

## *hp AlphaServer ES47/ES80/GS1280*

# Site Preparation

Version 4.0



This document provides site preparation information.

**January 2004**

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### **Regulatory Notices for Series ET2003**

#### **FCC Notice**

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (i.e., personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user. The rating label on the device shows which class (A or B) the equipment falls into. Class B devices have an FCC ID on the label. Class A devices do not have an FCC ID on the label. Once the class of the device is determined, refer to the following corresponding statement.

#### **Class A Equipment**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

#### **Class B Equipment**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

#### **Modifications**

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

#### **Cables**

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC rules and regulations.

#### **Declaration of Conformity for products marked with the FCC logo – United States only**

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## Taiwanese Notice

### 警告使用者:

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

## Japanese Notice

この装置は、情報処理等電波障害自主規制協議会（VCCI）基準に基づくクラス A 情報装置です。この装置を家庭環境で使用すると電波障害を引き起こすことがあります。この場合には、使用者が適切な対策を講じるよう要求されることがあります。

## Canadian Notice (Avis Canadien)

### Class A Equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations. Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

### Class B Equipment

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations. Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## European Union Notice

Products with the CE marking comply with the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community and if this product has telecommunication functionality, the R&TTE Directive (1999/5/EC).

Compliance with these directives implies conformity to the following European Norms (in parentheses are the equivalent international standards and regulations):

- EN55022 (CISPR 22) – Electromagnetic Interference
- EN55024 (IEC61000-4-2, 3, 4, 5, 6, 8, 11) – Electromagnetic Immunity
- EN61000-3-2 (IEC61000-3-2) – Power Line Harmonics
- EN61000-3-3 (IEC61000-3-3) – Power Line Flicker
- EN60950 (IEC60950) – Product Safety



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## Introduction

The EV7 AlphaServer family includes high-performance server platforms designed for enterprise-level applications. The ES47/ES80 systems, based on 2P drawers, are contained in a single cabinet. The GS1280 system is based on 8P drawers and requires one or two cabinets, depending on the number of drawers in the system.

- Customer Responsibilities
- Hewlett-Packard Responsibilities



## Customer Responsibilities

- Move all system cabinets, peripherals, and related supplies shipped with the system to the intended installation site.
- Ensure all wall mounts, floor modifications, and other related site preparations are completed prior to the installation. The environment must include all requirements for product installation per HP specifications.
- Identify the contacts with whom HP personnel should communicate.
- Allow HP personnel full access to all equipment and software.
- Notify HP of any potential safety or health hazards that may exist at the site, as well as provide and/or recommend safety procedures to be followed while on the site.
- Provide at no charge to HP a reasonably secure work space and storage facilities, supplies and scratch media (including spare tapes and disk space) as required.
- Have an authorized customer employee present during installation and service.
- Maintain site conditions within the common environmental range of all system devices (and media) as specified by HP. See Recommended Operating Environment.

## Hewlett-Packard Responsibilities

Hewlett-Packard will install equipment per the product specifications, including:

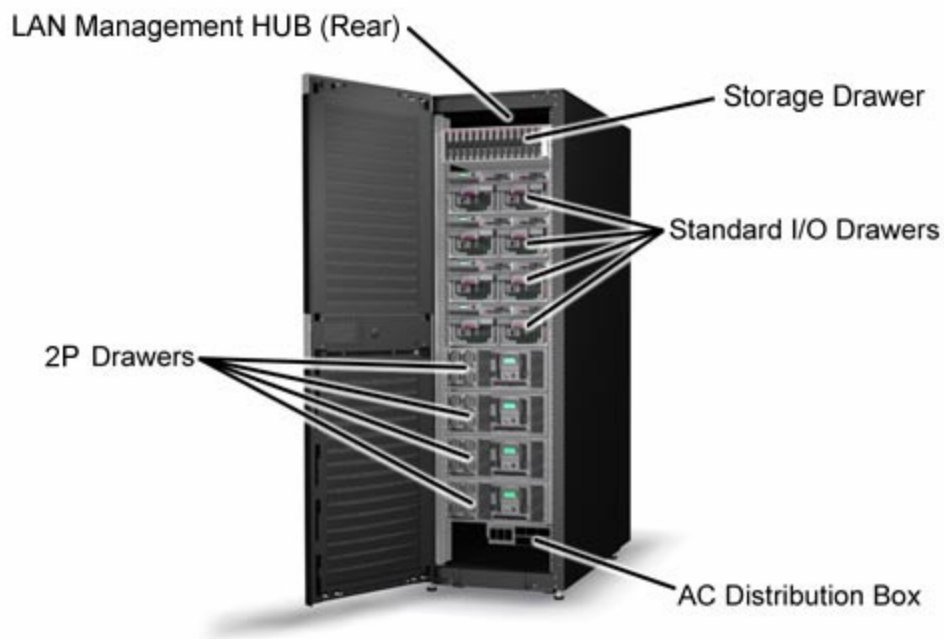
- Unpacking equipment (if appropriate)
- Inspecting for damage
- Installing all Hewlett-Packard components in the system enclosure or storage subsystem
- Installing all components per Hewlett-Packard product configuration specifications
- Running standard test/diagnostics
- Installing appropriate service tools
- Installing components into a pre-assembled cabinet

## ES47/ES80 Systems

ES47/ES80 systems are housed in a single cabinet. In ES80 systems, the cabinet holds a maximum of four 2P drawers. In ES47 systems, the cabinet contains two 2P drawers. An ES47 tower configuration is available. Each system drawer has one dual-processor module.

### Power Requirements

ES47/ES80



## ES47/ES80 System Power

- Three-phase PDU
- Single-phase PDU
- Heat Dissipation
- Airflow

<b>Specification</b>	<b>North America</b>	<b>Japan</b>	<b>Europe</b>
<b>Three-phase PDU</b>	3X-H7606-AA	3X-H7606-AA	3X-H7606-AB
Nominal Voltage	200-208	200-208	380-415
Rated Current	24A	24A	24A
Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Phases	3W+N+G	3W+N+G	3W+N+G
Kva, Model 2 (1 I/O Expansion Drawer, 9 StorageWorks Shelves)	6.683	6.683	6.683
Kva, Model 4 (2 I/O Expansion Drawers, 6 StorageWorks Shelves)	6.166	6.166	6.166
Kva, Model 6 (2 I/O Expansion Drawers, 5 StorageWorks Shelves)	6.349	6.349	6.349
Kva, Model 8 (2 I/O Expansion Drawers, 3 StorageWorks Shelves)	5.932	5.932	5.932
Line connection	Fixed cord & plug	Fixed cord & plug	Fixed cord & plug
Power cord	3 x 12 AWG	3 x 12 AWG	3 x 2.5mm
Power plug (site)	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W
Main breaker	30A	30A	30A
Sub breakers	3x20A(2 pole) 1x20A(3 pole)	3x20A(2 pole) 1x20A(3 pole)	3x20A(2 pole) 1x20A(3 pole)

<b>Single-phase PDU</b>	3X-H7609-EB	3X-H7609-EB	3X-H7609-DB
Voltage	200-240	200-240	200-240
Rated Current	16A	16A	16A
Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Kva	3.2-3.84	3.2-3.84	3.2-3.84
Current per phase	17.5A	17.5A	17.5A
Power outlets (internal)	3 x C19, 24 x C13	3 x C19, 24 x C13	3 x C19, 24 x C13
Line connection	Fixed cord & plug	Fixed cord & plug	Fixed cord & plug
Power cord	3 x 12 AWG	3 x 12 AWG	3 x 2.5 mm <sup>2</sup>
Power plugs (1 per cab)	NEMA L6-L20P	NEMA L6-L20P	IEC 309
Main breaker	20A (2)	20A (2)	20A (2)
Sub breakers	N/A	N/A	N/A
<b>Heat Dissipation</b>			
Minimally configured system, (Model 2 only)	894W	894W	894W
Btu/hr (Model 2 only)	3,051	3,051	3,051
Fully configured system, (Model 2 only)	1,930W	1,930W	1,930W
Btu/hr (Model 2 only)	6,587	6,587	6,587
Minimally configured system, Model 4 only)	1,788W	1,788W	1,788W
Btu/hr (Model 4 only)	6,102	6,102	6,102
Fully configured system, Model 4 only)	3,860W	3,860W	3,860W
Btu/hr (Model 4 only)	13,174	13,174	13,174
Minimally configured system, Model 6 only)	2,682W	2,682W	2,682W
Btu/hr (Model 6 only)	9,153	9,153	9,153
Fully configured system, Model 6 only)	4,596W	4,596W	4,596W
Btu/hr (Model 6 only)	15,686	15,686	15,686
Minimally configured system, Model 8 only)	3,576W	3,576W	3,576W
Btu/hr (Model 6 only)	12,204	12,204	12,204
Fully configured system, Model 8 only)	5,928W	5,928W	5,928W
Btu/hr (Model 8 only)	20,230	20,230	20,230

<b>Airflow, cfm</b>		
Model 2	Minimum	227
	Maximum	492
Model 4	Minimum	554
	Maximum	984
Model 6	Minimum	831
	Maximum	1476
Model 8	Minimum	1108
	Maximum	1968

