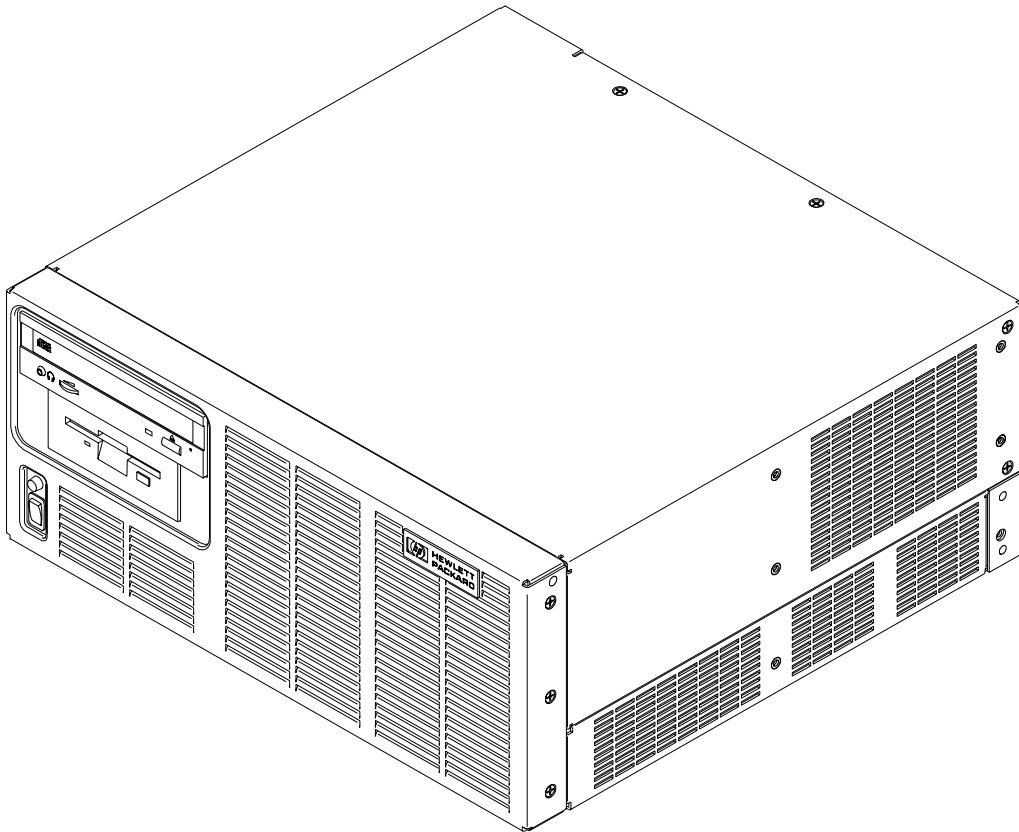


# Technical Reference Manual for OEMs

HP Model 745/132L



HP Part No. A4964-90603  
Printed in USA

June 1998

Edition E0698

## Legal Notices

### Manual Content

Information in this manual is subject to change without notice.

*Hewlett-Packard makes no warranty of any kind about this manual, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or direct, indirect, special, incidental, or consequential damages about the furnishing, performance, or use of this material.*

Copyright © Hewlett-Packard Company 1998. This document contains information which has been protected by copyright. All rights are reserved. Reproduction, adaptation, or translation without prior written permission is prohibited, except as allowed under the copyright laws.

Software mentioned and documentation is based in part on the Fourth Berkeley Software Distribution under license from the Regents of the University of California.

### Restricted Rights Legend

Use, duplication, or disclosure by the United States Government is subject to restrictions as set forth in subparagraph (c) (1) (ii) of the Rights in Technical Data and Computer Software clause at FARs 52.227.7013.

Hewlett-Packard Company

300 Apollo Dr.

Chelmsford, MA 01824

---

## Printing History

The printing date and edition number shown is the current edition of this manual. The printing date changes when a new edition is printed. Minor changes may be made at reprint without changing the printing date.

June 1998, Edition 1

## Safety Symbols and Conventions

This manual uses the following conventions:

---

***NOTE:***

Notes contain important information set off from the text.

---

***CAUTION:***

Caution messages indicate procedures which, if not observed, could result in damage to equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

---

***WARNING:***

Warning messages indicate procedures or practices which, if not observed, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

---

---

# Contents

## 1 General Information

Model 745/132L Industrial System 1-2

Product Description 1-2

Supported Configurations 1-2

Model 745/132L Industrial System Functional Description 1-5

Environmental Specifications for Monitors 1-6

Model 744 Board Computers 1-7

Product Description 1-7

Supported Configurations 1-9

Model 744 Memory 1-9

System Graphics 1-9

Model 744 External Devices 1-9

Keyboard and Mouse 1-9

Model 744 Cables 1-9

Model 744 Functional Description 1-11

Model 744 Block Diagram 1-12

CPU Circuit 1-13

Boot ROM Circuit 1-13

Graphics Circuit 1-13

Model 744 Memory Controller Circuit 1-14

LED Displays 1-15

I/O Controller ASIC 1-15

I/O Expansion 1-20

I/O Expansion Block Diagrams 1-20

Original Equipment Manufacturer (OEM) Support Overview 1-21

Standard Support 1-21

Additional OEM Support Programs 1-21

## 2 References

HP Hardware Manuals 2-2

Installation Guides 2-2

Service Manuals 2-2

Diagnostic Manuals 2-3

---

## Contents

### 3 Quality

#### Safety Compliance Programs 6

##### Introduction 6

Underwriter's Laboratories (USA) / Canadian Standards Association  
(Canada) 6

TUV Product Services(Germany) 6

#### Electromagnetic Compatibility Programs 7

Federal Communications Commission (USA) 7

European Community 7

Voluntary Control Council for Interference (Japan) 8

Canadian Department of Communication 8

Taiwan BQIC 8

Australian C-Tick 8

#### Electromagnetic Compatibility Test Suites 9

#### Climatic and Dynamic Environmental Ruggedness 12

#### Statistical Reliability 15

Annualized Failure Rate Projections 15

Mean Time Between Failure Computations 15

### 4 Mechanical Information

#### Model 745 Chassis and Modules 4-2

#### Model 744 Board Computers 4-10

Key Component 4-10

Interface Connectors 4-11

Mechanical Dimensions 4-12

Weights 4-21

Mounting and Support 4-22

Mechanical Drawings 4-22

Conversion Cables 4-22

Chassis Parts and Models 4-23

---

## Contents

### **5 Electrical Information**

Video Connector Pinouts	5-3
Audio Connector Pinouts	5-6
HP Parallel Connector Pinouts	5-8
RS-232 Connector Pinouts	5-10
AUI LAN Connector Pinouts	5-12
Single-Ended SCSI Connector Pinouts	5-14
PS/2 Connector Pinouts	5-16
Backplane Connector Pinouts	5-17
Real-Time Clock (RTC) Battery Information	5-31
Battery Specifications	5-31
Video Output Signal Specifications	5-31
Video Timing Specifications	5-31

### **6 Power Requirements**

Power Supply Specifications	6-2
Chassis Power Distribution	6-3
Monitor Power Specifications	6-6

---

## Contents

### Figures

Model 745/132L Functional Block Diagram	1-5
Model 744 Board Computer Front View	1-7
Model 744 Board Computer Functional Components	1-11
Model 744 Functional Block Diagram	1-12
PMC Adapters Block Diagrams	1-20
Model 745/132L Front Bezel	4-2
Model 745/132L Chassis Top Cover	4-3
Model 745/132L Chassis Base Module	4-4
Model 745/132L Chassis Mid-tray Module	4-5
Model 745/132L Disk Carrier Module	4-6
Model 745/132L Disk Adapter Bracket	4-7
Model 745/132L Disk Carrier Upper Shield	4-7
Model 745/132L Disk Carrier Lower Shield	4-8
Model 745/132L EISA Backplane Board	4-8
Model 745/132L PCI Backplane Board	4-9
Model 745/132L Chassis Backplane Board	4-9
Model 744 Key Components	4-10
Model 744 Board Computer	4-12
Model 744 Board Computer (Continued)	4-13
Model 744 Board Computer (Continued)	4-14
Model 744 Board Computer (Continued)	4-15
Model 744 Board Computer (Continued)	4-16
Model 744 RAM Card	4-17
Model 744 RAM Card (Continued)	4-17
Model 744 RAM Card (Continued)	4-18
PMC Bridge Adapter	4-19
PMC Expansion Adapter	4-20
Video Connector	5-3
HP A4223A Conversion Video Cable Connectors	5-4
HP A4305A Conversion Video Cable Connectors	5-5
Audio Connector	5-6
HP A4302A Conversion Audio Cable Connectors	5-7
HP Parallel Connector	5-8
HP A4300A Conversion HP Parallel Cable Connectors	5-9



---

## Contents

RS-232 Serial Connector	5-10
HP A4301A Conversion RS-232 Cable Connectors	5-11
AUI LAN Connector	5-12
HP A4303A Conversion LAN Cable Connectors	5-13
Single-Ended SCSI Connector	5-14
PS/2 Connector	5-16
Model 745/132L Chassis Power Distribution	6-3
Model 744 Board Computer Power Distribution Diagram	6-4
PMC Adapters Power Distribution	6-5

---

## Contents

### Tables

Model 745/132L Industrial System Features	1-2
Model 745/132L Supported Monitors	1-3
Supported EISA Accessory Cards	1-4
Environmental Specifications for Monitors	1-6
Model 744/132L (A4500A) Features	1-8
Model 744 Standard Cables	1-10
Model 744 Conversion Cables	1-10
Model 744 CPU Performance	1-13
Model 744 Graphics Performance	1-14
LED Meanings	1-15
Model 744 I/O Performance	1-16
Model 744 Audio Specifications	1-17
LAN AUI Specifications	1-17
Single-Ended SCSI Interface Specifications	1-18
HP Parallel Interface Specifications	1-18
RS-232-C Interface Specifications	1-19
System Installation/Owner's Manuals	2-2
Related Service Manuals	2-2
Diagnostic Manuals	2-3
Radiated Emissions Tests During Operation	3-9
Conducted Emissions Tests During Operation	3-9
Power Line Harmonics Tests During Operation	3-9
Power Line Flicker Test During Operation	3-9
Magnetic Emissions Tests While Non-Operating	3-9
Magnetic Emissions Tests During Operation	3-10
Electro-Static Discharge Field Immunity	3-10
Radiated Field Immunity	3-10
Electrical Fast Transients	3-10
Surge Transients	3-10
Conducted Immunity	3-10
Line Dips and Interrupts	3-11
Line Surge	3-11
Line Blackout/Dropout	3-11
Line Brownout	3-11

---

## Contents

Line Brownout/Recovery	3-11
Temperature Tests	3-12
Humidity Tests	3-12
Altitude Tests	3-13
Vibration Tests	3-13
Package Test	3-13
Shock Tests	3-13
Sound Power Levels	3-14
MTBF Example	3-15
Model 744 Board Computer AFR Projections (%/Year)	3-16
Interface Connector Manufacturing Data	4-11
Weights of Model 745 Product and Modules	4-21
Mechanical Drawings for Chassis Parts and Modules	4-23
Video Connector Pinouts	5-3
A4223A Conversion Video Cable Wiring Table	5-4
A4305A Conversion Video Cable Wiring Table	5-5
Audio Connector Pinouts	5-6
HP Parallel Connector Pinouts	5-8
Conversion HP Parallel Cable Wiring Table	5-9
RS-232-C Connector Pinouts	5-10
Conversion RS-232 Cable Wiring Table	5-11
AUI LAN Connector Pinouts	5-12
Conversion LAN Cable Wiring Table	5-13
Single-Ended SCSI Connector Pinouts	5-15
PS/2 Connector Pinouts	5-16
Model 745/744 P1/J1 Pin Assignments and Signal Mnemonics	5-18
Model 744 P2 Pin Assignments and Signal Mnemonics	5-19
Model 745 P2/J2 Pin Assignments and Signal Mnemonics	5-20
PMC JN1 Signals (Bridge J21)	5-21
PMC JN2 Signals (Bridge J22)	5-22
PMC JN1 Signals (Bridge J11)	5-23
PMC JN2 Signals (Bridge J12)	5-24
PMC JN4 Pin Outs (Bridge J14)	5-25
PMC Bridge J3 Connector	5-26
PMC JN1 Signals (Expander J31)	5-27
PMC JN2 Signals (Expander J32)	5-28

---

## Contents

PMC JN1 Signals (Expander J41)	5-29
PMC JN2 Signals (Expander J42)	5-30
RTC Battery Specifications	5-31
Timing Specifications at 72 Hz (A4490A)	5-32
Timing Specifications for VESA 75 HZ Standard (A4490A and A4575A)	5-33
Model 745/132L Power Supply Specifications (for reference only)	6-2
Monitor Power Specifications	6-6

---

## **General Information**

The General Information Chapter provides general information on the Model 745 Industrial System, environmental specifications for the supported monitors, and OEM support.

## Model 745/132L Industrial System

The sections that follow contain the Model 745/132L Industrial System product description and the functional description.

### Product Description

The 745/132L model incorporates the HP 744/132L Board Computer that is based on the PA-RISC 7300LC central processing unit (CPU). Table 1-1 summarizes the features of the Model 745/132L.

**Table 1-1** Model 745/132L Industrial System Features

Feature	Functionality
Operating system	HP-UX - Supports SICL libraries and Rocky Mountain Basic (RMB)
System board	See the feature set for the Model 744 Board Computer
Monitors	17 or 19-inch color monitors 72 or 75 Hz refresh rate, multi-mode
Mass storage module	Up to five of the following devices (only two removable media devices allowed): 4 GB SE hard disk drive DDS-2, 4 GB native capacity yielding up to 8 GB w/Data compression. 3.5-inch flexible disk drive CD-ROM drive
EISA module, or	4 EISA accessory cards
PCI module	4 PCI accessory cards
Power supply	One 400 watt power supply

### Supported Configurations

This section discusses the following supported configurations: mass storage, monitors, built-in interfaces, EISA module, and PCI module.

**Mass Storage**

Model 745/132L uses several factory-installed mass storage devices. One or two removable media devices may be installed, and a total of five devices are possible. Model 745/132L mass storage devices are factory installed with the removable media drives accessed from the front of the system. Users may reconfigure devices to reverse the access. Hard disk drives are typically installed in any available storage bay.

Mass storage devices are also available as the following upgrades:

- HP A4484A 4 GB SE SCSI Hard Drive Upgrade
- HP A2645A 3.5-inch Flexible Disk Drive Upgrade
- HP A4496A CD-ROM Disk Drive Upgrade
- HP A4307A 4-8 GB DDS (DDS-2, 4 GB native, 8 GB with data compression) Tape Drive Upgrade

**Monitors**

Table 1-2 lists the color monitors supported. Grayscale monitors are not supported.

