 months or upon "first use" of the module(s)
- A blank copy of the agreement is available at <http://www.compaq.com/alphaserver/cod>  
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 12-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 (V5.1 support planned for early 2001), 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

Physical Characteristics	GS160 Model 8	GS160 Model 16	
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 <sup>(1)</sup>	76.5 x 44 x 48 in / 195 x 112 x 122 cm <sup>1</sup>	76.5 x 44 x 48 in / 195 x 112 x 122 cm <sup>1</sup>	
Weight - kg (lb)	393 (868)	393 (868)	
Maximum configuration	517 (1140)	603 (1330)	
Shipping Weight - kg (lb)			
Maximum configuration	634 (1400)	721 (1590)	
Heat dissipation	GS160 Model 8	GS160 Model 16	
Minimally configured system <sup>(2)</sup> (system & power cabinet)	2,100 W / 7,200 Btu/hr	3,500 W / 12,000 Btu/hr	
Fully configured system <sup>(3)</sup> (system & power cabinet)	4,200 W / 14,300 Btu/hr	6,600 W / 22,500 Btu/hr	
Fully configured system <sup>(4)</sup> (system & power cabinet with two I/O expansion cabinets)	8,900 W / 30,400 Btu/hr	11,200 W / 38,200 Btu/hr	
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°F to 95°F / 5°C to 35°C	-40°F to 151°F / -40°C to 66°C	
Humidity	10% to 90%	10% to 95%	
Altitude	0-10,000 ft / 0-3 km	40,000 ft / 12.2 km	
Vibration	5-500 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.		
Power Requirements <sup>(5)</sup>	GS160 Model 8		
	US/Canada	Japan	Europe
Nominal voltage(s)	120/208V	202V	380-415V
Frequency range	50 Hz-60 Hz	50 Hz-60 Hz	50 Hz-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
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)

## Technical Specifications

Power Requirements <sup>(5)</sup>	GS160 Model 16		
	US/Canada	Japan	Europe
Nominal voltage(s)	120/208V	202V	380-415V
Frequency range	50 Hz–60 Hz	50 Hz–60 Hz	50 Hz–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) <sup>(6)</sup>	15 ft / 4.5 m	15 ft / 4.5 m	15 ft / 4.5 m
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)

- (1) The GS160 is shipped in two cabinets, which are joined in the field. The dimensions and weights shown represent the largest of the cabinets.
- (2) 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.
- (3) 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.
- (4) "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.
- (5) Power system provides near unity power factor that allows full utilization of the input line current (Watts = VA).
- (6) GS160 Model 8 includes a second power cord for future expansion, but only one power cord is required.

## 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 48in / 195 x 92 x 122 cm
Weight - kg (lb)	320 (700)
Maximum configuration	
Shipping Weight - kg (lb)	380 (830)
Maximum configuration	

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°F to 95°F / 5°C to 35°C	-40°F to 151°F / -40°C to 66°C
Humidity	10% to 90%	10% to 95%
Altitude	0-10,000 ft / 0-3 km	40,000 ft / 12.2 km
Vibration	5-500 Hz @ .1G maximum	
Heat dissipation <sup>(1)</sup>	<b>Minimally configured cabinet <sup>(1)</sup></b> 250 W / 850 Btu/hr <b>Fully configured cabinet <sup>(2)</sup></b> 2,400 W / 8,200 Btu/hr	

Power Requirements	US/Canada	US/Canada/Japan	Europe
Option part number	H9A20-AA	H9A20-AC	H9A20-AB
Nominal voltage(s)	120V	200-240V	220-240V
Frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Phases	2 circuits 1-phase 2-wire+GND	2 circuits 1-phase 2-wire+GND	2 circuits 1-phase 2-wire+GND
<b>Dual AC source support <sup>(3)</sup></b>	<b>No</b>	<b>Yes</b>	<b>Yes</b>
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 / 4.5m	15 ft / 4.5m	15 ft / 4.5m
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)

(1) Minimally configured expander cab contains a minimally configured PCI shelf and one disk drive

(2) Fully configured expander cab contains three PCI shelves and 24 disk drives

(3) H9A20-AB/AC expansion cabinets are recommended for use with dual AC sources