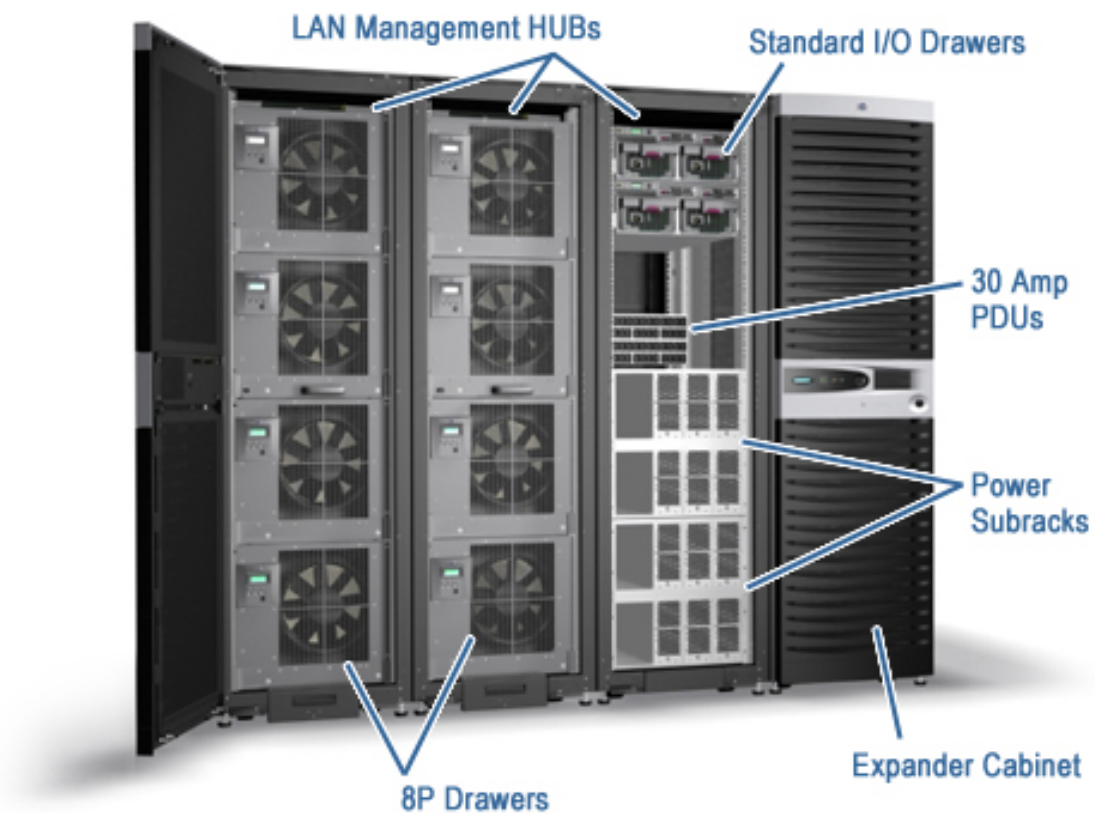
**Note:** *Maximum heat output is generated with full memory installed in 2P drawer and I/O optimized for full performance. Typical output assumes I/O drawers are optimized for connectivity.*

## GS1280 System

The GS1280 system cabinet holds up to four 8P system drawers. Larger systems require a separate power cabinet. Expansion cabinets may house optional storage shelves and I/O.

### Power Requirements

- Model 8
- Model 16
- Model 32
- Model 64



## GS1280 Model 8 System Power

<b>Power</b>	<b>US/Canada</b>	<b>Japan</b>	<b>Europe</b>
Voltage	120/208	200	380–415
Rated Current	24A	24A	24A
Phase	3W+N+G	3W+N+G	3W+N+G
Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Kva, Model 8, 1 I/O Drawer, 4 StorageWorks Shelves	6.092	6.092	6.092
Current per phase	17.5A	18A	9.5A
Kva, Model 8, 2 I/O Drawers, 4 StorageWorks Shelves	5.982	5.982	5.982
Current per phase	17A	17.8A	9.5A
Power outlets (Internal)	3 x C19, 24 x C13	3 x C19, 24 x C13	3 x C19, 24 x C13
Line connection	Fixed cord & plug	Fixed cord & plug	Fixed cord & plug
Power cord	5 x 10AWG	5 x 10AWG	5 x 4 mm <sup>2</sup>
Power plugs	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W
Number of PDUs required	1, 2 for dual AC	1, 2 for dual AC	1, 2 for dual AC
Main breaker	30A	30A	30A
Sub-breakers	3x20A(2 pole) 1x20A(3 pole)	3x20A(2 pole) 1x20A(3 pole)	3x15A(2 pole) 1x15A(3 pole)
<b>Heat Dissipation</b>			
Max heat output	3,405W	3,405W	3,405W
Max heat output, Btu/hr	11,622	11,622	11,622
Typical heat output	2,430W	2,430W	2,430W
Typical heat output, Btu/hr	8,297	8,297	8,297
Max heat output, full rack	6,405W	6,405W	6,405W
Max heat output, Btu/hr, full rack	21,861	21,861	21,861
Typical heat output, full rack	3,330W	3,330W	3,330W
Typical heat output, Btu/hr, full rack	11,366	11,366	11,366
<b>Airflow, cfm</b>			
Airflow, minimum full rack	850	850	850
Airflow, maximum full rack	1,210	1,210	1,210

**Note:** Maximum heat output is generated with a full capacity of CPUs and memory installed in the 8P drawer, and I/O optimized for full performance. Typical heat output assumes one half of the CPU slots are used and the I/O drawer is optimized for connectivity.

## GS1280 Model 16 System Power

<b>Power</b>	<b>US/Canada</b>	<b>Japan</b>	<b>Europe</b>
Voltage	120/208	200	380
Rated Current	24A	24A	24A
Phase	3W + N + G	3W + N + G	3W + N + G
Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Kva, Model 16, 1 I/O Drawer, 1 StorageWorks Shelf	6.193	6.193	6.193
Current, per phase	19A	20A	10.5A
Kva, Model 16, 2 I/O Drawers, 0 StorageWorks Shelves	5.73	5.73	5.73
Current, per phase	18.5A	18.5A	8.3A
Power outlets (Internal)	3 x C19, 24 x C13	3 x C19, 24 x C13	3 x C19, 24 x C13
Line connection	Fixed cord and plug	Fixed cord and plug	Fixed cord and plug
Power cord	5 x 10AWG	5 x 10AWG	5 x 4 mm <sup>2</sup>
Power plugs	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W
Number of PDUs required	2, 4 for dual AC	2, 4 for dual AC	2, 4 for dual AC
Main breaker	30A	30A	30A
Sub-breakers	3x20A(2 pole) 1x20A(3 pole)	3x20A(2 pole) 1x20A(3 pole)	3x15A(2 pole) 1x15A(3 pole)
<b>Heat Dissipation</b>			
Maximum heat output	6,810W	6,810W	6,810W
Maximum heat output, Btu/hr	23,243	23,243	23,243
Typical heat output	3,700W	3,700W	3,700W
Typical heat output, Btu/hr	12,632	12,632	12,632
<b>Airflow, cfm</b>			
Airflow, full rack, minimum	1,500	1,500	1,500
Airflow, full rack, maximum	2,200	2,200	2,200

**Note:** Maximum heat output is generated with a full capacity of CPUs, memory installed in the 8P drawers, and I/O optimized for full performance. Typical heat output assumes one half of the CPU slots are used and the I/O drawer is optimized for connectivity.

## GS1280 Model 32 System Power

<b>Power</b>	<b>US/Canada</b>	<b>Japan</b>	<b>Europe</b>
Voltage	120/208	200	380/415
Current	24A	24A	24A
Phase	3W + N + G	3W + N + G	3W + N + G
Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Kva, Model 32, 1 I/O Drawer, 1 StorageWorks Shelf	10.990	10.990	10.990
Current per phase	11.7A	11.7A	7.3A
Power outlets (internal)	3x C19, 24 x C13	3 x C19, 24 x C13	3 x C19, 24 x C13
Number of PDUs required	4, 8 for dual-AC	4, 8 for dual-AC	4, 8 for dual-AC
Line connection	Fixed cord and plug	Fixed cord and plug	Fixed cord and plug
Power cord	5 x 10AWG	5 x 10AWG	5 x 4mm <sup>2</sup>
Power plug	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W
Main breaker	30A	30A	30A
Sub-breakers	3x20A(2 pole) 1x20A(3 pole)	3x20A(2 pole) 1x20A(3 pole)	3x15A(2 pole) 1x15A(3 pole)
<b>Heat Dissipation</b>			
Max heat output	14,820W	14,820W	14,820W
Max heat output, Btu/hr	50,581	50,581	50,581
Typical heat output	8,000W	8,000W	8,000W
Typical heat output, Btu/hr	27,304	27,304	27,304
<b>Airflow, cfm</b>			
Airflow, minimum full rack, CPU rack	3,400	3,400	3,400
Airflow, maximum full rack, CPU rack	1,800	1,800	1,800
Airflow, minimum full rack, power rack	1,685	1,685	1,685
Airflow, maximum full rack, power cab	1,455	1,455	1,455

**Note:** Maximum heat output is generated with a full capacity of CPUs and memory installed in the 8P drawers, and I/O optimized for full performance. Nominal heat output assumes one half of the CPU slots are used and the I/O drawer is optimized for connectivity.