**Table 1-2 Model 745/132L Supported Monitors**

Product Number	Type	Resolution	Comments
HP A4490A	17-inch color	1280 by 1024	
HP A4575A	19-inch color	1280 by 1024	

**SCSI Interface** The mass storage module has a SCSI connector for connecting external SCSI device cables. When the external SCSI interface connector is not used, a SCSI terminator should be plugged into the SCSI connector.

A cable from the mass storage module connects to the system board's SCSI connector and must be connected for internal drives to operate. SCSI interface circuits use high-density, shielded connectors. The internal cable length is 1.5 meters (4.9 feet), including the .5 meter cable connecting the board computer to the mass storage module.

The last device on each SCSI bus must be terminated. Internal drives do not have terminators enabled. The SCSI bus terminator shipped with the Model 745/132L must be installed on the external bus connector if no external devices are connected. The single-ended terminator is order number K2291 (part number A1658-62016).

General Information  
**Model 745/132L Industrial System**

**EISA Module** The Model 745/132L is available with a 4-slot EISA module. Table 1-3 shows the EISA accessory cards that are supported.

**EISA Bus Performance** The ideal slave read/write transfer rate is 25/25 MB/sec.

**Table 1-3** Supported EISA Accessory Cards

Product Number	Product Name	Quantity Supported	Notes
HP E2070C	Instrument HP-IB	Up to 4	
HP E2071C	High-Speed Instrument HP-IB	Up to 4	
HP 25525B	Differential SCSI	Up to 4	
HP 25567B	IEEE 802.3 Thin/AUI LAN	Up to 4	
HP J2159A	PSI/X.25 Interface	Up to 4	

**PCI Module** The Model 745/132L is available with a module that provides four slots for customer provided PCI accessory cards. The module supports the +5 Vdc PCI bus signalling card type.

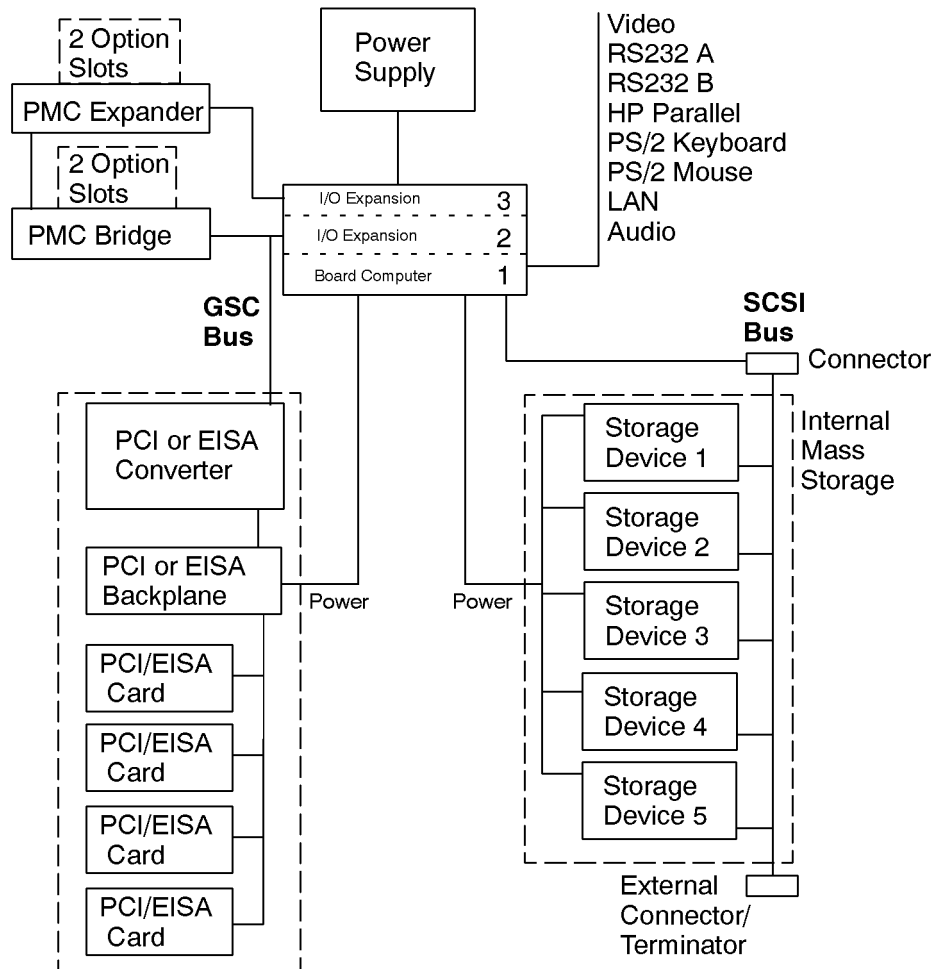


**Model 745/132L Industrial System Functional Description**

The section that follows contains a block diagram of the Model 745/132L Industrial System.

**Block Diagram**

Figure 1-1 shows the functional architecture of the Model 745/132L industrial system.



**Figure 1-1 Model 745/132L Functional Block Diagram**

### Environmental Specifications for Monitors

This section describes the environmental specifications for the HP A4490A and HP A4575A color monitors.

Table 1-4 lists the operating, non-operating or storage, and recommended specifications for altitude, humidity, and temperature for the monitors.

**Table 1-4 Environmental Specifications for Monitors**

<b>Environmental Condition</b>	<b>Specification</b>
Altitude, non-operating	15,240 m (49,530 ft.)
Altitude, operating	3,658 m (11,888 ft.) <sup>a</sup>
Humidity, nonoperating or storage	5% to 95% RH
Humidity, operating	10% to 80% RH
Humidity, recommended operating at 22° C	Non-condensing RH
Temperature, nonoperating or storage	-40° C to 60° C
Temperature, operating	0° C to 40° C
Temperature, recommended operating	10° C to 40° C

a. Temperature derating above 2,500-m (8,000 ft.): 1.1° C for each 1,000 feet above 7,500 feet.

---

## Model 744 Board Computers

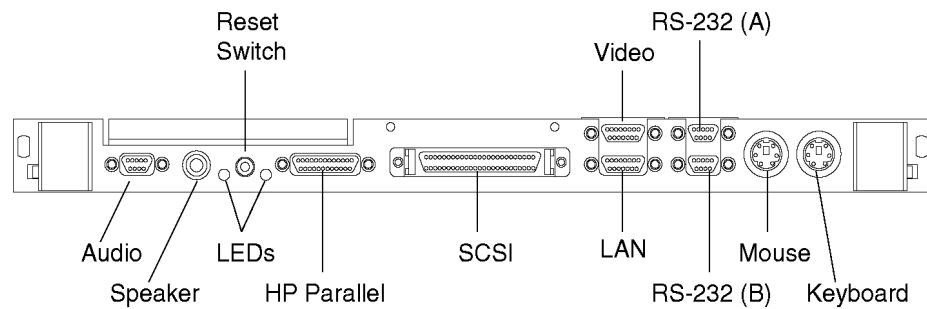
The sections that follow contain the Model 744 Board Computer product descriptions and functional descriptions, as implemented in the Model745/132L industrial controller (there are differences in terms of available options).

### Product Description

HP Model 744/132L Board Computers are based on the PA 7300LC CPU.

The board computer is complete with the core I/O of an HP-PA workstation in a single-slot solution with expandability for more I/O or RAM in a two-slot or three-slot solution.

Figure 1-2 illustrates the front panel of Model 744 Board Computers.



**Figure 1-2**                      **Model 744 Board Computer Front View**

General Information  
**Model 744 Board Computers**

Table 1-5 lists the feature sets of the Model 744/132L Board Computer

**Table 1-5 Model 744/132L (A4500A) Features**

Feature	Specifications
Slot Configuration	Single Slot - Standard features Two Slots - PMC Bridge Adapter (A4504A) Three Slots - PMC Expansion Adapter (A4509A)
CPU	132 MHz PA-RISC PA7300-LC 128 KB Primary internal cache (64 KB instruction cache, 64KB data cache)
Clocks	Battery backed real-time clock Interval timers (one 32-bit and two 16-bit) Watchdog timer
Operating System	HP-UX 10.20 or later - Supports SICL libraries - Support Rocky Mountain Basic (RMB)
User Interface	HP VUE graphical user interface (HP-UX) HP CDE graphical user interface (HP-UX)
Compatibility	Source and binary code compatible with the Series 700 product family
Main Memory	Single Slot Configuration - 32 to 128 MB (A4502A, A4503A, A4449A) Two Slots Configuration - 32 to 512 MB
Standard Features	Internal SCSI-2 single-ended bus Audio Two asynchronous RS-232-C ports One HP parallel port One LAN AUI port Two mini-DIN PS/2 ports One site for memory card stack Video connector for onboard graphics
Two Slot Upgrades	PMC Bridge Adapter (A4504A) with two PMC sites
Three Slot Upgrades	PMC Expansion Adapter (A4509A)

## Supported Configurations

This section discusses the following supported configurations: memory, system graphics, external devices, keyboard and mouse, and cables.

Hewlett-Packard only supports products having Hewlett-Packard approved parts, accessories, peripherals, operating systems, and application programs.

### Model 744 Memory

Standard memory is Error Checking and Correcting (ECC) RAM cards. Up to four RAM cards may be installed. RAM upgrades include:

- HP A4502A 32 MB RAM Card
- HP A4503A 64 MB RAM Card
- HP A4449A 128 MB RAM Card

Model 744 Board Computers use custom TSOP-based RAM cards. Use of TSOP packaging allows adequate cooling in single-slot installations.

There is one stack location for RAM cards on the Model 744.

When mixing the 128MB RAM card with cards of a different capacity, the 128MB card(s) must always be in the lower memory slots.

### System Graphics

The HP-UX operating system supports up to three displays.

### Model 744 External Devices

Model 744 supports the following external devices:

- LAN Transceiver (Medium Attachment Unit)
  - HP 28641B ThinLAN Ethernet Transceiver (order number A2670A)
  - HP 28685B Ethertwist Transceiver (order number A2671A)
  - HP 28683A Fiber Optic Hub/Transceiver
- Speaker: 8 ohm impedance with  $\frac{1}{8}$ -inch sub-miniature stereo connector
- Single-ended SCSI through the onboard SE SCSI adapter

### Keyboard and Mouse

Model 744 supports the mouse with mini-DIN connector (PS/2) and keyboard with mini-DIN connector (PS/2) included in the HP A4030D Localization Kit.

### Model 744 Cables

Table 1-6 and Table 1-7 show the part numbers for standard cables and conversion cables used to interface with the Model 744 I/O backplanes.

Drawings showing mechanical and electrical characteristics for these cables are available. Refer to chapter 4 in this manual for more information.

**Table 1-6 Model 744 Standard Cables**

<b>Product Number</b>	<b>Interface</b>	<b>Cable Type</b>
HP 24524G	RS-232	3-meter terminal cable; 9-pin female to 25-pin male
HP 24524H	RS-232	3-meter modem cable; 9-pin female to 25-pin female
HP C2950A	HP Parallel	DB 25-pin male to 36-pin Centronics male
HP 92284A	HP Parallel	DB 25-pin male to 25-pin male
HP K2296	SCSI-2	0.9 meter high-density 50-pin to standard bail lock <sup>a</sup>

a. Additional lengths are available.

Conversion cables provide a way to connect a standard cable to the high-density connectors on the Model 744 front panel.

All conversion cables are 762 plus/minus 30mm (30 plus/minus 1.18 inch) long.

**Table 1-7 Model 744 Conversion Cables**

<b>Product Number</b>	<b>Interface</b>	<b>Cable Type</b>
HP A4300A	HP parallel	High-density 25-pin to standard 25-pin female
HP A4301A	RS-232	High-density 9-pin to standard 9-pin male
HP A4302A	Audio	High-density 9-pin to stereo line-in
HP A4303A	LAN	High-density 15-pin to 15-pin AUI
HP A4223A	Video -VGA	High-density 15-pin to standard 15-pin female
HP A4305A	Video - EVC	High-density 15-pin to EVC connector

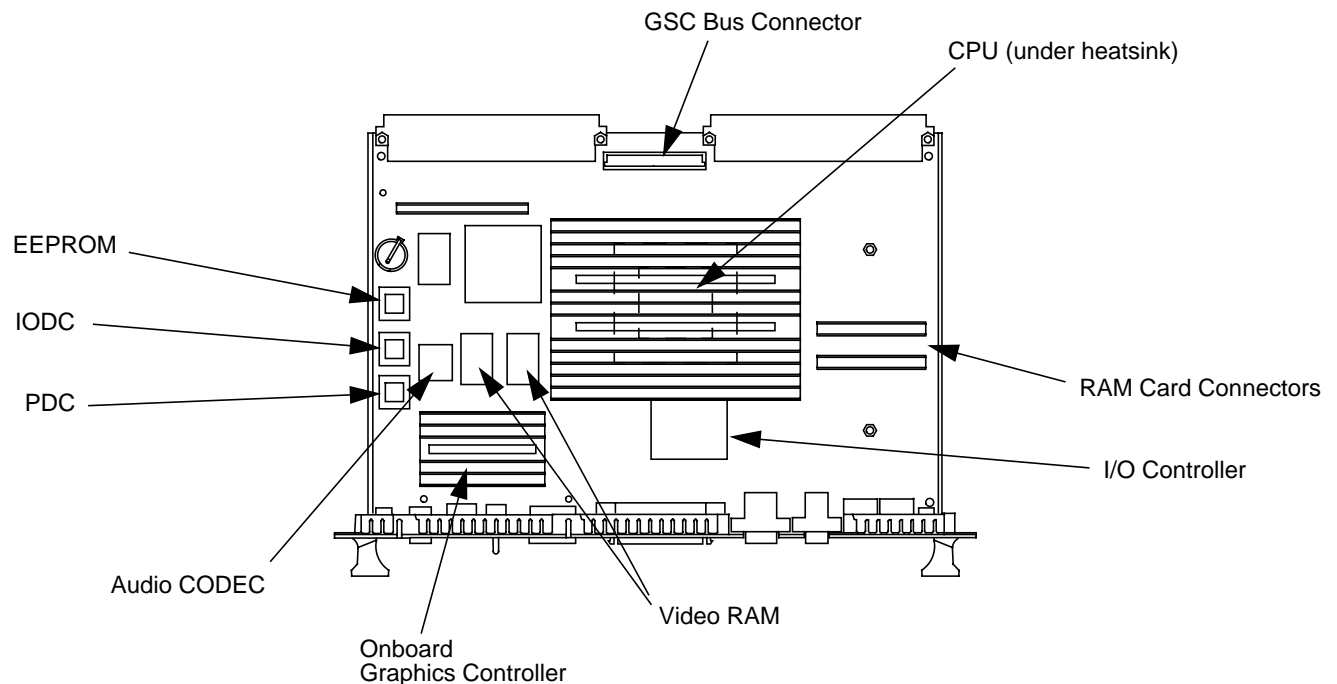
### Model 744 Functional Description

This section describes the major components of the Model 744 board computers

The system board contains the following functionality:

- Boot ROMs
- CPU
- Graphics
- I/O controller, which controls these interface circuits:
  - Audio
  - HP Parallel
  - LAN
  - RS-232-C
  - SE SCSI
  - Keyboard and mouse
  - Battery-backed Real Time/Time-of-Day clock
- Memory controller

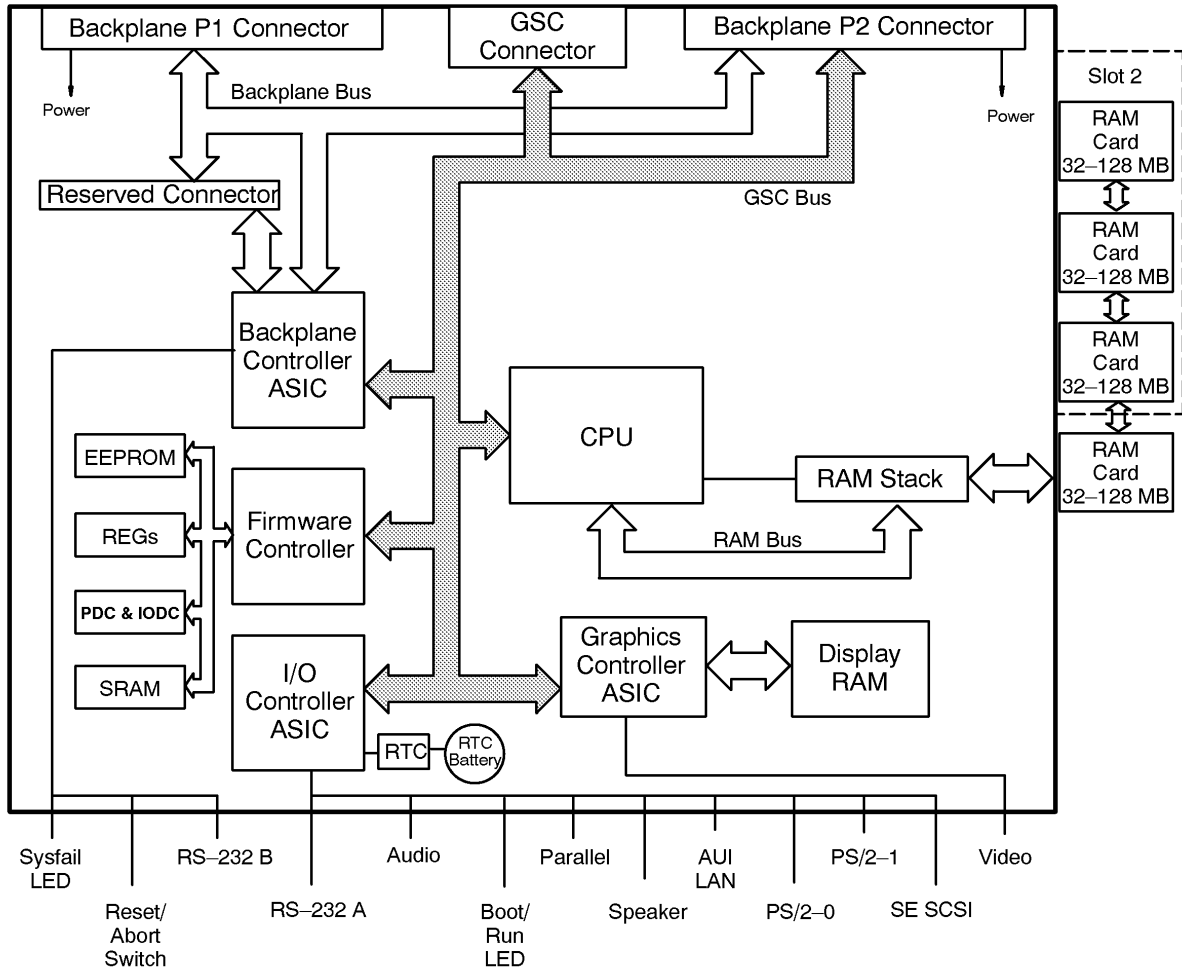
Figure 1-3 shows the major components of the Model 744.



**Figure 1-3** Model 744 Board Computer Functional Components

**Model 744 Block Diagram**

Figure 1-4 illustrates the functional architecture of the Model 744 system board.



**Figure 1-4 Model 744 Functional Block Diagram**



### CPU Circuit

The Model 744 uses a Hewlett-Packard PA-RISC PA7300-LC CPU chip. The CPU chip is the heart of the CPU circuit. It executes instructions and controls the other circuits.

Table 1-8 lists the CPU performance figures for the Model 744 with HP-UX.

**Table 1-8 Model 744 CPU Performance**

<b>Model 744 Performance Based on HP-UX 10.20</b>	<b>132 MHz</b>
SPECint95	5.90
SPECfp95	6.22

### Boot ROM Circuit

The Boot ROM circuits have Boot ROMs containing 2x526 Kilobytes of information that does the following:

- Manages the internal interface configurations
- Searches for and boots an operating system
- Self-tests the board computer's main circuits
- Starts the CPU functions

An EEPROM stores the following information:

- Internal interface configurations
- LAN ID number
- System board serial number

---

**NOTE:**

---

The workstation's LAN ID number's last 6 characters are labeled on the EEPROM. The first group of six digits are typically "0060b0" (the HP-owned prefix).

A PLL Clock Module generates the system clock, on which all timing is based.

### Graphics Circuit

System boards have a graphics controller ASIC and the display RAM. Resolution and refresh rate can be configured using the boot console handler for several types of monitors.

A keyboard must be connected to the PS/2 0 port if graphics are used as part of the console path. When a graphics device is specified as the console path, the boot ROM first checks for a keyboard by using the keyboard search list. If a keyboard is not found in this search list, graphics are not enabled.

Table 1-9 summarizes the graphics performance figures for the Model 744 with HP-UX.

**Table 1-9 Model 744 Graphics Performance**

<b>On-board HP Visualize-EG Graphics</b>	<b>132 MHz</b>
X11 Lines	5.74M
Xmark93	33.11
PLBsurf93	49.7
PLB wire93	116.1K
2D/3D vectors/sec	3.1M

**Model 744 Memory Controller Circuit**

The CPU's memory controller circuit manages memory. Up to 512 MB of RAM may be installed. An Error Checking and Correcting (ECC) function checks memory word read/write operations. The ECC function detects single-bit and double-bit errors. Single-bit errors are corrected. Double-bit errors are detected but not corrected. The memory controller circuit uses a 132-bit memory bus. One RAM card location is used, behind the PS/2 connectors on the system board. Up to four RAM cards are supported.

Physical RAM slot positions are:

Bottom RAM card, slot 0

Second RAM card, slot 1

Third RAM card, slot 2

Fourth RAM card, slot 3

**RAM Cards** When mixing RAM cards of different capacities that include 128MB cards, the 128MB cards must be installed into the lowest numbered memory sites. Memory mapping at turn on determines the size of the card in each location.

### LED Displays

Model 744 Board Computers have two LEDs that indicate various system functions: a system failure LED and a functional LED. See Table 1-10.

**Table 1-10**

#### LED Meanings

<b>SYSFAIL (Red)</b>	<b>POWER (Green)</b>	<b>Meaning</b>	<b>Possible Solution</b>
Off	Off	No Power	Check for board seating in chassis.
On	2Hz Flash	Normal Power-on/self-test	
On	Off	Memory Failure	Troubleshoot for failed RAM card or problem with the RAM connection.
On	1 Flash/sec.	CPU (board) Failure	Replace the system board.
On	4 Flash/sec.	No console identified	Check the console search path and keyboard connections. If no problem is found, replace the system board.
On	On	OS is booted with failure	Check the Operating System.
Off	On	OS is booted OK	

#### I/O Controller ASIC

I/O control by the system board's I/O controller ASIC includes the following interfaces:

- Audio
- AUI LAN
- HP Parallel
- PS/2 Ports 0 and 1
- RS-232 Port A
- Single-Ended SCSI
- Speaker

The battery-backed real-time clock is also implemented in the I/O controller ASIC.

The connectors for the system board's built-in interfaces are on the front panel. Most use micro-miniature connectors that require special conversion cables in order to use standard interface cables.

Table 1-11 summarizes I/O performance figures for the Model 744

Table 1-11

Model 744 I/O Performance

I/O Type	Performance	Notes
Audio	48 KHz	Sampling rate
HP Parallel	300+ KB/second	With DMA
	200 KB/second	Sustained
LAN	10 Mb/second	
PS/2	2.5 K 11-bit samples/sec	
RS-232	460.8 Kbps	
SE SCSI	5 MB/second	Synchronous
	1.5 MB/second	Asynchronous

The sections that follow explain the functions of the interfaces.

**Audio** Model 744 Board Computers provide audio input and output, in stereo, with a 16-bit coder-decoder (CODEC) over a frequency range of 25-20,000 Hz. A stereo headphone mini-plug (8 ohms impedance) provides output. The stereo line-in and mono microphone mini-plugs provide input with the HP A4302A Audio Cable.

The CODEC combines stereo A/D converters for microphone and line input levels. D/A converters for driving headset and line outputs are used. The input sampling rate and format are programmable, as are the input gain control (used for software control of recording levels) and output attenuation.

A 1/8-inch mini-jack is used for the speaker out connection. The other audio signals are on a 9-pin micro D-sub connector. The output is capable of driving a minimum of 8 ohms. It can also be used for higher impedance devices with little or no additional distortion.

A voice-quality audio output may be used.

For information on programming for audio, refer to *Using the Audio Developer's Kit* (B2355-90069) and the man page *audio*.

Table 1-12 lists the Model 744 audio specifications.

**Table 1-12 Model 744 Audio Specifications**

Function	Range
Headphone maximum output level	2.75 V pp at 50 ohms
Input sensitivity	Line in, 2.0 V pp at 47 K ohms microphone, 22 mV at 1 K ohm
Programmable input gain	0 to 22.5 dB in 1.5 dB steps
Programmable output attenuation	0 to 96 dB in 1.5 dB steps
Programmable rates	8, 11.025, 16, 22.05, 32, 44.1, 48 KHz
Signal to noise ratio	Headphone, 61 dB Line in, 61 dB Microphone, 57 dB

---

**NOTE:** Audio CD ROMs cannot output to the audio out connector.

---

**AUI LAN** LAN circuits use the Ethernet/IEEE 802.3 standard interface. Only the Attachment Unit Interface (AUI) version is used; no BNC connector is provided for ThinLAN. The AUI connector enables connections to an external MAU using the HP A4303A adapter cable. Table 1-13 summarizes the LAN AUI interface specifications.

**Table 1-13 LAN AUI Specifications**

Connector type	15-pin MDSM
Controller	Intel 82596CA compatible megacell
Data rate	10 Mbits/sec
Electrical interface	AUI
Type	IEEE 802.3, Ethernet 1.0

**Single-Ended SCSI** The 8-bit single-ended implementation is compatible with the current Series 700 products and supports 5 MB/sec data transfer rates.

The SCSI bus is terminated to 3.3 volts through 127 ohms on the system board. Internal mass storage devices must have their terminator removed or disabled. If an external disk drive is used, an active terminator must be used on the last drive's uncabled connector.

Table 1-14 summarizes the specifications for the single-ended SCSI interface.

**Table 1-14 Single-Ended SCSI Interface Specifications**

Controller	NCR 53C710 compatible macrocell, Rev D
Connector type	SCSI-II, ALT-1 50-pin high-density thumbscrew
Data rate	Asynchronous, 1.5 MBs/second Synchronous, 5 MB/second
Device limits	7 internal and/or external devices plus the host controller <sup>a</sup>
Maximum external cable length	4.5 meters (14.76 feet)
Type	SCSI-II (ANSI X3.131-1986), 8-bit, single-ended

a.The board computer is the host controller.

**HP Parallel** The parallel port is compatible with Centronics standards, plus some additional features found in HP Series 700 workstations. It supports a bi-directional register model interface. An 8-bit parallel, synchronous interface is used.

A high-density micro D-sub connector is used for the HP Parallel interface. An HP A4300A adaptor cable is required to convert to standard PC compatible 25-pin female D-sub.

Table 1-15 summarizes the specifications for the HP parallel interface.

**Table 1-15 HP Parallel Interface Specifications**

Connector type	Female 25-pin micro D-sub
Data rate	>300 Kilobytes/second with DMA 200 Kilobytes/second sustained
Device limit	1
Type	Centronics® and BUSY handshakes

**PS/2 Ports 1 and 0** There are two PS/2 style serial ports: one PS/2 keyboard port and one PS/2 mouse port.

**RS-232** There are two serial interfaces. The I/O controller ASIC controls port A, and the backplane controller ASIC controls port B. Each supports CTS/RTS hardware handshaking. An HP A4301A adaptor cable is required to convert it to a standard PC compatible, 9-pin male D-sub. The maximum baud rate listed in Table 1-16 is the hardware limit. Actual transfer rates depend upon the operating system and application load.

Table 1-16 summarizes the specifications for RS-232-C.

---

**NOTE:**

---

The RS-323 port B is not active until the OS is up and running.

**Table 1-16 RS-232-C Interface Specifications**

Baud rate	50 to 460.8 Kb/second
Connector type	9-pin female micro D-sub
Controller	16550 UART compatible megacell
Parity	Odd, even, none, one, zero
Stop bits	1, 1.5, 2
Type	EIA RS-232-C, CCITT V.24/V.28
Word size	5 to 8 bits

**Battery-Backed Real-Time Clock** The battery-backed clock is implemented in the I/O controller ASIC. Once power is applied to the system board, the battery-backed clock time is read by the operating system only during system initialization. Once the operating system is booted, real time is kept by using the timer built into the CPU. The battery-backed real-time clock is updated by the operating system only when the user (“root” or “super-user”) explicitly requests it though the **date** command. The clock has a resolution of 1 second. The accuracy of the clock is within  $\pm 5$  seconds every 24 hours when the operating temperature is from 0 to 55° C.

### I/O Expansion

The Model 744 board computers are capable of accepting expansion adapters allowing greater functionality through expansion I/O cards. The PMC bridge adapter occupies an additional slot directly above the board computer, and has two sites for industry standard +5V signalling PMC cards. The PMC expansion adapter occupies another slot above the PMC bridge adapter, and provides two additional sites for PMC cards.

### I/O Expansion Block Diagrams

Figure 1-5 illustrates the functional architecture of the optional PMC adapters.