## GS1280 Model 32 System Power – Dual AC Feed

<b>Power</b>	<b>US/Canada</b>	<b>Japan</b>	<b>Europe</b>
Voltage	120/208	200	380/415
Current	48A	48A	25A
Phase	3W + G	3W + G	3W + N + G
Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Kva, Model 32, 1 I/O Drawer, 1 StorageWorks Shelf	10.1	10.1	10.1
Number of PDUs required	2 Main, 2 Aux	2 Main, 2 Aux	2 Main, 2 Aux
<b>Main PDU</b>			
Current, per phase	24A	25A	16A
Line Connection	fixed cord & plug	fixed cord & plug	fixed cord & plug
Power Cord	4 x 8AWG	4 x 8AWG	5 x 4 mm <sup>2</sup>
Power Plug	IEC 60A, Hubbell 460P9W	IEC 60A, Hubbell 460P9W	IEC 32A, Hubbell 532P6W
<b>Auxiliary PDU</b>			
Current, per phase	2.5A	2.5A	1.3A
Line Connection	fixed cord & plug	fixed cord & plug	fixed cord & plug
Power Cord	5 x 10AWG	5 x 10AWG	5 x 4 mm <sup>2</sup>
Power Plug	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W
<b>Heat Dissipation</b>			
Max heat output	14,820W	14,820W	14,820W
Max heat output, Btu/hr	50,581	50,581	50,581
Typical heat output	8,000W	8,000W	8,000W
Typical heat output, Btu/hr	27,304	27,304	27,304
<b>Airflow, cfm</b>			
Airflow, minimum full rack, CPU rack	3,400	3,400	3,400
Airflow, maximum full rack, CPU rack	1,800	1,800	1,800
Airflow, minimum full rack, power rack	1,685	1,685	1,685
Airflow, maximum full rack, power cab	1,455	1,455	1,455

**Note:** Maximum heat output is generated with a full capacity of CPUs and memory installed in the 8P drawers, and I/O optimized for full performance. Nominal heat output assumes one half of the CPU slots are used and the I/O drawer is optimized for connectivity.

## GS1280 Model 64 System Power

<b>Power</b>	<b>US/Canada</b>	<b>Japan</b>	<b>Europe</b>
Voltage	120/208	200	380/415
Current	24A	24A	24A
Phase	3W + N + G	3W + N + G	3W + N + G
Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Kva, Model 64, 1 I/O Drawer, 1 StorageWorks Shelf	10.990	10.990	10.990
Current per phase	10.6A	10.9A	6.8A
Power outlets (internal)	3x C19, 24 x C13	3 x C19, 24 x C13	3 x C19, 24 x C13
Number of PDUs required	8	8	8
Line connection	Fixed cord and plug	Fixed cord and plug	Fixed cord and plug
Power cord	5 x 10AWG	5 x 10AWG	5 x 4mm <sup>2</sup>
Power plug	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W
Main breaker	30A	30A	30A
Sub-breakers	3x20A(2 pole) 1x20A(3 pole)	3x20A(2 pole) 1x20A(3 pole)	3x15A(2 pole) 1x15A(3 pole)
<b>Heat Dissipation</b>			
Max heat output	28,440W	28,440W	28,440W
Max heat output, Btu/hr	97,066	97,066	97,066
Typical heat output	14,800W	14,800W	14,800W
Typical heat output, Btu/hr	50,513	50,513	50,513
<b>Airflow, cfm</b>			
Airflow, minimum full rack, CPU rack	6,800	6,800	6,800
Airflow, maximum full rack, CPU rack	3,600	3,600	3,600
Airflow, minimum full rack, power rack	1,324	1,324	1,324
Airflow, maximum full rack, power cab	1,508	1,508	1,508

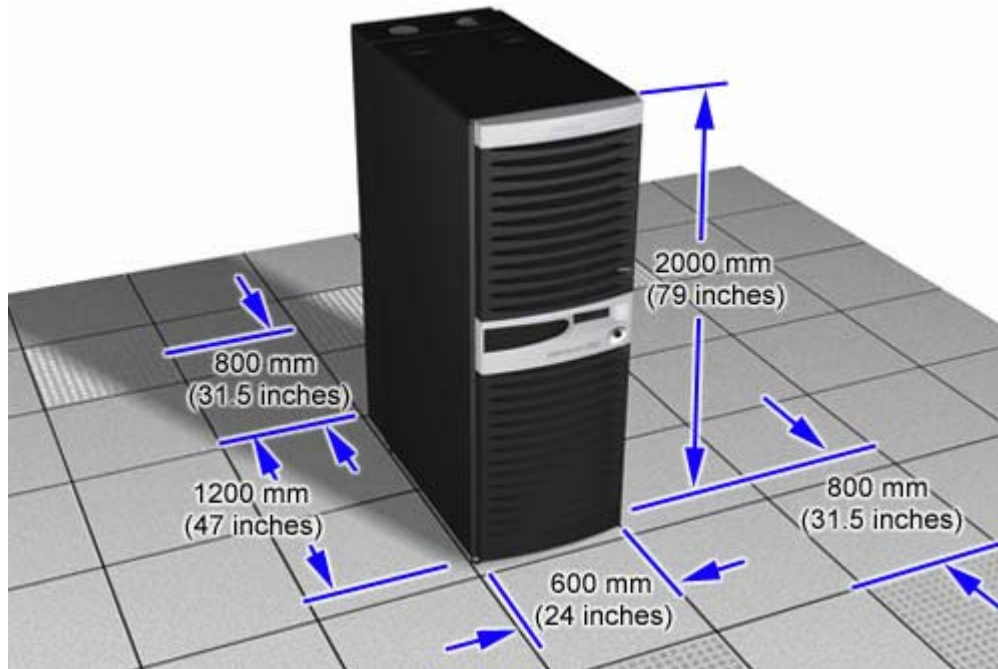
**Note:** Maximum heat output is generated with a full capacity of CPUs and memory installed in the 8P drawers, and I/O optimized for full performance. Nominal heat output assumes one half of the CPU slots are used and the I/O drawer is optimized for connectivity.

## GS1280 Model 64 System Power – Dual AC Feed

<b>Power</b>	<b>US/Canada</b>	<b>Japan</b>	<b>Europe</b>
Voltage	120/208	200	380/415
Current	48A	48A	25A
Phase	3W + G	3W + G	3W + N + G
Frequency	50-60 Hz	50-60 Hz	50-60 Hz
Kva, Model 32, 1 I/O Drawer, 1 StorageWorks Shelf	18.7	18.7	18.7
Number of PDUs required	4 Main, 2 Aux	4 Main, 2 Aux	4 Main, 2 Aux
<b>Main PDU</b>			
Current, per phase	24A	25A	16A
Line Connection	fixed cord & plug	fixed cord & plug	fixed cord & plug
Power Cord	4 x 8AWG	4 x 8AWG	5 x 4 mm <sup>2</sup>
Power Plug	IEC 60A, Hubbell 460P9W	IEC 60A, Hubbell 460P9W	IEC 32A, Hubbell 532P6W
<b>Auxiliary PDU</b>			
Current, per phase	2.5A	2.5A	1.3A
Line Connection	fixed cord & plug	fixed cord & plug	fixed cord & plug
Power Cord	5 x 10AWG	5 x 10AWG	5 x 4 mm <sup>2</sup>
Power Plug	L21-30P, Hubbell 2811	L21-30P, Hubbell 2811	Hubbell 532P6W
<b>Heat Dissipation</b>			
Max heat output	28,440W	28,440W	28,440W
Max heat output, Btu/hr	97,066	97,066	97,066
Typical heat output	14,800W	14,800W	14,800W
Typical heat output, Btu/hr	50,513	50,513	50,513
<b>Airflow, cfm</b>			
Airflow, minimum full rack, CPU rack	6,800	6,800	6,800
Airflow, maximum full rack, CPU rack	3,600	3,600	3,600
Airflow, minimum full rack, power rack	1,324	1,324	1,324
Airflow, maximum full rack, power cab	1,508	1,508	1,508

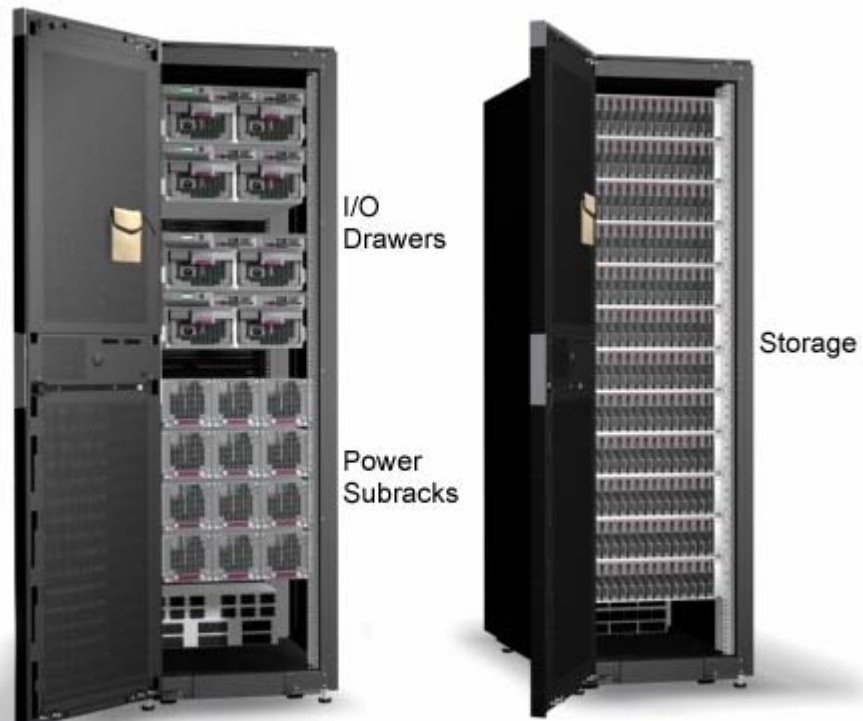
**Note:** Maximum heat output is generated with a full capacity of CPUs and memory installed in the 8P drawers, and I/O optimized for full performance. Nominal heat output assumes one half of the CPU slots are used and the I/O drawer is optimized for connectivity.

## System Cabinet



<b>Dimensions</b>	
Height	2000 mm (79 in.)
Width	600 mm (24 in.)
Depth	1200 mm (47 in.)
<b>Shipping Dimensions</b>	
Height, mm	2150
Width, mm	925
Depth, mm	1400
<b>Service Clearance</b>	
Front	800 mm (31.5 in.)
Rear	1000 mm (39 in.)
Sides	0
<b>Weight</b>	
One system drawer (8P)	395 kg (870 lb)
Two system drawers (16P)	577 kg (1272 lb)
Four system drawers (32P)	704 kg (1552 lb)
<b>Power Cabinet Weight (32P)</b>	257 kg (566 lb)

## Expansion Cabinets



Expander Cabinets

## Expansion Cabinet Dimensions

<b>Cabinet</b>	<b>Dimensions</b>
<b>41U Cabinet (H9A45)</b>	
Height, mm	2000
Width, mm	600
Depth, mm	1200
<b>Service Clearance</b>	
Front, mm	800
Sides, mm	0
Rear, mm	1000
<b>Shipping Dimensions</b>	
Height, mm	2170
Width, mm	813
Depth, mm	1219
<b>34U Cabinet (H9A40)</b>	
Height, mm	1700
Width, mm	600
Depth, mm	1200
<b>Service Clearance</b>	
Height, mm	800
Width, mm	0
Depth, mm	1000
<b>Shipping Dimensions</b>	
Height, mm	1897
Width, mm	813
Depth, mm	1219
<b>42U Cabinet (10642)</b>	
Height, mm	2000
Width, mm	610
Depth, mm	1008
<b>Service Clearance</b>	
Height, mm	800
Width, mm	0
Depth, mm	1000
<b>Shipping Dimensions</b>	
Height, mm	2190
Width, mm	813
Depth, mm	1219

## Site Considerations

A successful installation requires planning and preparing the right physical environment for the system. Site considerations include the following:

- Delivery Route
- Space Requirements
- Computer Room Safety
- Power
- Grounding Requirements
- Cooling

## Delivery Route

Packaging specifications and illustrations for the system cabinets will determine whether all paths from the receiving dock to the installation site are wide enough, whether all doorways are tall enough, and whether elevator door size and weight restrictions can support passage of the system cabinets.

Before moving equipment, study the route it will take, from the receiving area to the installation site. Take measurements to ensure problem-free transport of equipment.

*NOTE: A system cabinet is 2 m (79 in.) tall and will pass through a 2.03 m (80 in.) doorway when removed from the shipping pallet.*

Consider the following factors:

- Height, width, and location of doors
- Size, capacity, and availability of an elevator
- Width of passageways from receiving area to installation area
- Passageway restrictions (bends, slopes, or obstructions)
- Floor loading and floor and wall covering protectors
- Fire code restrictions for entryways and exits for the site

## **Space Requirements**

Physical specifications and illustrations for the system cabinets will define the required floor space, operating and service clearances, and floor loading.

The total floor area required to support an EV7 AlphaServer depends on the:

- System configuration
- Operation area
- Service area required as determined by door swings and effective cooling capability
- Proximity to other computing systems having equal or greater cooling requirements
- Location of walls, partitions, windows, doors, columns, obstructions, or supporting equipment (air-handlers, power distribution systems, and so on)
- Storage and work areas

## **Computer Room Safety**

Inside the computer room, fire protection and adequate lighting (for equipment servicing) are important safety considerations. Federal and local safety codes govern computer installations.

The National Fire Protection Association's Standard for the protection of Electronics Computer Data Processing Equipment, NFPA 75, contains information on safety monitoring equipment for computer rooms. Most computer room installations are equipped with the following fire protection devices:

- Smoke detectors
- Fire and temperature alarms
- Fire extinguishing system

Additional safety devices are:

- Circuit breakers
- An emergency power cutoff switch
- Devices specific to the geographical location, i.e., earthquake protection

## Power

Power specifications and illustrations for the system cabinets will help with the design of power capacity and distribution.

*NOTE: HP recommends designing or preparing a computer site in accordance with NFPA 75: Protection of Electronic Computer / Data Processing Equipment.*

*NOTE: HP recommends designing or preparing the power distribution system in accordance with IEEE 1100-1999: Recommended Practice for Powering and Grounding of Electronic Equipment (IEEE Emerald Book) and any country specific electrical codes.*

The power source should be independent of all other loads; meaning, it should not supply air-conditioners, convenience outlets, lighting, or any other potentially noisy loads. The power source should be an isolation transformer (with electrostatic shield), located in close proximity to the proposed system that has sufficient capacity to support the existing loads, the proposed system, future expansion, and inrush currents.

All aspects of the power distribution system must comply with the minimum standards set forth by the National, State, or local electrical codes.

Today's computer equipment power supplies are tolerant of minor sags and surges on the power line. Many even feature built-in surge suppression. However, on occasion the power is distorted enough to cause operational problems. It is the customer's responsibility to analyze the power quality and determine the most appropriate solution. HP offers services that can assist with this effort.

All receptacles must be derived from dedicated branch circuits that include a grounding conductor. All receptacles must be standard grounding-type receptacles. HP does not recommend the use of isolated grounding (IG) type receptacles except where proven necessary. Branch circuits should not exceed 75 feet in length wherever possible to help minimize ground differential voltages that can upset system operation.

## **Grounding Requirements**

Two grounding systems are required: a safety grounding system that meets national, state, and local electrical codes, and a high frequency grounding system for noise reduction. A safety ground is required and must conform to the following specifications:

- The safety ground must be completely isolated from neutral all the way back to the power transformer.
- The safety ground must never be dependent on a conduit alone. A wire must be run into the electrical feed along with the power wiring and neutral for use as safety ground.
- The safety ground and neutral must be firmly connected together at the power transformer.
- The safety ground must be firmly wired to the unit for personnel safety and to ensure that the AC line filters properly function.

## Cooling

The systems are cooled front-to-rear. Air enters the front of the rack and exhausts from the rear of the rack. There are no air inlets in the bottom nor exhausts out the top of the cabinets.

Systems may be run on either raised floor or non-raised floor environments. It is recognized that uniform airflow and air temperature distribution within the non-raised floor environment is much more difficult to attain. The inlet temperature ranges specified must be available to all systems within the cabinet. For raised floor applications this means that the drawers in the lowest part of the cabinet, where cold air is discharged, and the units in the topmost part of the cabinet, must meet the requirements. Similarly, for non-raised floor environments, using overhead diffusers, the air entering the bottom of the cabinet must meet the same requirements as the air entering the top of the cabinet.

### Inlet Temperature Ranges

<b>GS1280 Systems</b>	<b>ES47/ES80 Systems</b>
Minimum: 50°F (10°C)	Minimum: 50°F (10°C)
Maximum: 95°F (35°C)	Maximum: 104°F (40°C)

It is highly recommended that a hot aisle/cold aisle arrangement be used for positioning the system. Inlets of systems face a cold aisle, where air is introduced, and exhausts of units blow into hot air, where air is returned to the air handling system. This will reduce the mixing of warm and cold air streams. Adequate airflow should be provided in the supply aisle and adequate return air flow should be removed in the discharge aisle. The system fans are very powerful and if the air handlers supply insufficient supply or discharge flow, recirculation of hot exhaust into the machines inlets are a possibility. The system air movers are all temperature-controlled variable speed blowers, which will increase cooling flow in the unit depending upon a number of environmental variables, including inlet ambient temperature, system load, and CPU thermistor temperature. The minimum/maximum cooling flow rates for the systems are listed below.

### Cooling Airflow Rates In Cubic Feet per Minute (CFM)

	<b>8P System Cab</b>	<b>16P System Cab</b>	<b>32P System Cab</b>	<b>64P System Cabs</b>	<b>Exp Cab</b>	<b>ES47 Cab</b>	<b>ES80 Cab</b>
<b>Maximum</b>	1404 cfm	2454 cfm	3400 cfm	6800 cfm	1416 cfm	1968 cfm	984 cfm
<b>Minimum</b>	912 cfm	1562 cfm	1800 cfm	3600 cfm	1048 cfm	1108 cfm	554 cfm

The typical operating air temperature rise in a device in a system is about 10 C. The air delivery system should be capable of providing airflow rates listed above to prevent system exhaust recirculation.