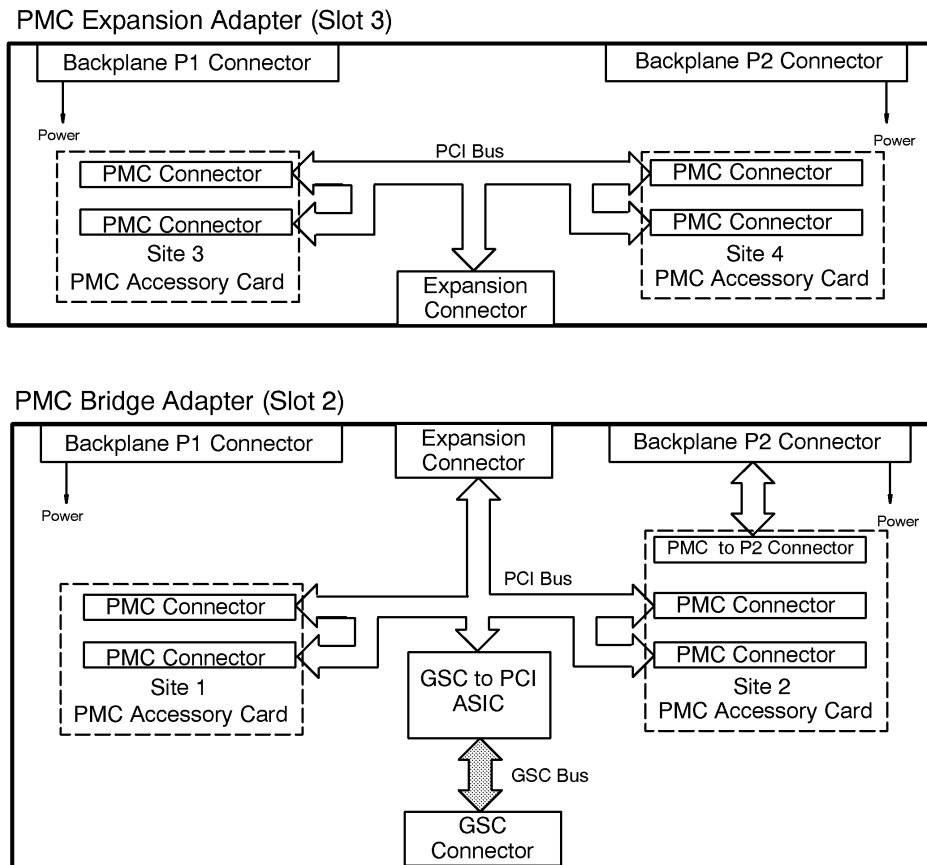


Figure 1-5 PMC Adapters Block Diagrams



## **Original Equipment Manufacturer (OEM) Support Overview**

The sections that follow describe standard OEM support and additional OEM support.

### **Standard Support**

OEMs may obtain the following standard hardware and software support through their local Hewlett-Packard Sales and Service Office:

- Customer support programs for servicing Hewlett-Packard products
- System/product hardware/software configurations
- System support options, including the following:
  - HP SupportLine electronic support
  - License to use software updates
  - Media and document updates
  - On-site response

### **Additional OEM Support Programs**

Contact your Hewlett-Packard OEM Sales Representative regarding the availability of the following OEM support:

- Detailed product qualification programs information
- Drawings: electrical and mechanical
- Engineering consulting time
- Hewlett-Packard specifications for products
- Peripheral device specifications
- Product component lists and specifications

General Information  
**Model 744 Board Computers**

---

## References

This chapter lists the titles and part numbers for hardware and software manuals associated with the Model 745.

## HP Hardware Manuals

This section contains tables listing the hardware installation guides, service manuals, and diagnostic manuals for the Model 745 and Model 744.

### Installation Guides

Table 2-1 lists the hardware installation guides available for the Model 744 and Model 745.

**Table 2-1**

#### System Installation/Owner's Manuals

Manual Title	Part Number
HP Model 744 Board Computer Owner's Guide	A4511-90602
HP Model 745/132L Owner's Guide	A4964-90601

### Service Manuals

Table 2-2 lists the hardware service manuals available for the Model 744 and Model 745.

**Table 2-2**

#### Related Service Manuals

Manual Title	Part Number
HP Model 744	A4511-90603
HP Model 745/132L	A4964-90602

**Diagnostic Manuals**

Table 2-3 lists the hardware diagnostic manuals available for the Model 744 and Model 745.

**Table 2-3****Diagnostic Manuals**

<b>Manual Title</b>	<b>Part Number</b>
PA-RISC Support Tools Manual Licensed Users Volume 1, SPU	5960-3149
PA-RISC Support Tools Manual Licensed Users Volume 2, Device Adapters/MUXes	5960-3151
PA-RISC Support Tools Manual Licensed Users Volume 3, LAN	5960-3153
PA-RISC Support Tools Manual Licensed Users Volume 4, SCSI	5960-3155
PA-RISC Support Tools Manual Licensed Users Volume 5, Disks	5960-3157
PA-RISC Support Tools Manual Licensed Users Volume 6, Tapes/Printers	5960-3159
PA-RISC Support Tools Manual Licensed Users Volume 7, Utilities	5960-3161
PA-RISC Support Tools Manual Licensed Users Volume 8, ISL Support Tools	5960-3163
PA-RISC Support Tools Manual for HP Employees	5960-3165
Support Tools Manager User's Manual; HP 9000 Series 700 and 800	5961-1612
HP Apollo 9000 Series 700 Diagnostics Manual, Volume 1	09740-90041
HP Apollo 9000 Series 700 Diagnostics Manual, Volume 2	09740-90043
HP Apollo 9000 Series 700 Support Tape/CD-ROM User's Manual	B2380-90000

## References

---

## Quality

The Quality Chapter discusses safety compliance programs, electromagnetic compatibility programs, climatic and dynamic environmental tests, acoustics levels, statistical reliability, and manufacturing quality programs.

## Safety Compliance Programs

The sections that follow describe the Underwriter's Laboratories, Canadian Standards Association, and TUV Rheinland programs.

### Introduction

The Model 745/132L is designed, manufactured, and marketed in compliance with the published safety standards stated below. Validation testing was done with one unit representative of the product shipped to the customer. Continued compliance is measured by periodic regulatory audits; production units are tested for each audit. The Model 745/132L is in compliance with adopted safety standards issued by the following standards bodies:

- Underwriter's Laboratories (USA)
- Canadian Standards Association (Canada)
- TUV Product Services(Germany)

The sections that follow explain each standard.

#### **Underwriter's Laboratories (USA) / Canadian Standards Association (Canada)**

- UL Standard 1950 Information Technology Equipment 3 Edition
- CSA Standard 22.2 No. 950 3 Edition

As evidence of UL's listing and CSA conformance, the products are marked with the CUL listing mark.

#### **TUV Product Services(Germany)**

- Safety Standards - EN60950 Safety of Information Technology Equipment including Electronic Business Equipment; International Electrotechnical Commission, Publication 950.

As evidence of TUV's certification, the products are marked with the TUV GS mark.



## Electromagnetic Compatibility Programs

The Model 745/132L complies with published standards for Electromagnetic Compatibility (EMC). In general, testing to required standards was performed using statistically significant quantities of typical Model 745/132L configurations representative of the product shipped to customers. These tests' statistical basis demonstrates that with 80% confidence, at least 80% of the production population meets the specified margins to each standard. Additional configurations are also tested to reduce the probability that non-conforming configurations exist. Continued compliance is measured by periodic regulatory audits; production units are tested for each audit. The Model 745/132L is in compliance with adopted EMC standards issued by the following standards bodies:

- Federal Communications Commission (USA)
- European Community
- Voluntary Control Council for Interference (Japan)
- Canadian Department of Communication
- Taiwan BCIQ
- Australia C-Tick

### **Federal Communications Commission (USA)**

- Self-Certified to 47 CFR (Code of Federal Regulations), part 15, Class A

As evidence of compliance, products are marked with the FCC A statement.

### **European Community**

- Compliant to the EMC Directive 89/33/EEC and 92/31/EEC for Information Technology Equipment (ITE)

As evidence of compliance, products are marked with the CE mark, and the product manuals include a Declaration of Conformity.

**Voluntary Control Council for Interference (Japan)**

- Registered to VCCI as a Class A product, according to CISPR 22

As evidence of compliance, products are marked with the VCCI statement.

**Canadian Department of Communication**

- Self Certified as a Class A product

As evidence of compliance, products are marked with the Industry Canada Class A statement.

**Taiwan BQIC**

- Registered as a Class A product

As evidence of compliance, products are marked with the BQIC identification number.

**Australian C-Tick**

- Registered as a Class A product

As evidence of compliance, products are marked with the Australia C-Tick mark.

## Electromagnetic Compatibility Test Suites

**Table 3-1 Radiated Emissions Tests During Operation**

Standard	Level
AS/NZS 3548	CISPR 22 class A
CSM 13438	CISPR 22 class A
EN55022	CISPR 22 class A
EN55011	CISPR 11 class A
FCC CFR 47 parts 2 and 15	FCC Class A
VCCI class A	CISPR 22 class A

**Table 3-2 Conducted Emissions Tests During Operation**

Standard	Level
EN55022	CISPR 22 class A
EN55011	CISPR 11 class A
FCC CFR 47 parts 2 and 15	FCC Class A
VCCI class A	CISPR 22 class A

**Table 3-3 Power Line Harmonics Tests During Operation**

Standard	Level
EN61000-3-2	Class A

**Table 3-4 Power Line Flicker Test During Operation**

Standard
EN61000-3-3

**Table 3-5 Magnetic Emissions Tests While Non-Operating**

Standard	Level
HP Standard 765.006 complies with CFR49 IATA Dangerous Goods Regulations, 30ed	<2 milligauss at 2.1 m

**Table 3-6 Magnetic Emissions Tests During Operation**

Standard	Level
HP Standard 765.007	< 5 gauss p-p

**Table 3-7 Electro-Static Discharge Field Immunity**

Standard	Level
HP Standard 765.002	15 KV A.D. (operating)
IEC 801-2 level 2	4 KV C.D., 8 KV A.D.

**Table 3-8 Radiated Field Immunity**

Standard	Level
IEC 801-3	3 V/m
IEC 1000-4-3	10 V/m

**Table 3-9 Electrical Fast Transients**

Standard	Level
IEC 801-4	2 KV mains, 1 KV I/O ports
IEC 801-4	1 KV mains, 0.5 KV I/O ports

**Table 3-10 Surge Transients**

Standard	Level
HP Standard 765.003	1 KV DM/CM high energy transient
HP Standard 765.003	1 KV DM/CM low energy transient
IEC 801-5 level 3	1 KV DM, 2KV CM

**Table 3-11 Conducted Immunity**

Standard	Level	Frequency Range
HP Standard 765.005	3 V rms	30 Hz to 50 KHz
HP Standard 765.005	1 V rms	50 KHz to 400 MHz

**Table 3-12**      **Line Dips and Interrupts**

Standard	Level
HP Standard 765.003	500 ms, 33% sag
EN61000-4-11	10 ms, 30% dip
EN61000-4-11	100 ms, 60% dip
EN61000-4-11	5 s, 95% dip

**Table 3-13**      **Line Surge**

Standard	Level
HP Standard 765.003	500 ms, 12% surge

**Table 3-14**      **Line Blackout/Dropout**

Standard	Level
HP Standard 765.003	20 ms

**Table 3-15**      **Line Brownout**

Standard	Level
HP Standard 765.003	100 Vac to 0 Vac in 30 minutes.

**Table 3-16**      **Line Brownout/Recovery**

Standard	Level
HP Standard 765.003	0 Vac to 100 Vac in 30 minutes.

## Climatic and Dynamic Environmental Ruggedness

The Model 745/132L is designed for use in an environment that involves moderately high and low temperatures, humidity variations, and occasional vibration. Many of the test limits the workstations are subjected to during development are more severe than those documented.

The tests were developed to cause product failure so that product weaknesses are identified, understood, and eliminated, when possible and to provide greater assurance of long-term compliance to product specifications.

An effective qualification program establishes appropriate assurances. Our development and manufacturing process capabilities are well understood.

Significant quantities of Model 745/132L were tested prior to release for volume production. Representative samples of customer-shippable workstations were tested in various configurations through the environmental tests to evaluate corner-case conditions.

**NOTE:**

Presentation of these test suites does not imply a guarantee of product performance, nor a guarantee of performance to these levels by the entire population of Model 745/132L computer systems.

**Table 3-17 Temperature Tests**

Standard	Non-Operational Level	Operational, without Mass Storage Level	Operational, with Mass Storage Level
HP Standard 757 IEC 721-3-1	-30° C to 70° C	N/A	N/A
HP Standard 757 IEC 721-3-3	N/A	0° C to 55° C	5° C to 40° C
Temperature slew rate	N/A	10° C/minute	10° C/minute

**Table 3-18 Humidity Tests**

Standard	Non-Operational Level	Operational without Mass Storage Level	Operational with Mass Storage Level
HP Standard 758 IEC 721-2-1	90% relative humidity at 65° C	95% relative humidity at 40° C	90% relative humidity at 40° C

**Table 3-19 Altitude Tests**

Standard	Non-Operational Level	Operational without Mass Storage Level	Operational with Mass Storage Level
HP Standard 761 IEC 721-3-3, Method 68-2-13	4.6 Km (15 K ft.)	4.6 Km (15 K Ft.)	3.05 Km (10 K ft.)

**Table 3-20 Vibration Tests**

Standard	Non-Operational Level Without Mass Storage	Operational Level With Mass Storage
HP Standard 759	4.9 m/s <sup>2</sup> (0.75 g 0-p) swept sine (5-500-5 Hz)	N/A
HP Standard 759	Survival (random vibration) ~2.41 Grms 0.02 g <sup>2</sup> /Hz from 5-100 Hz, rolloff @ 6dB/Octave from 100-137 Hz, 0.0107 g <sup>2</sup> /Hz from 137-350 rolloff @ 6dB/Octave from 350-500Hz, 0.0052 g <sup>2</sup> /Hz @ 500 Hz	(random vibration) ~0.21 Grms 0.0001 g <sup>2</sup> /Hz from 5-350 Hz, rolloff @ 6dB/Octave from 350-500Hz, 0.00005 g <sup>2</sup> /Hz @ 500 Hz
Packaging tests HP Standard 762	4.9 m/s <sup>2</sup> (0.5 g 0-p) swept sine (5-500-5 Hz)	N/A
Packaging tests HP Standard 762	0.015 g <sup>2</sup> /Hz (.3 g rms) random 1.47 G rms (5-200 Hz)	N/A

**Table 3-21 Package Test**

Standard	Level
HP Standard 762 Packaging drop test	.76 meters

**Table 3-22 Shock Tests**

Standard	Non-Operational Level	Operational Level
HP Standard 760	80 Gpk ≤ 3ms half sine	20 Gpk ≤ 3ms half sine

**Table 3-23**

**Sound Power Levels**

Sound power levels are A-weighted for these tests.