## Environmental Specifications

The physical environment surrounding an operating or stored computer plays an important role in the long-term reliability of the electronic equipment and peripherals. Computer rooms, office areas, and industrial sites present varying environmental conditions that may affect the operation of the computer equipment. Environmental parameters associated with contamination and corrosion may need to be considered, evaluated, and possibly controlled during the computer site preparation process.

<b>Environmental Specifications</b>	<b>GS1280 Systems</b>	<b>ES47/ES80 Systems</b>
<b>Temperature</b> Operating Non-operating	10 to 35°C (41 to 95 °F) – 40 to 66°C (-40 to 151°F)	10 to 40°C (50 to 104 °F) – 40 to 66°C (-40 to 151°F)
<b>Relative humidity</b> (noncondensing) Operating Non-operating	10 to 90% 10 to 95%	10 to 90% 10 to 95%
<b>Maximum altitude</b> Operating Non-operating	3050 m (10,000 ft) 12,200 m (40,000 ft)	3050 m (10,000 ft) 12,200 m (40,000 ft)
<b>Shock</b>	5G 30ms, half sine	5G 30ms, half sine
<b>Vibration</b>	.1 G, 10500 Hz	.1 G, 10500 Hz
<b>Acoustics</b> Sound Power (LwAd B)  Sound Pressure (LpAm dBA)	7.5 (Model 8) 7.8 (Model 16) 8.1 (Model 32) 8.4 (Model 64)  57 (Model 8) 60 (Model 16) 63 (Model 32) 66 (Model 64)	6.6 (ES47/ES80 Model 2) 6.9 (ES47/ES80 Model 4) 7.2 (ES80 Model 6) 7.5 (ES80 Model 8)  48 (ES47/ES80 Model 2) 51 (ES47/ES80 Model 4) 54 (ES80 Model 6) 57 (ES80 Model 8)
<b>Heat Dissipation (Watts)</b> Maximum  Typical	3555 W (Model 8) 7110 W (Model 16) 14,820 W (Model 32) 28,440 (Model 64)  2430 W (Model 8) 3700 W (Model 16) 8000 W (Model 32) 14,800 (Model 64)	3000W (ES47/ES80)  2000W (ES47/ES80)

## **Air Quality and Environmental Contaminants**

The evaluation of a potential computer site's air quality requires varying efforts, depending on the specific environmental conditions that exist at the site. Typical computer sites do not present environmental air quality concerns. However, a site that is particularly dirty or close to known contamination sources requires a thorough evaluation to assess the need for environmental controls.

Airborne contamination can contribute to intermittent errors and a general decrease in system reliability. In addition to potential system degradation due to contamination and/or corrosion, airborne contamination can be hazardous to people. Quantifiable parameters that site planners should be aware of:

- Gaseous contamination
- Particulate contamination
- Organic contamination
- Metallic particulate contamination

Testing for the existence as well as specific concentration levels of various forms of contamination that may be present in computer rooms, office areas, and industrial sites involves specialized skills and equipment. Numerous evaluation techniques are available. Various techniques provide answers very rapidly on site, while some specific tests require site sampling and follow-up laboratory analysis. If airborne contamination measurements reveal unacceptable concentrations present at the proposed computer site, corrective action should be taken.

- Relocate the proposed computer room. This option is often chosen during the site preparation process to avoid the expense of correcting contamination issues.
- Filtration of particulate contamination. Recirculating filtration systems are available for the control of particulate contamination.
- Filtration of gaseous contamination. Chemical filtration systems are available for the control of numerous gaseous contaminants.
- Modular computer rooms are available for extremely contaminated environments. These rooms require an outside source of uncontaminated air.
- Sealed computer cabinets are available to isolate individual computer system components from aggressive environments. These cabinets can be equipped to recirculate the internal air through a dedicated air conditioner for temperature and humidity control. NEMA cabinets are available which provide various levels of environmental isolation specified by a class designation.
- Purge with inert gas. For some applications, specifically designed cabinets can be purged with an inert gas such as nitrogen to maintain a dry contamination free environment around the computer.

## Gaseous Contamination

Gaseous contamination, in sufficient quantities, can contribute to the degradation of numerous materials in computer systems including both metallic and nonmetallic materials. Gases such as chlorine, hydrogen sulfide, sulfur dioxide, ozone, and nitrogen dioxide are some of the common contaminants that corrode electronic components and equipment, resulting in decreased system reliability. The human sense of smell is inadequate for the detection of some of the corrosive gases encountered in or around industrial facilities. The concentration levels necessary to degrade computer equipment are relatively small; therefore, it is appropriate to identify the composition and measure the concentrations of gaseous contaminants in suspect computer sites.

The following table defines average reactive chemical concentrations for some common airborne contaminants that may exist in a typical computer site. Levels greater than the average levels definitely require evaluation to determine whether other additional environmental control equipment is necessary. Some equipment, such as tape drives, even at average levels may require protection depending on other contributing factors that can degrade the environmental setting.

<b>Reactive chemical species</b>	<b>Average</b>
Chlorine	0.001 ppm *
Hydrogen sulfide	0.01 ppm *
Sulphur dioxide	0.05 ppm *
Nitrogen oxide	0.05 ppm *
Hydrocarbons	0.24 µg/ m <sup>3</sup>
Particulate contamination	50 µg/ m <sup>3</sup> -24h

\* Measured by volume at 25°C and 760 mm pressure

## Particulate Contamination

Particulate contamination (dust) is a form of contamination that is frequently overlooked in many computer facilities. Dust contamination exists in a variety of concentrations, size distributions and compositions. The characteristics of dust are very dependent upon the dust sources. It is very common to find clothing fiber, dirt, and construction materials in computer facilities.

Particulate contamination can have one or more of the following characteristics.

- **Abrasiveness:** abrasive particulate may contribute to wear as well as fretting and fretting corrosion.
- **Hydroscopic:** many particulate contamination compositions have an affinity for water and readily absorb water vapor from the air. If sufficient water vapor is available, the particulate can become wet with water at temperatures above the bulk room dew point.
- **Corrosive:** the elemental composition of any particulate contamination may be corrosive to materials within the computer system.

Excessive particulate contamination within computer equipment can contribute to several problems, including corrosion, wear, heat transfer, and failure of electrical contacts.

Controlling particulate contamination within the computer room can be achieved by using some simple preventative measures. Maintaining the computer room ambient pressure at a level slightly greater than adjacent building areas will help minimize the infiltration of contamination sources. A slightly elevated computer room ambient pressure is achieved by adding a controlled volume of make-up air into the "sealed" computer room. This make-up air should be filtered to remove gaseous and particulate contamination, as well as conditioned for temperature and relative humidity control.

Paper handling equipment such as printers and copying machines should be located outside of the computer room. If the printers are located in an adjacent room, sticky mats can be used at the doorway to minimize operator traffic from transferring paper and toner particulate into the computer room. The printer room requires conditioned air for cooling and relative humidity control. The source of the air-conditioning in the printer room must be separate from the computer room process coolers to eliminate the likelihood of transferring particulate contamination into the computer room.

All filters should be replaced throughout the computer room on a periodic schedule. Appropriate filter maintenance will help ensure removal of particulate contamination, as well as ensure the necessary airflow rates through the computer equipment.

## **Organic Contamination**

Organic contamination refers to contamination from airborne organic compounds commonly referred to as hydrocarbons. The largest source of airborne organic contamination is the incomplete combustion of fossil fuels. In addition to combustion, oxidation of plastics, rubbers, and elastomers are other sources of this form of contamination.

## **Metallic Particulate Contamination**

Metallic particulates can be especially harmful around electronic equipment. This type of contamination may enter the data center environment from a variety of sources, including but not limited to raised floor tiles, worn air conditioning parts, heating ducts, rotor brushes in vacuum cleaners or printer component wear.

Because metallic particulates conduct electricity, they have an increased potential for creating short circuits in electronic equipment. This problem is exaggerated by the increasingly dense circuitry of electronic equipment.

Over time, very fine whiskers of pure metal can form on electroplated zinc, cadmium, or tin surfaces. If these whiskers are disturbed, they may break off and become airborne, possibly causing failures or operational interruptions. For over 50 years, the electronics industry has been aware of the relatively rare but possible threat posed by metallic particulate contamination. During recent years, a growing concern has developed in computer rooms where these conductive contaminants are formed on the bottom of some raised floor tiles.

Although this problem is relatively rare, it may be an issue within your computer room. Since metallic contamination can cause permanent or intermittent failures on your electronic equipment, HP strongly recommends that your site be evaluated for metallic particulate contamination before installation of electronic equipment.

## Recommended Operating Environment

The specifications presented are recommended by Hewlett-Packard to optimize the operating environment for your computer hardware.