<b>Standard</b>	<b>Level</b>	<b>Equipment Under Test Conditions, Procedures, and Measurements (Acceptance Criteria)</b>
HP Environmental tests, Section 767 ISO 7779	6 Bels	Fans operating



## Statistical Reliability

The sections that follow explain the Annualized Failure Rate (AFR) and the Mean Time Between Failure (MTBF) computations.

### Annualized Failure Rate Projections

Estimated AFR is based on a parts count and the failure rates of those parts in similar products. The AFR is estimated from the sum of the failure rates of the components' assemblies. A key assumption is that AFR is constant beyond the early life of the product and before long-term wear out.

Projected Failure Rate is the mature AFR, estimated from the failure rates of the components of the product. The "Estimated Long-Term Annualized Failure Rate" is a future projection of an average realistic failure rate beyond the typical infant failure period that occurs in the first few months of use and before long-term wear out, which occurs after many years of use.

### Mean Time Between Failure Computations

The MTBF is the reciprocal of the AFR. MTBF uses the following two units of time:

- Annualized MTBF (A-MTBF), the time units are years, or annually.
- Hourly MTBF (H-MTBF), the time unit is the hour.

This is derived by factoring out the AFR's annualized percentage, then finding its reciprocal. A resultant A-MTBF term is in years.

**Table 3-24**      **MTBF Example**

Example	AFR
Model 744 board computer with graphics	4.8%/year
Add one 32MB RAM card	0.72%/year
Total	5.5%/year

$$\frac{1}{0.055 / 8766 \text{ hours}} = 159,381 \text{ hours}$$

**Table 3-25 Model 745/132L Ruggedized Workstation with Model 744 CPU AFR Projections (%/Year)**

<b>Hardware Configurations</b>	<b>Projected AFR (%/Yr.)</b>
744 Board Computer, 32 MB RAM, EISA Tray, 2.0-GB FWD SCSI Disk, 17-inch Monitor	11.8
Option 64 MB RAM card (one card using 16 Mbit DRAM)	1.23
Power Supply	4.3
EISA Backplane	1
PCI Backplane	1
System Backplane	1
Miscellaneous hardware (cables, switches, etc.)	2

**Table 3-26 Model 744 Board Computer AFR Projections (%/Year)**

<b>Hardware Configurations</b>	<b>Projected AFR (%/Yr.)</b>
744 Board Computer with on-board graphics option	4.8
Memory 32 MB RAM card (one card using 16Mbit DRAM)	0.7
64 MB RAM card (one card using 16Mbit DRAM)	1.23
128 MB RAM card (one card using 64Mbit DRAM)	2.1
Option PMC Bridge	2.0

---

## **Mechanical Information**

This chapter contains mechanical information about the components of the Model 745 Industrial System and the Model 744 Board Computers. Included is interface connector manufacturing data, system board and accessory card dimensions, chassis and module dimensions and weights, mounting and support, and mechanical drawings.

## Model 745 Chassis and Modules

Figure 4-1 shows the dimensions of the Model 745/132L front bezel.

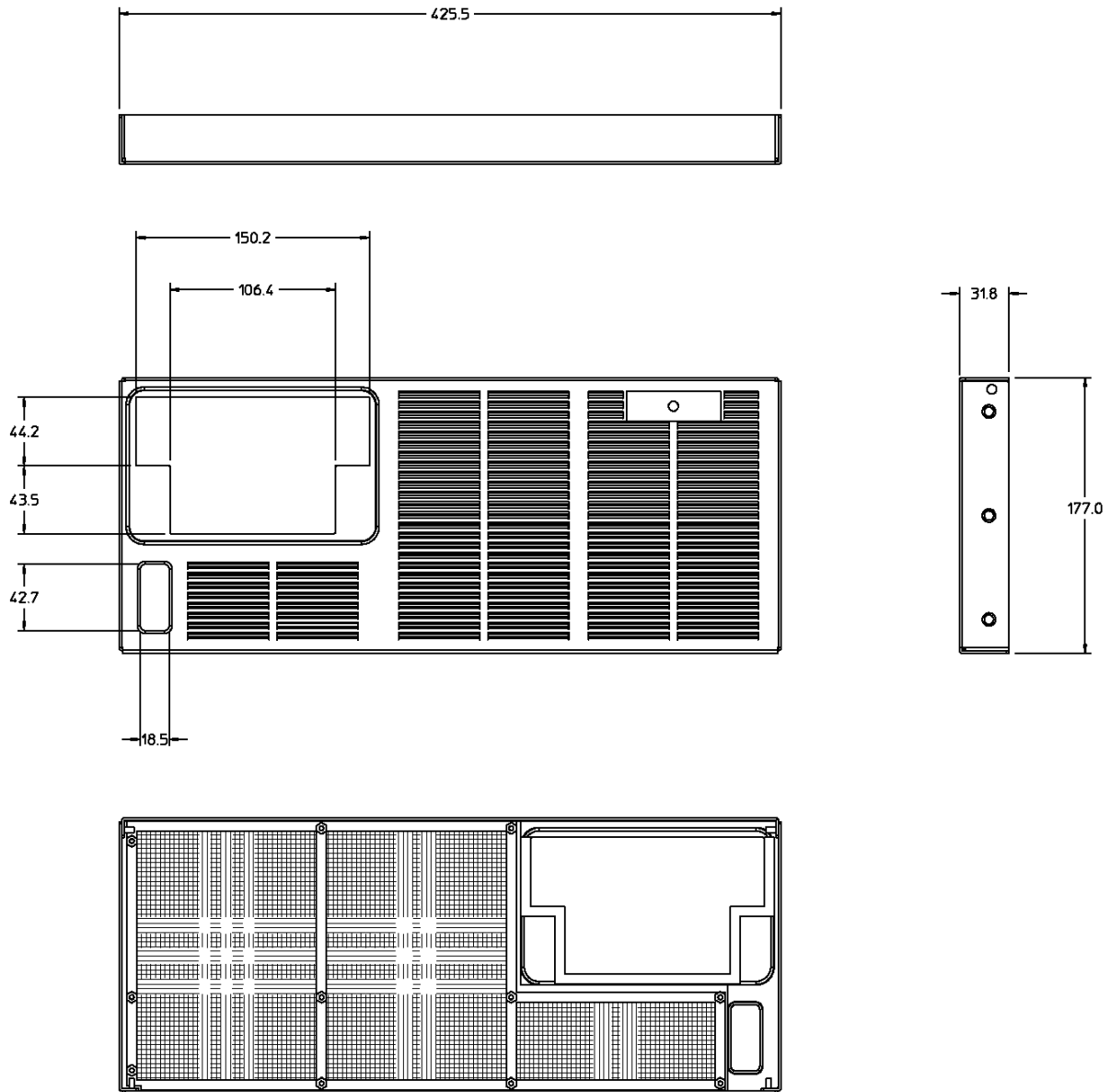


Figure 4-1

Model 745/132L Front Bezel

Figure 4-2 shows the dimensions of the Model 745/132L chassis top cover.

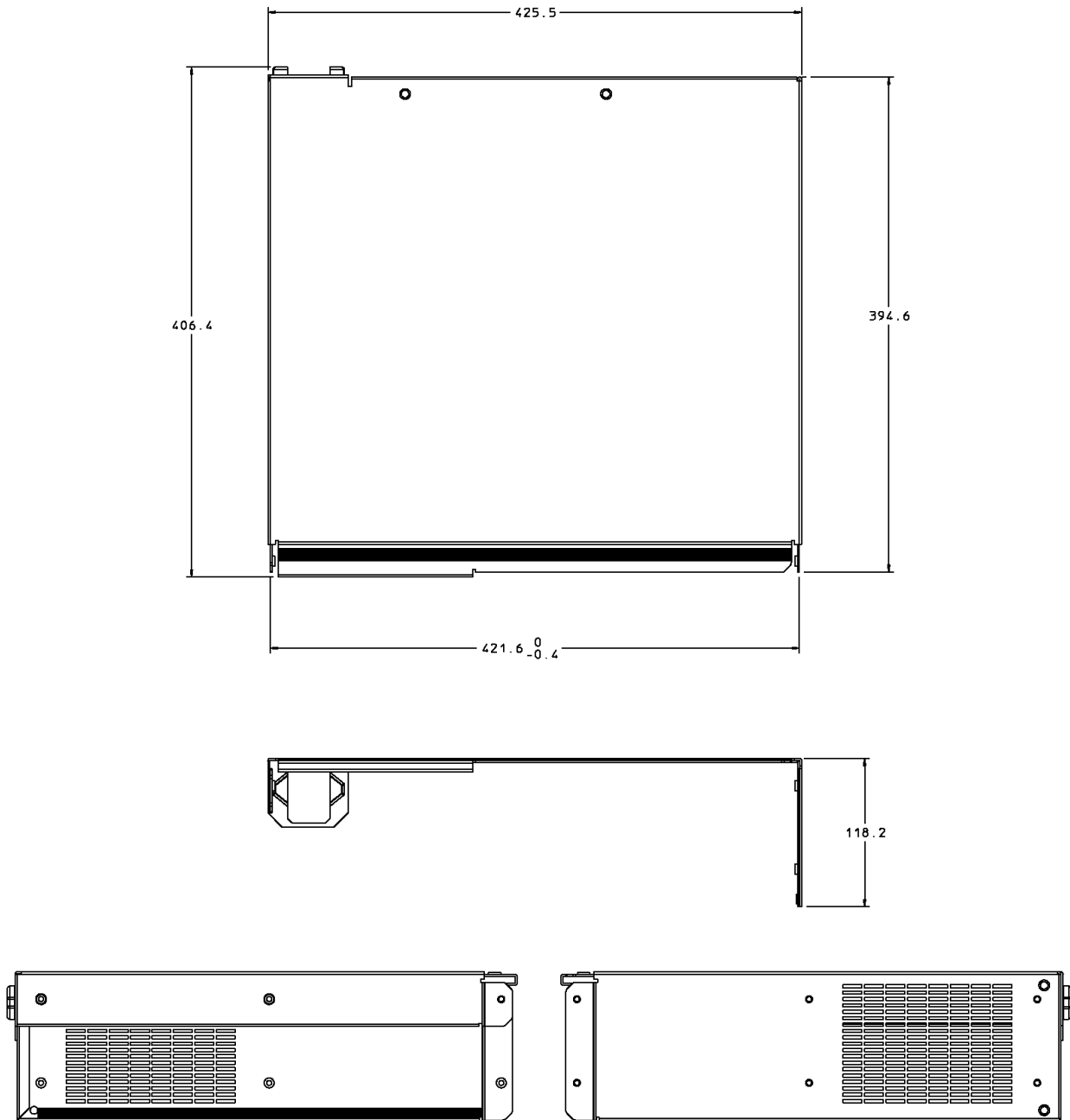


Figure 4-2 Model 745/132L Chassis Top Cover

Mechanical Information  
Model 745 Chassis and Modules

Figure 4-3 shows the dimensions of the Model 745/132L chassis base module.

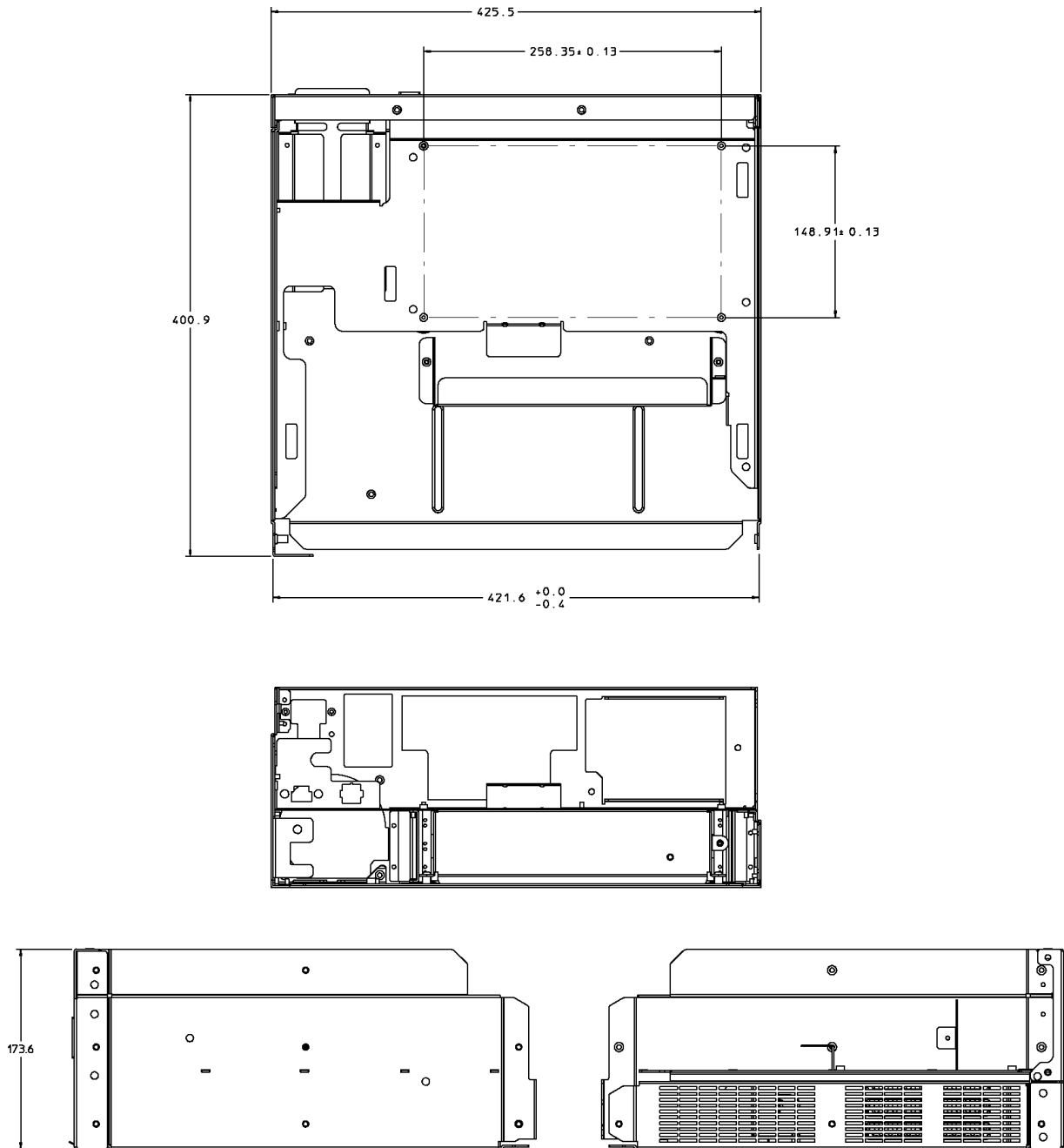


Figure 4-3 Model 745/132L Chassis Base Module

Figure 4-4 shows the dimensions of the Model 745/132L chassis mid-tray module.