<b>Voltage</b>	<b>North America</b>
Nominal:	Single-phase products: 120 Volts
	Three-phase products: 208/120 Volts
Range:	Single-phase products: 104-128 Volts
	Three-phase products: 180-220 Volts
Crest Factor:	1.4 +/- 1%

<b>Voltage</b>	<b>Europe</b>
Nominal:	Single-phase products: 230 Volts
	Three-phase products: 400/230 Volts
Range:	Single-phase products: 190-256 Volts
	Three-phase products: 331-443 Volts
Crest Factor:	1.4 +/- 1%

<b>Voltage</b>	<b>Japan</b>
Nominal	Single-phase products: 101 Volts
	Three-phase products: 202/101 Volts
Range	Single-phase products: 90-110 Volts
	Three-phase products: 180-220 Volts
Crest Factor	1.4 +/- 1%

## Voltage Unbalance

Equipment requiring 3-phase power shall operate satisfactorily when the voltage unbalance is 5% or less as calculated below.

$$\text{Unbalance percent} = \frac{(V_{\max} - V_{\min}) \times 100}{(V_{\text{avg}})}$$

Where:

$$V_{\max} = \text{maximum line-to-line RMS voltage}$$
$$V_{\min} = \text{minimum line-to-line RMS voltage}$$
$$V_{\text{avg}} = \frac{(V_{AB} + V_{BC} + V_{CA})}{3}$$

$V_{AB}, V_{BC}, V_{CA}$  = line-to-line voltage

## Voltage Transients

Power line transients should be no greater in amplitude than the value of the nominal AC RMS voltage. This limitation applies to common and transverse mode transients of positive or negative polarity as they are imposed in the AC sine wave.

## Voltage Harmonic Distortion

The power source voltage total harmonic distortion should not exceed 5% with any single harmonic not exceeding 3% of the fundamental frequency.

## Frequency

Nominal: 60 Hz      Nominal: 50 Hz  
Range: 59 - 61 Hz    Range: 49 - 51 Hz

## Phase Angle Unbalance

Maximum of 5° variation from the 120° relationship for 3-phase power.

## Phase Rotation

ABC

## Current Unbalance

Equipment requiring 3-phase power shall operate satisfactorily when the current unbalance is a maximum of 5 amps or 20% as calculated below.

$$\text{Unbalance percent} = \frac{(I_{\max} - I_{\min}) \times 100}{(I_{\text{avg}})}$$

Where:

$$I_{\max} = \text{maximum line currents in RMS amperes}$$
$$I_{\min} = \text{minimum line currents in RMS amperes}$$
$$I_{\text{avg}} = \frac{(I_A + I_B + I_C)}{3}$$

$I_A, I_B, I_C$  = line currents in RMS amperes

## Magnetic Fields

Most equipment, excluding monitors and some disk and tape products at power line frequencies, can operate properly up to the AC magnetic field flux density limits specified below. Above these limits, the operation of some equipment may be impaired.

Frequency (Hertz)	Maximum field (Gauss)
50	10.0
500	2.0
1000	1.0
10000	0.1
500000	0.002

For high-resolution monitors using refresh rates different from the power line frequency, the maximum AC magnetic field flux density at power line frequencies is 7.07 mGauss RMS (20 mGauss peak-to-peak). For low-resolution monitors, the maximum AC magnetic field flux density at power line frequencies varies with the product, but is always greater than 7.07 mGauss RMS. The maximum DC magnetic field flux density limit up to which most monitors operate properly is approximately 2.0 Gauss.

For some disk and tape drive products, the maximum DC and AC magnetic field flux density specified at power line frequencies is 3.0 Gauss. Other disk and tape drive products can withstand higher magnetic field flux densities. Avoid storage of media in AC or DC magnetic fields. In unavoidable locations, the media should only be subjected to AC magnetic field flux densities up to a maximum of 3.0 Gauss.

### Electric Fields

Maximum of 2 volts/meter cumulative total for radiated fields from 10 kHz to 1 GHz. Ensure that not more than 1 volt RMS is present on the AC connection points to the computer system from 10 kHz to 30 MHz. Measure between frame of the equipment and all phase, neutral, and grounding connections at the power receptacle(s).

### Airflow Rate Range

266-314 m<sup>3</sup>/h-kilowatts or 550-650 cfm/ton at the air-conditioner output

### Vibration

Most equipment has been normally tested on a short-term basis for performance up to the vibration limits specified below. Above these limits or with a continuous vibration level, the operation of equipment may be impaired.

Frequency (Hertz)	Amplitude
5 - 22	0.254 millimeters (0.010 inches) double amplitude
22-500	0.25 g peak

## **Protection Against Electrostatic Discharge**

Follow these precautions to minimize possible electrostatic discharge-induced failures in the computer room:

- Install conductive flooring (conductive adhesive must be used when laying tiles).
- Use conductive wax (if waxed floors are necessary).
- Ensure that all equipment and flooring are properly grounded and are at the same ground potential.
- Use conductive tables and chairs.
- Use a grounded wrist strap (or other grounding method) when handling circuit boards.
- Store spare electronic modules in anti-static containers.
- Maintain recommended humidity level and airflow rates in the computer room

## **Guidelines for Structural and Raised Floor**

### **Structural Floor Requirements**

The structural floor must be poured concrete that has been sealed to provide dust and humidity control. This floor must be true and level within a total depressed deviation of 13 mm (1/2 in.).

Where drains are required, it may not be practical to meet this leveling requirement and achieve the required slope for adequate drainage. Provide non-backup drains to draw water from recessed floors. Floor drains must have adequate capacity to drain water from the sprinkler system, air conditioner malfunctions, or spills within a reasonably short time. Where building codes allow, direct the air conditioning unit condensate to drains to maintain water seal. Otherwise, you must fill drains with water monthly.

The weight capacity of the structural floor must be great enough to support the total system load including raised-floor, personnel, and concentrated loads.

### **Raised-Floor Requirements**

The raised floor must be capable of withstanding a uniform load of 1,220 kg/m<sup>2</sup> (250 lb/ft<sup>2</sup>) or a load of 454 kg (1000 lb) on any 6.5 cm<sup>2</sup> (1.0 in.<sup>2</sup>), with a maximum deflection of 2.5 mm (0.1 in.).

The recommended panel size for the raised floor is 610 mm (24 in.) square. The panel size may be 457 mm (18 in.) to 914 mm (36 in.). These panels must be easily removable to facilitate access to the under-floor area.

The raised floor must be level within +3.2 mm (1/8 in.) overall and within +1.6 mm (1/16 in.) in any 3.05 m (10 ft) distance.

The raised floor material must conform to NFPA 75 (or equivalent governing requirement in the country where installed). NFPA 75 states that the flamespread rating is 25 or less, as specified in NFPA 255 (or equivalent governing requirement in the country where installed). The fire resistance of the raised floor must be a minimum of 1 hour as specified in NFPA 251 (or equivalent governing requirement in the country where installed).

*NOTE: Fire resistance of floor material must comply with more stringent, local regulations.*

The metallic structure of the raised floor must be electrically bonded to the ground to minimize static buildup. The floor panels must have conductive contact with either the framing, the pedestals, or both for positive electrical grounding.

The bolted-stringer raised floor is considered by the National Electrical Code (NEC) to be electrically bonded to itself. This type of raised floor need only be interconnected to the building steel, electrical safety ground, and any other metallic structure that penetrates the perimeter of the floor to meet the required specifications.

A raised-floor structure that does not have bolted stringers must be circled with a bonding conductor connected to the top cap area of the pedestals, routed from pedestal to pedestal, in as short a route as possible. According to the NEC, the conductor must be bare copper wire not smaller than No. 6 AWG.

*NOTE: The equipment supplier recommends using No. 4 AWG bare copper wire.*

Install additional bonding conductors to subdivide the floor into sections of less than 371.6 m<sup>2</sup> (4,000 ft<sup>2</sup>) when a raised floor area is not a bolted-stringer design. The bonding conductor must then be bonded to the building steel, electrical safety ground, and any other metallic structure that penetrates the floor.

The bonding and interconnecting of the floor structure minimizes the static buildup on the floor panel surfaces. The panels are to be constructed of metal or have metal undersurfaces, according to the NFPA-75 (or equivalent governing requirement in the country where installed), and make conductive contact with the floor support structure.

Panel surfaces must be high-pressure laminate. Do not use carpeting. Use material that is both dust and crack resistant. The material must withstand movement of heavy equipment on casters and must resist the buildup of static electricity. Cleaning products containing ammonia must not be used. Panel surfaces must meet the following electrical resistance test specifications to ensure electrical safety and still provide adequate conduction to minimize static charges:

- Maximum  $1 \times 10^{11}$  (100 billion) ohms/square
- Minimum  $1 \times 10^5$  (100 thousand) ohms/square

The use of ESD-protective floor wax in place of ESD-protective floor materials is not recommended. However, the resistance to ground of any ESD-protective flooring from any point on its surface must be:

- Greater than  $1 \times 10^5$  (100 thousand) ohms
- Less than  $1 \times 10^8$  (100 million) ohms

All cable openings in floor panels must have plastic edging to prevent damage to cables. If new construction is contemplated, consider recessing the primary floor in the computer room. Recessing the primary floor allows installation of a raised floor at the same level as surrounding floors, eliminating the need for ramps. Provide adequate drainage to ensure that no moisture accumulates in the recessed area.

Place the following provisions for the computer system between the raised floor and the primary floor:

- AC power distribution for the computer system
- Input/output cables
- Air ducts or passages for cooling air
- Cable ducts

### **Clearance Between Raised Floor and Primary Floor**

In general, the equipment supplier recommends 406 mm (16 in.) clearance between the raised floor and the primary floor. While it may be possible to install a system on a raised floor with less clearance to the primary floor, the problems of adequate airflow and of cable routing to prevent blockage of airflow are magnified, especially on large system.

### **Clearance for Under-floor Cables**

The customer service engineer must determine if there is adequate space for the under-floor cables. The cables are to be routed along the under floor and brought up to the cabinet locations prior to placing the cabinets. Ensure that at least 102 mm (4 in.) of free space exists between the top of the under-floor cables and the raised floor. Route the cables so that excessive buildup does not occur in any local area. Cables routed under the floor that are to connect to electronic equipment must be routed so that excessive strain does not occur on the connector due to inadequate space for bent radius of the cable. In the case of the large diameter input/output cables for peripheral equipment, provide a minimum bend radius of 212 mm (6 in.). All cables are to be routed at 90 degree angles. Power and signal cables must be separated by 6 to 12 inches to minimize noise interference.

### **Guidelines for Non-raised Floor**

- The non-raised floor must be capable of withstanding a uniform load of 1,220 kg/m<sup>2</sup> (250 lb/ft<sup>2</sup>) or a load of 454 kg (1,000 lb) on any 6.5 cm<sup>2</sup> (1.0 in.<sup>2</sup>) with a maximum deflection of 2.5 mm (0.1 in.).
- The floor must be level within +3.2 mm (1/8 in.) overall and within +1.6 mm (1/16 in.) in any 3.05 m (10 ft) distance.
- Floor surfaces must be resistant to cracking and dust, must withstand the movement of heavy equipment on casters, and must resist the buildup of static electricity.
- Cleaning products containing ammonia must not be used on the floor.
- The use of electrostatic discharge (ESD) protective floor wax in place of ESD-protective floor materials is not recommended. However, the resistance to ground of any ESD-protective flooring from any point on its surface must be:
  - Greater than 1 x 10<sup>5</sup> (100 thousand) ohms
  - Less than 1 x 10<sup>8</sup> (100 million) ohms

## **Guidelines for Connecting to the Console**

### **Preparing for a NAT Box Setup**

With the use of partitions and complex computer room environments, traditional single consoles for each system and partition are becoming obsolete. There are now several ways to connect consoles to the system. Three possible LANs to consider are:

- the internal LAN, resident in the system
- the multi-server LAN, connecting each server's NAT box (or router)
- the corporate LAN, connecting to the multi-server LAN through the AMS (AlphaServer Management Station)

Following are a number of console connection options.

#### **Connecting directly to the system**

This is a traditional console connection. A PC or laptop is connected to the system's internal LAN. This connection is secure and limits the control of the system. However, the operator must be present in the computer room and only one console is available.

#### **Connecting an AMS**

An AlphaServer Management Station (AMS), consisting of a computer, software, and terminal server, is available on the multi-server LAN, a local network designed to:

- manage systems in a computer room
- manage systems distributed throughout a building
- manage systems in several buildings

Systems connected to the multi-server LAN can be controlled by the AMS.

#### **Connecting the corporate LAN to the AMS**

The AMS connects the corporate LAN and the multi-server LAN. The AMS provides access to systems in the computer room environment. This option allows the most flexibility for system managers; enabling them to work remotely and giving them control of user privileges.

#### **Connecting the corporate LAN to the internal LAN**

A PC, running a terminal emulator session, is connected to a corporate LAN, which in turn is connected to a NAT box with a specific TCP/IP address to a system's internal LAN. This option allows remote access to anyone on the corporate LAN. This option is the least secure.

The NAT (Network Address Translation) box, or router, is the hardware bridge between two LANs. NAT boxes are used to connect a system's internal LAN to a multi-server LAN or a corporate LAN.

To save time, you can prepare for a NAT box setup prior to equipment shipment and installation by:

1) Deciding whether the system will be connected to the multi-server LAN or the corporate LAN.

2) Assigning the following network addresses:

- A static IP address for the NAT box on the LAN
- One, or possibly two, DNS addresses
- One, or possibly two, WINS addresses
- A gateway address, if applicable

See the *HP AlphaServer ES47/ES80/GS1280 Installation Information CD* for more details on the NAT box.

## Signal Reference Grid Recommendations

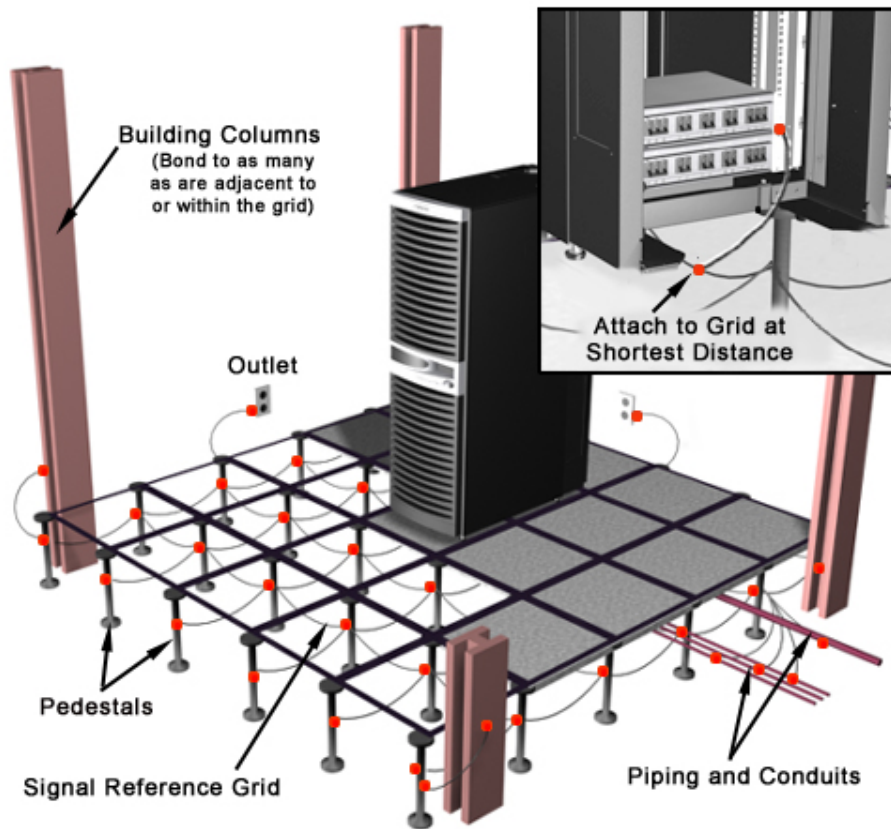
### Constructing the Signal Reference Grid

To prevent electrical noise from affecting computers and other equipment containing solid-state devices, two entirely different and separate grounding systems are required. First, the power distribution system must be grounded in accordance with the National Electrical Code (and all applicable local codes) requirements for safety; and second, the computer equipment and enclosures must be connected to a signal reference grid (SRG) system for high frequencies. This high-frequency protection is in no way related to system grounding. In fact, the high-frequency reference will work whether or not it is grounded to the system ground. However, since it consists of exposed, metallic noncurrent-carrying parts that could accidentally become energized, it must be grounded as required by the 1999 National Electrical Code, Section 250-110.

The intent of the signal reference grid is to establish an equipotential ground plane where everything connected rises and falls together in the event of an electrical disturbance, from whatever source. Electronic equipment is affected when there is a potential difference between devices. An equipotential grid significantly reduces potential differences, thus reducing current flow thereby eliminating the adverse affect on logic circuits. It should be noted that electrical noise of any frequency cannot be completely eliminated - only reduced. Thus, the objective of any grounding plane is noise reduction.

The signal reference grid is constructed using (in order of preference) flat braided copper cable, flat copper strips, or round multi-strand copper conductor. Due to the "skin effect" characteristic of high-frequency signals, flat braided copper cable offers superior performance. Of equal importance is cable length. High frequency noise attenuation is dependent on cable impedance which is dependent on cable length; the shorter the better. Of the available sizes, 1"-wide cable is preferred but  $\frac{3}{4}$ "-wide is acceptable.

## Connecting the Cabinet



## Constructing the Signal Reference Grid

1. Run a 1" flat braided copper cable around the entire perimeter of the computer room raised floor and connect to each pedestal in the cable's path. If the perimeter walls consist of several corners (L-shaped room), follow the perimeter walls. Do not omit a section to square off the grid. This conductor shall be referred to as the "perimeter loop conductor."

2. Connect all flat braided copper cables as close to the top of each raised floor pedestal as possible. Doing so will keep the grid cable out of the way of other obstacles and limit the probability of cable damage when other cabling is being installed or removed. Also, securing the cable toward the tops of the pedestals facilitates installing a short grounding cable to the various equipment cabinets.

3. All piping (HVAC, fire protection, etc.) and electrical conduits (HVAC, alarm systems, lighting, etc.) penetrating the perimeter walls must be bonded to the perimeter loop conductor using as short of a piece of flat braided copper cable as possible. Each individual pipe/conduit must be independently bonded to the loop conductor. DO NOT daisy chain multiple pipes/conduits (in close proximity to

each other) together and then make one connection to the perimeter loop conductor. This configuration will increase the propensity for high-frequency resonance, which would inject significant noise into the grid.