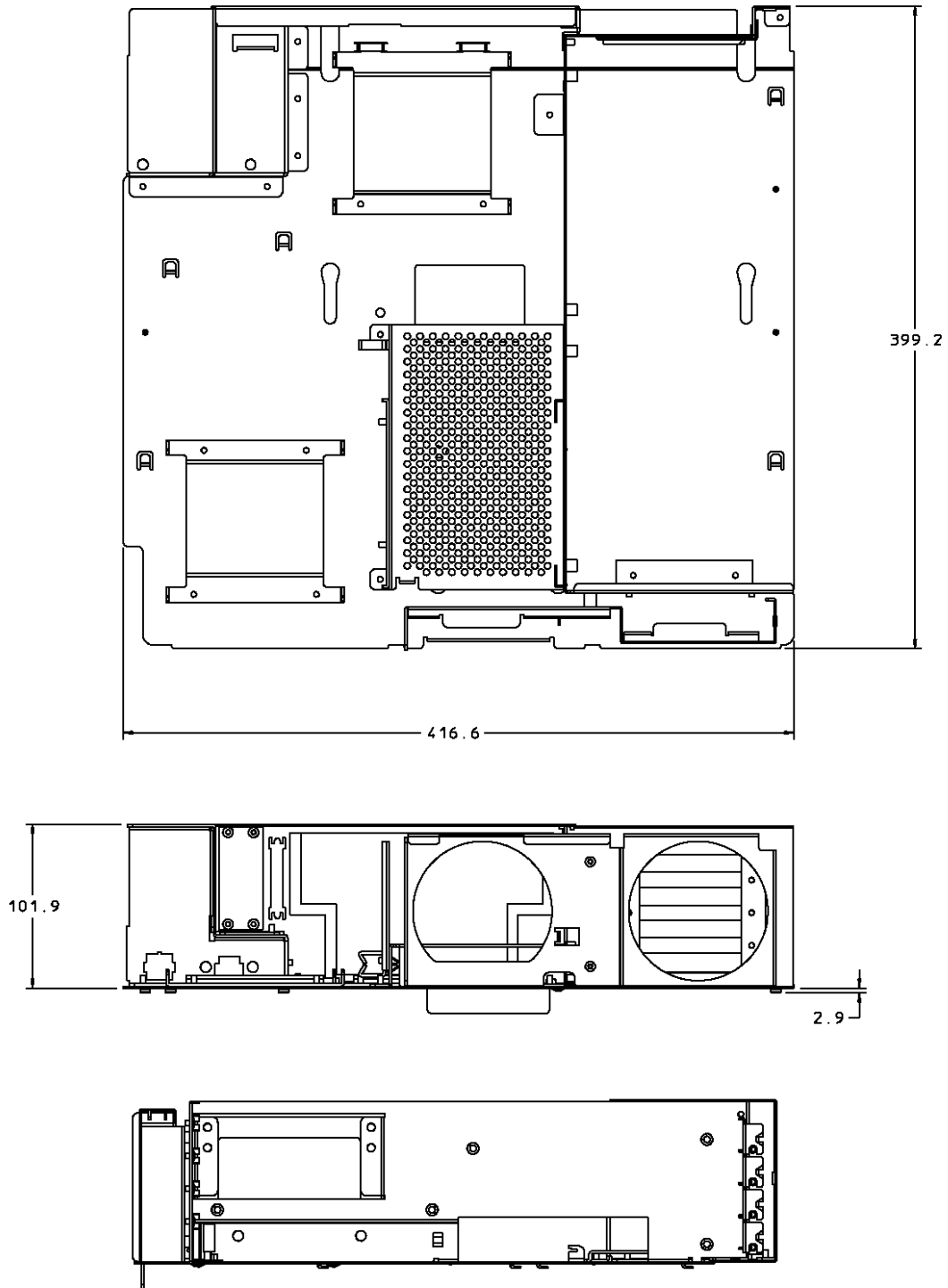


Figure 4-4 Model 745/132L Chassis Mid-tray Module

Mechanical Information  
Model 745 Chassis and Modules

Figure 4-5 shows the dimensions of the Model 745/132L disk carrier module.

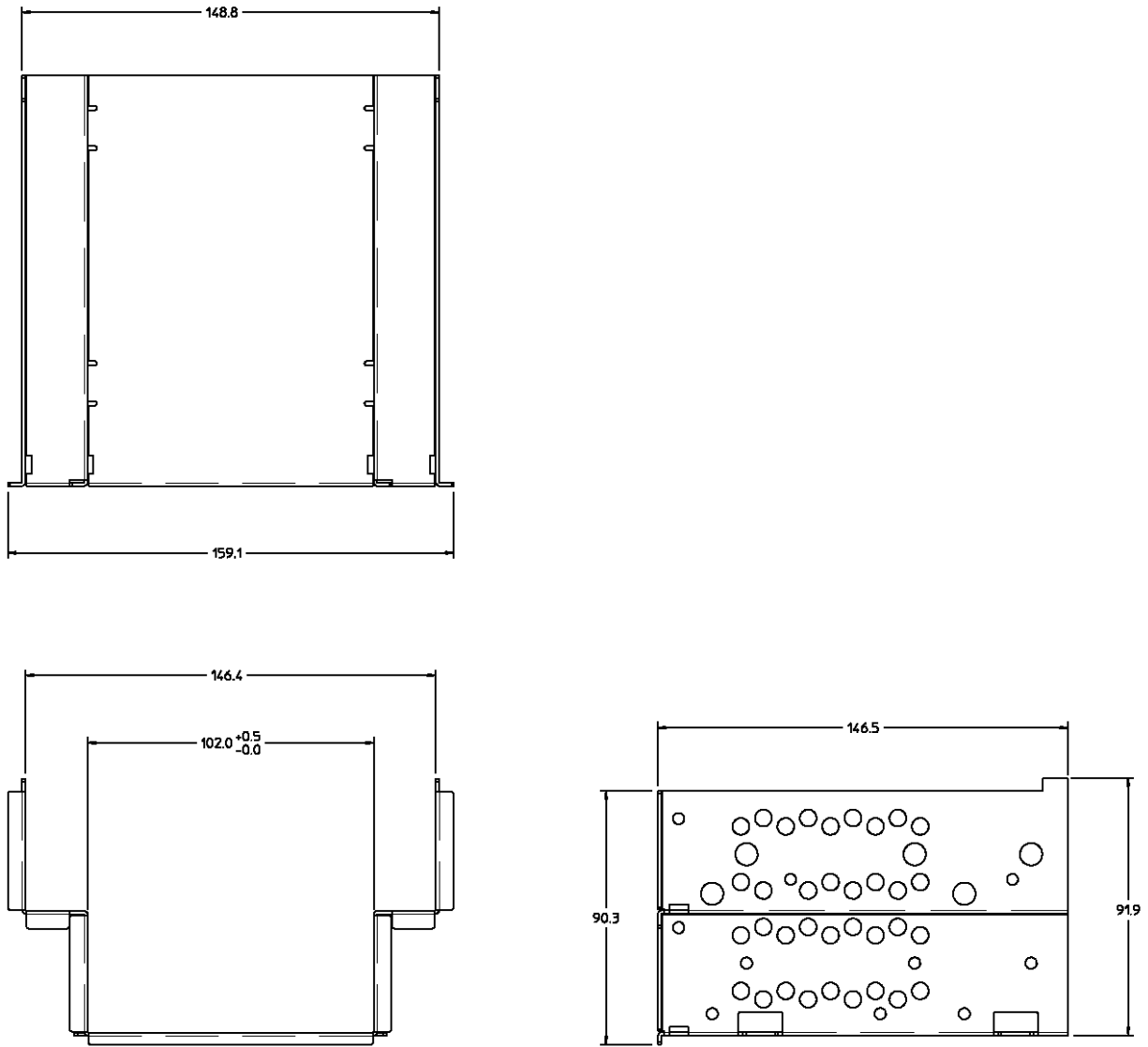
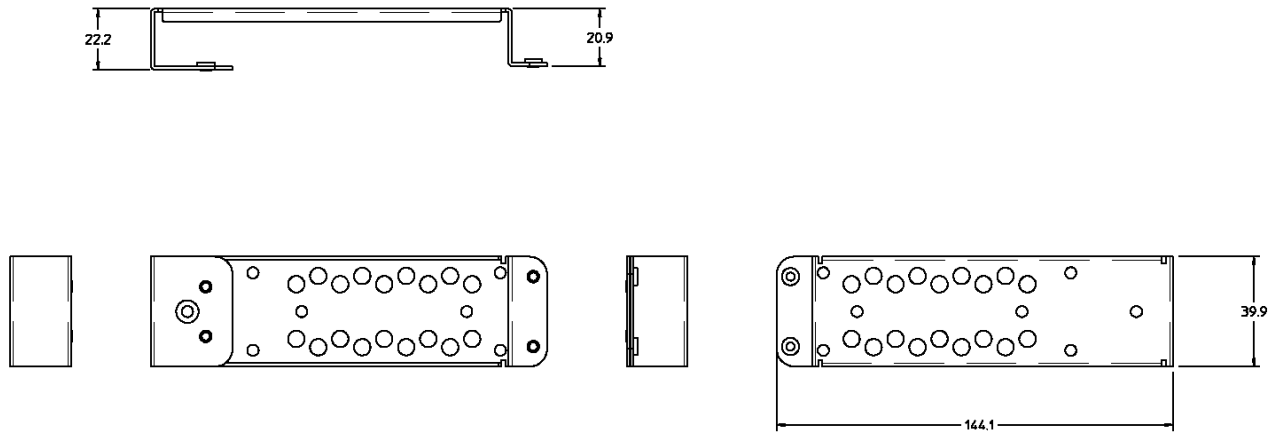


Figure 4-5 Model 745/132L Disk Carrier Module

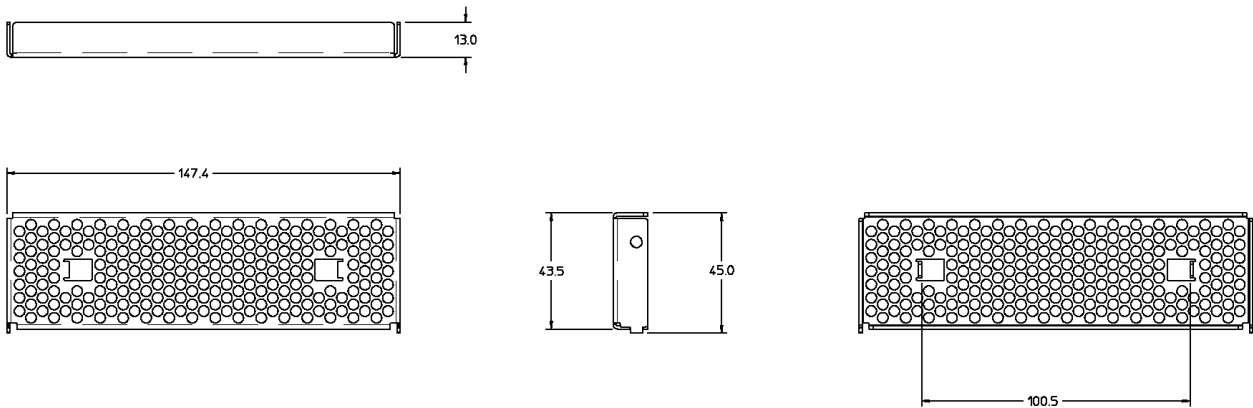


Figure 4-6 shows the dimensions of the Model 745/132L disk adapter bracket.



**Figure 4-6** Model 745/132L Disk Adapter Bracket

Figure 4-7 shows the dimensions of the Model 745/132L disk carrier upper shield.



**Figure 4-7** Model 745/132L Disk Carrier Upper Shield

Mechanical Information  
Model 745 Chassis and Modules

Figure 4-8 shows the dimensions of the Model 745/132L disk carrier lower shield.

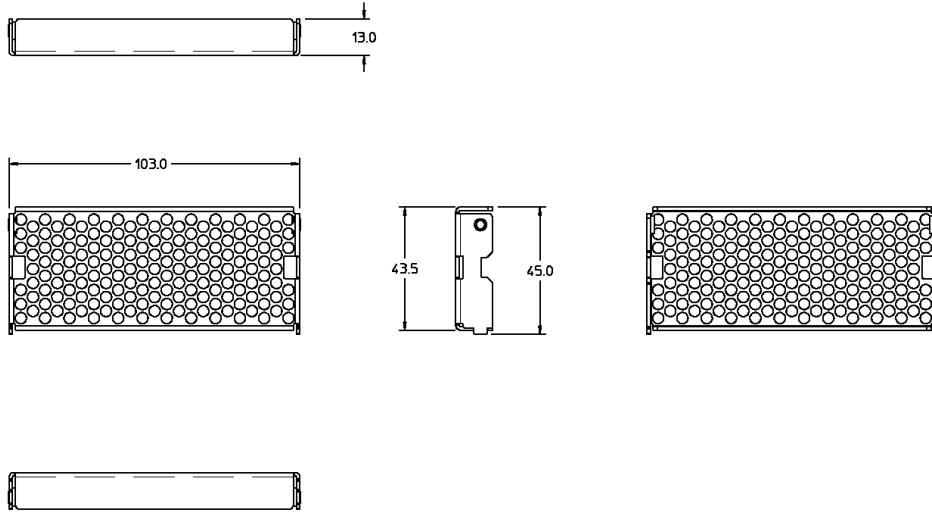


Figure 4-8 Model 745/132L Disk Carrier Lower Shield

Figure 4-9 shows the dimensions of the Model 745/132L EISA backplane board.