4. If there are any steel building columns in the perimeter walls, each one must be bonded to the perimeter loop conductor with as short of a piece of flat braided copper cable as possible.

5. Next, run flat braided copper cables along the full length and full width of the room at 2-foot intervals. In essence, connect to every raised floor pedestal in both directions. At each intersection, lay one cable over the other and then secure so the cables are in contact with each other and the pedestal.

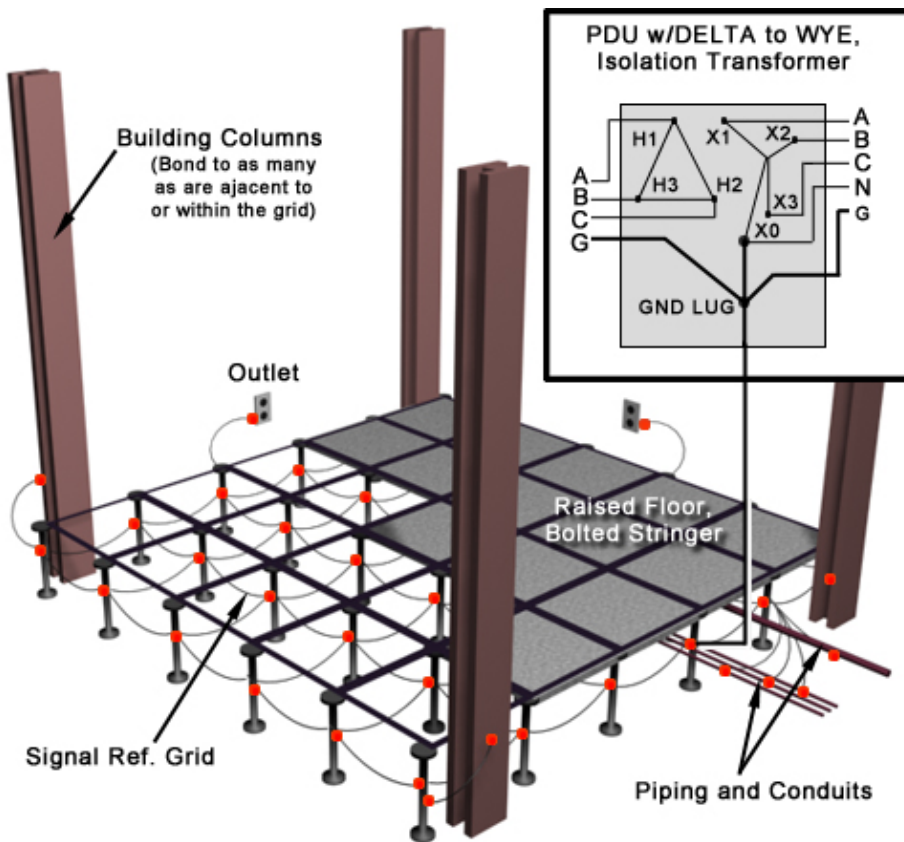
6. If there are any steel building columns within the computer room, each one should be bonded to the nearest pedestal with as short of a piece of flat braided copper cable as possible. Be sure to place this short cable on top of the two cables intersecting at the pedestal. All three cables must be in contact with each other.

7. Any Power Distribution Units (PDU) located within the room and containing isolation transformers with a delta-wye configuration (separately derived) must be bonded to the nearest pedestal with as short of a piece of flat braided copper cable as possible. Be sure to place this short cable on top of the two cables intersecting at the pedestal. All three cables must be in contact with each other. Follow the PDU manufacturer's recommendation for the proper connection point for the grid, otherwise connect the cable directly to the X0 terminal of the transformer secondary.

8. Any Uninterruptible Power Systems (UPS) or other forms of power-conditioning equipment located in the computer room must be bonded to the nearest pedestal with as short of a piece of flat braided copper cable as possible. Be sure to place this short cable on top of the two cables intersecting at the pedestal. All three cables must be in contact with each other. Follow the UPS manufacturer's recommendation for the proper connection point for the grid, otherwise connect the cable directly to the X0 terminal of the transformer secondary (if one exists) or the main grounding bus bar.

9. Any wall mounted panel boards that provide circuits to computer equipment or any equipment that is connect to computer equipment should be bonded to the perimeter loop conductor with as short of a piece of flat braided copper cable as possible.

10. The last step is to connect each computer cabinet to the grid. This should be accomplished using as short of a piece of flat braided copper cable as possible. Connect one end to the cabinet frame. Using one of the existing screws that is holding the cabinet PDU into place is an acceptable termination point. Be sure to scrape any paint that might prohibit a good solid connection of the grounding cable to the cabinet frame or PDU enclosure. Connect the other end to the nearest part of the grid. This could be a pedestal or it could be to some part of a flat braided copper cable stretched between two pedestals. The objective is to make the cable as short as possible. However, it should not be so tight that there is tension on the cable.



## **Computer Room Cleaning Procedures**

A computer room needs to be cleaned on a regularly scheduled basis. This is particularly important after an installation or upgrade or in areas where printing services are a major function. Besides the obvious places such as the tops of system cabinets and the floor surface, periodically clean underneath the raised floor and any other dust-catching surfaces such as ductwork and raised floor airflow panels. Specialized computer room cleaning companies use techniques and equipment designed to efficiently clean without introducing contaminants back into the computer environment or disturbing computer operation during cleaning.

Thorough cleaning will keep the room free from harmful dust and contaminants, which can infiltrate equipment and cause overheating, unnecessary wear, and reduced filter life. The forced air from the air conditioning systems and the blowers within computers are designed to keep the electronic components operating at a temperature that ensures long life and maximum reliability. An excessive amount of dust will reduce the heat transfer of electronic components. This will increase the component's temperature and shorten its life.

### **Computer Equipment**

Wipe the surfaces of all computer equipment with lint-free, anti-static cloths. Do not use dusting spray in the computer room. Spray on rag before entering room. Use specialized computer room vacuum cleaners equipped with 0.5-micron exhaust filters to clean intake filters or intakes vents for all computer equipment where readily accessible. Use static-free utensils and be sure vacuums are not plugged into receptacles designated for computer equipment.

These cleaning procedures should be done on a weekly basis.

## **Computer Room**

As required, remove all clutter around the computer room in the form of opened boxes (parts, supplies, etc.) from installations and hardware upgrades. These items represent a fire hazard.

## **Floor**

- Use specialized computer room vacuum cleaners equipped with 0.5-micron exhaust filters to clean debris from the floor before damp mopping. Use static-free utensils and be sure vacuums are not plugged into receptacles designated for computer equipment.
- Damp-mop the floor on a weekly basis. Mops must be damp, not wet. Do not use any cleaning solutions. Typical cleaning products may contain corrosive chemicals that react with the materials inside a computer. This can result in system failures.
- Once a week, use specialized computer room vacuum cleaners equipped with 0.5-micron exhaust filters to clean carpeted floors. This should be done every other day.
- Twice a year, use specialized computer room vacuum cleaners equipped with 0.5-micron exhaust filters to clean raised floor perforated airflow panels.

## **Under Raised Floors**

- Twice a year, remove any contamination found underneath the raised floor.
- Use specialized computer room vacuum cleaners equipped with 0.5-micron exhaust filters to remove dust and debris. Use static-free utensils and be sure vacuums are not plugged into receptacles designated for computer equipment.

## Preventative Measures

Here are several measures that you can take to minimize contamination.

- Make cleanliness part of your management program. Cleanliness is critical, and your employees should understand why.
- Appropriate filter maintenance will help ensure removal of particulate contamination, as well as ensure the necessary airflow rates through the computer equipment. Filters on air-conditioners, computers, and computer peripherals should be changed or cleaned regularly to prevent reduced airflow because of dust loading.
- By placing a dust or sticky mat at the entryway into the computer room, particulates can be prevented from entering the room on the shoe soles. Some 4' X 6' well-constructed mats can hold up to six pounds of dirt.
- Minimize the people traffic in a computer room.
- Locate all printers outside the computer room in a separately conditioned space. Printers should be away from mass storage devices and other computer equipment. Construct the printer area to eliminate the spread of paper dust to other equipment.
- Never store paper and cardboard boxes beyond what is needed for daily operations or hardware installations inside a computer room. This material is a source of dust, a potential fuel for fires, and generates unnecessary people traffic.
- If construction work must be completed in the computer room, construct Visqueen barriers to contain dust and debris until it can be picked up and discarded.

A computer facility is a dynamic environment where many activities occur on a regular basis. Maintenance and upgrades are done on the computer systems, the air-conditioning systems, the public telephone network and the architectural elements within the facility. Installation of new and additional power, data, security, or fire protection circuits is a recurring event. Under these circumstances, use the following guidelines:

- Have all work that requires cutting done out of the computer room. This is extremely important with interior construction, which involves sheet rock. Further, holes punched in the wall under the raised floor, as well as on top of the raised floor, should be caulked or repaired. Extra efforts should be made any time there is interior work done in the building to insure that sheet rock dust does not enter your computer room.
- It should be required and enforced that all installation personnel be responsible for the thorough cleanup of their work area after their installations are complete.