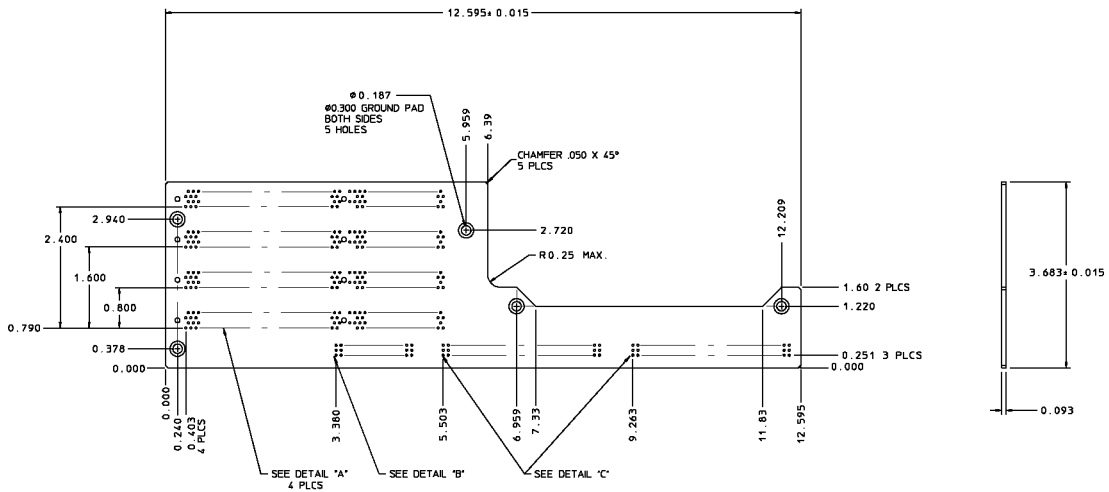
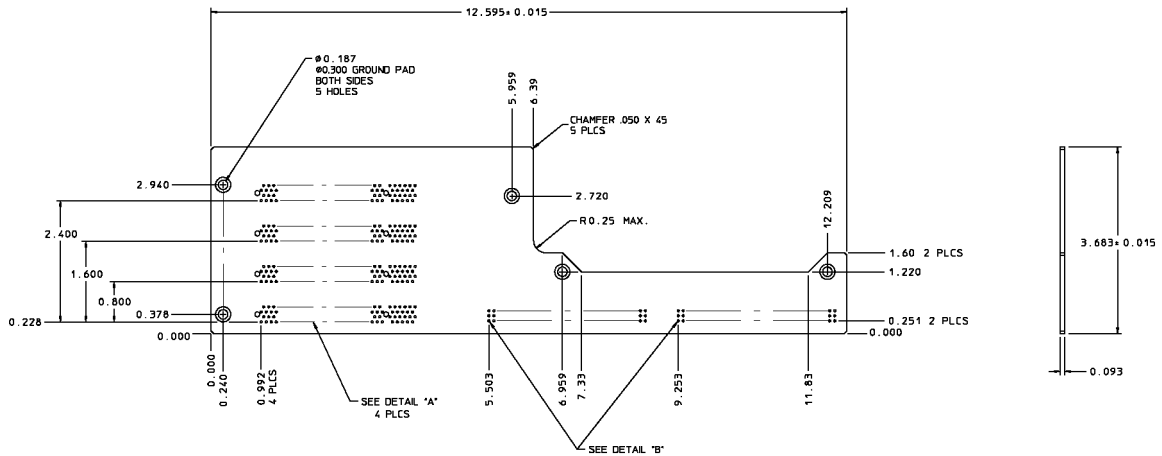


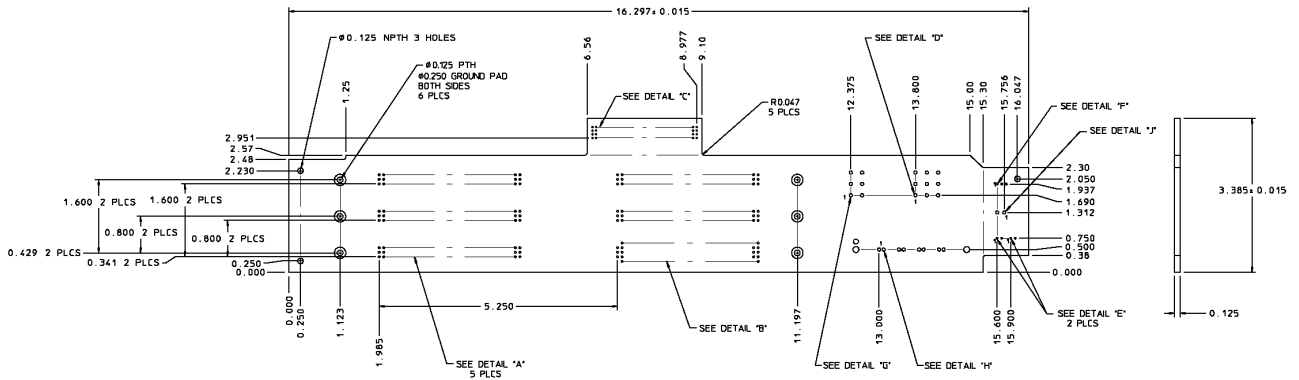
Figure 4-9 Model 745/132L EISA Backplane Board

Figure 4-10 shows the dimensions of the Model 745/132L PCI backplane.



**Figure 4-10 Model 745/132L PCI Backplane Board**

Figure 4-11 shows the dimensions of the Model 745/132L chassis backplane board.



**Figure 4-11 Model 745/132L Chassis Backplane Board**

## Model 744 Board Computers

### Key Component

Figure 4-12 shows key components on the Model 744 Board Computer.

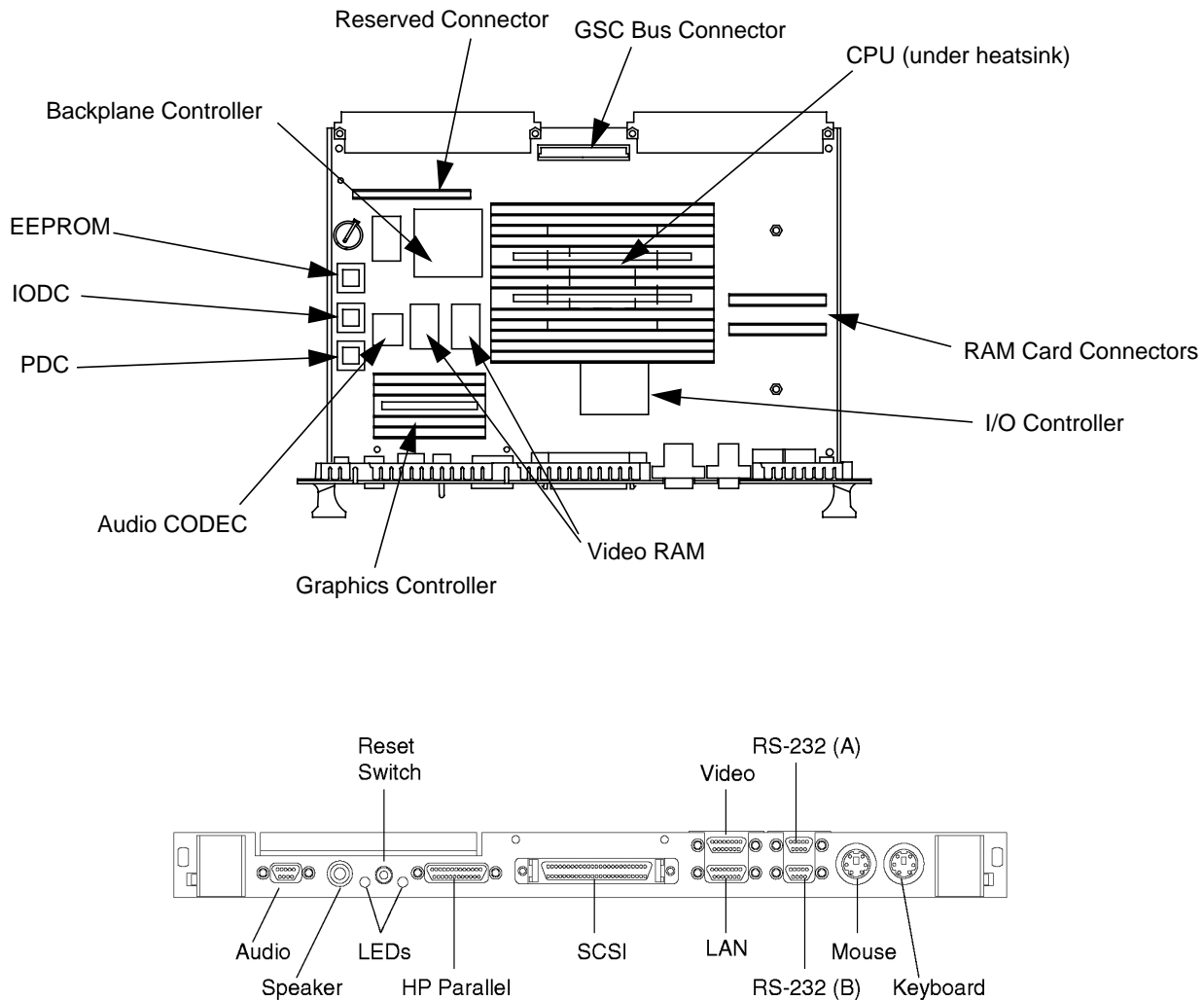


Figure 4-12

Model 744 Key Components

## Interface Connectors

Table 4-1 lists the interface connector manufacturing data.

**Table 4-1**      **Interface Connector Manufacturing Data**

Connector	Manufacturing Data	Manufacturing Part Number
Audio	ITT Canon	MDSM-9PE-Z10 or equivalent
HP Parallel	ITT Canon	MDSM-25PE-Z10 or equivalent
Mouse/Keyboard	AMP	750071-1 or equivalent
P1	AMP	215606-4 or equivalent
P2	AMP	650988-0 or equivalent
SCSI II	AMP	749830-5 or equivalent
Serial	ITT Canon	MDSM-18PE-Z22 or equivalent
Speaker	Hosiden	HSJ3062-01-410 or equivalent
Video/LAN	ITT Canon	MDSM-30PE-z10 or equivalent

### Mechanical Dimensions

Figure 4-13 through Figure 4-17 show the dimensions of the Model 744 system board.

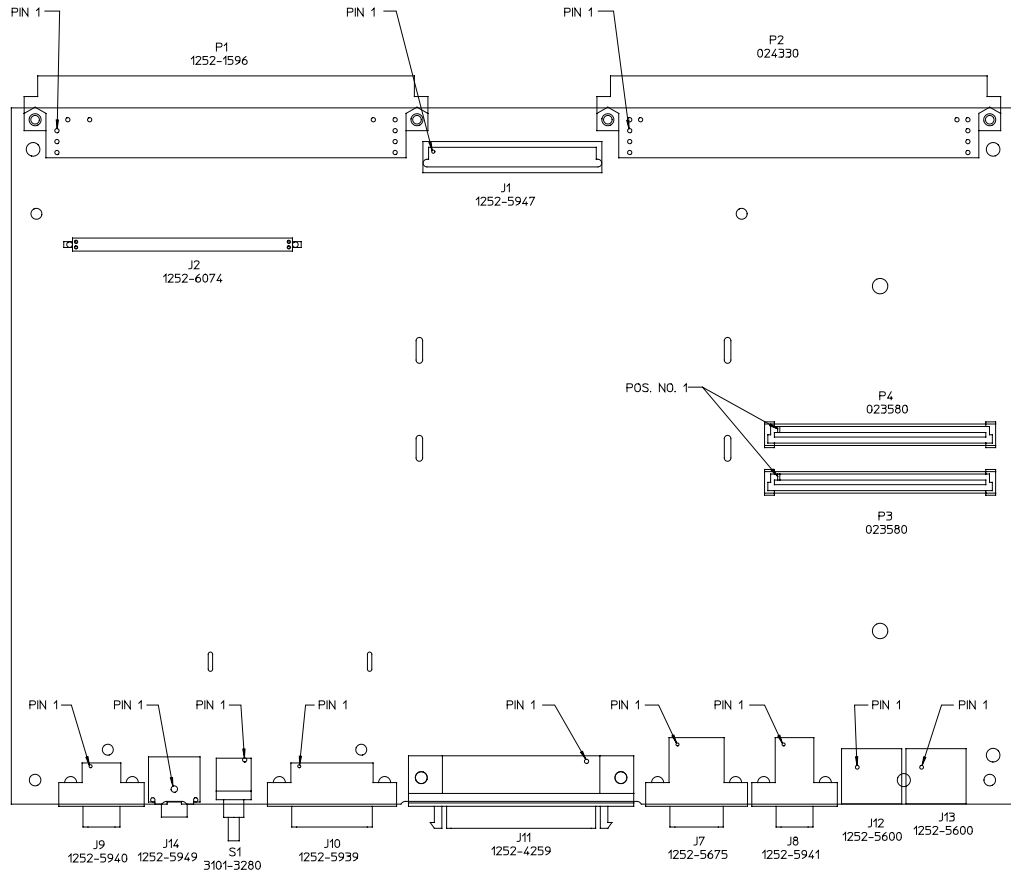


Figure 4-13 Model 744 Board Computer

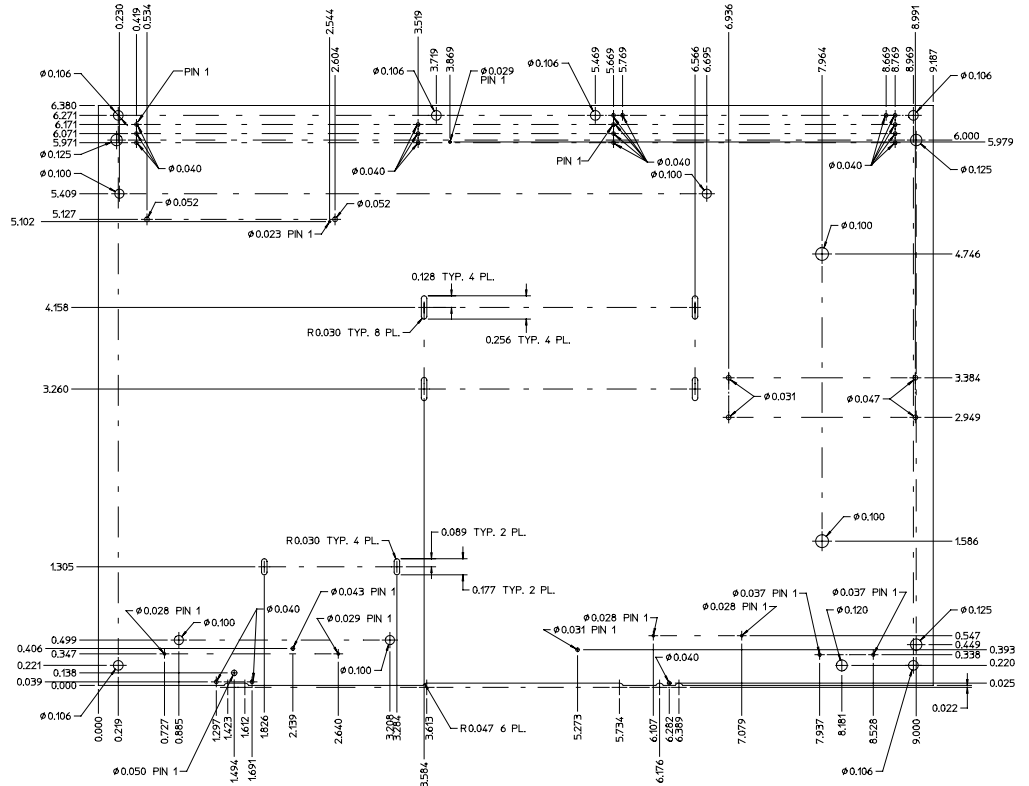


Figure 4-14 Model 744 Board Computer (Continued)

Mechanical Information  
Model 744 Board Computers

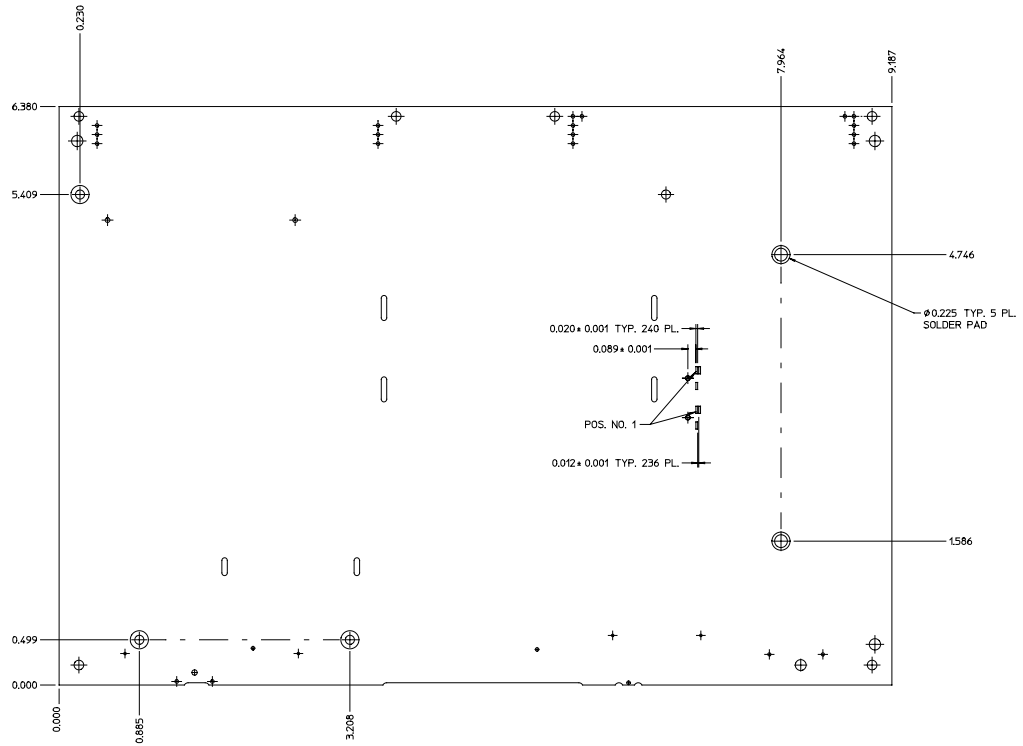


Figure 4-15 Model 744 Board Computer (Continued)



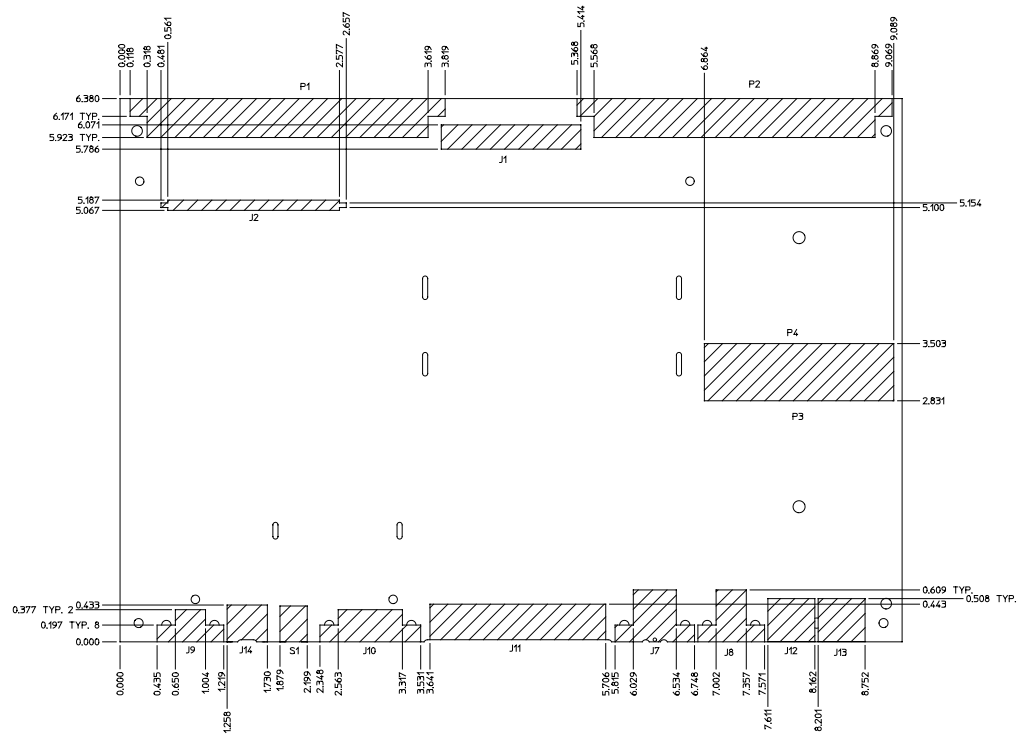


Figure 4-16 Model 744 Board Computer (Continued)

Mechanical Information  
 Model 744 Board Computers

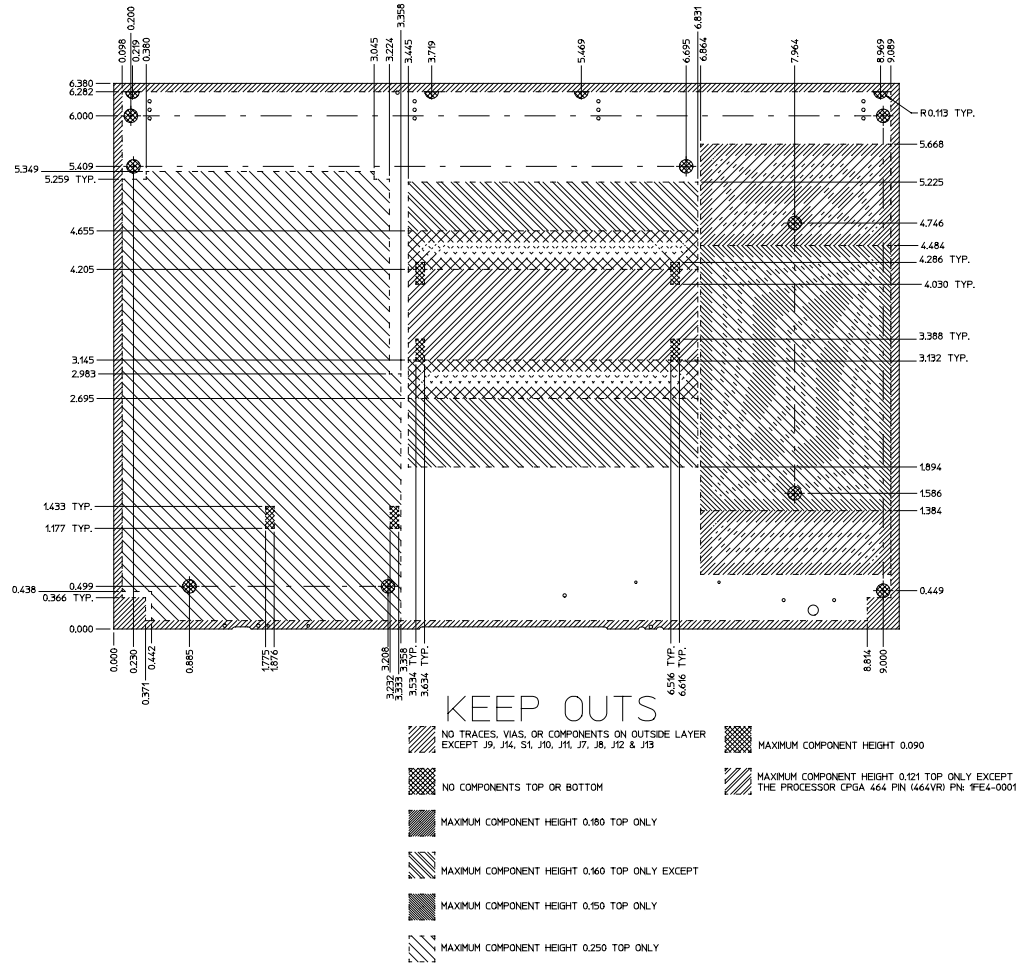


Figure 4-17

Model 744 Board Computer (Continued)

Figure 4-18 through Figure 4-20 show the dimensions of a Model 744 RAM card.

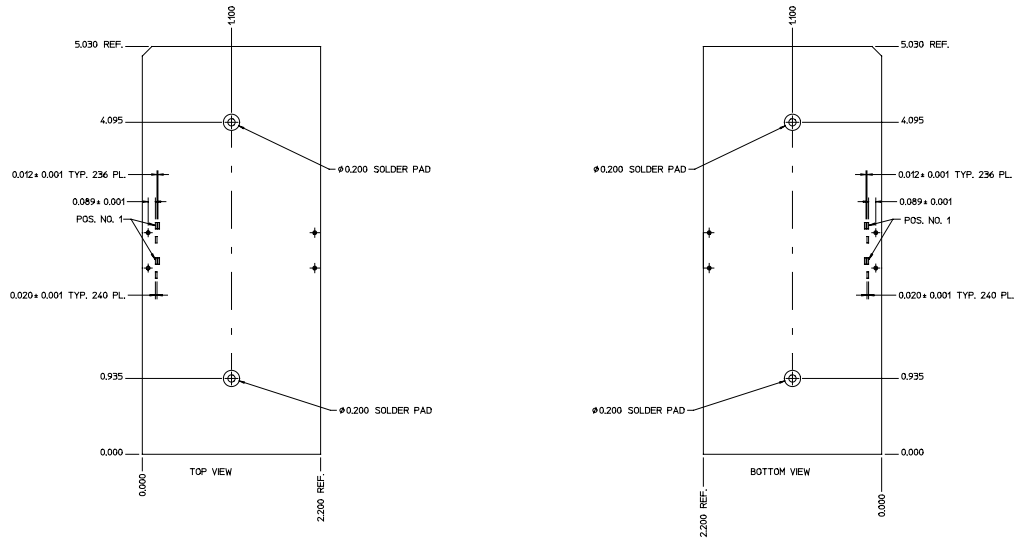


Figure 4-18 Model 744 RAM Card

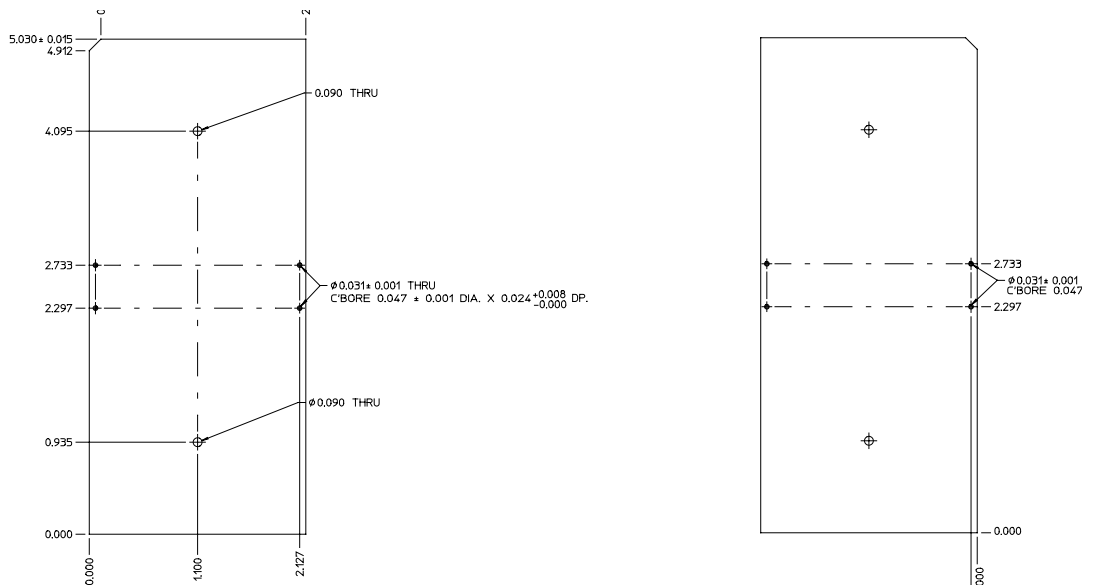
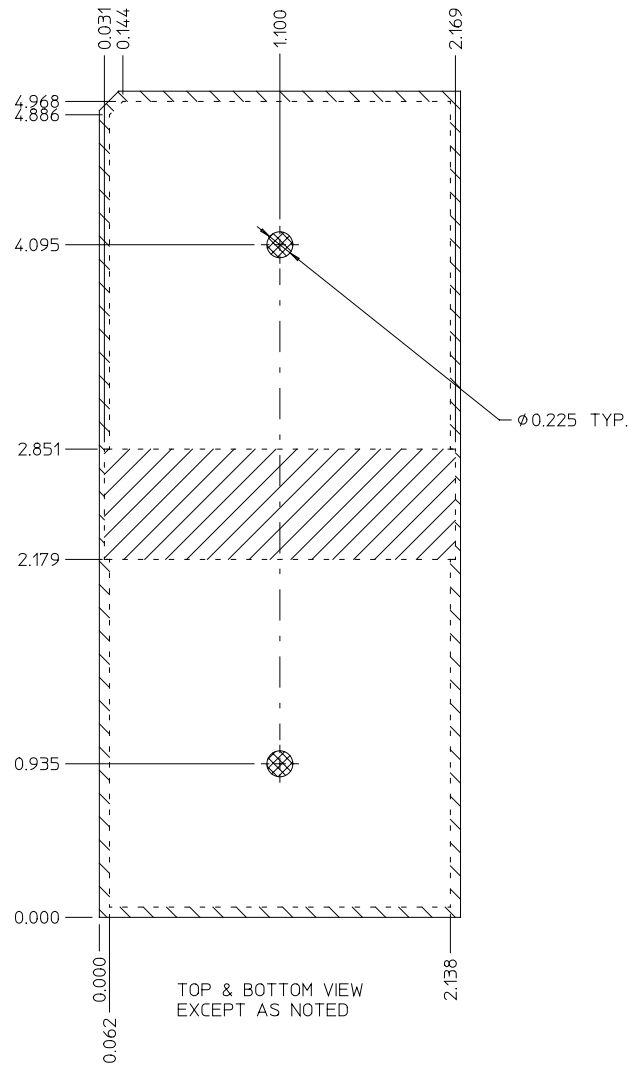





Figure 4-19 Model 744 RAM Card (Continued)

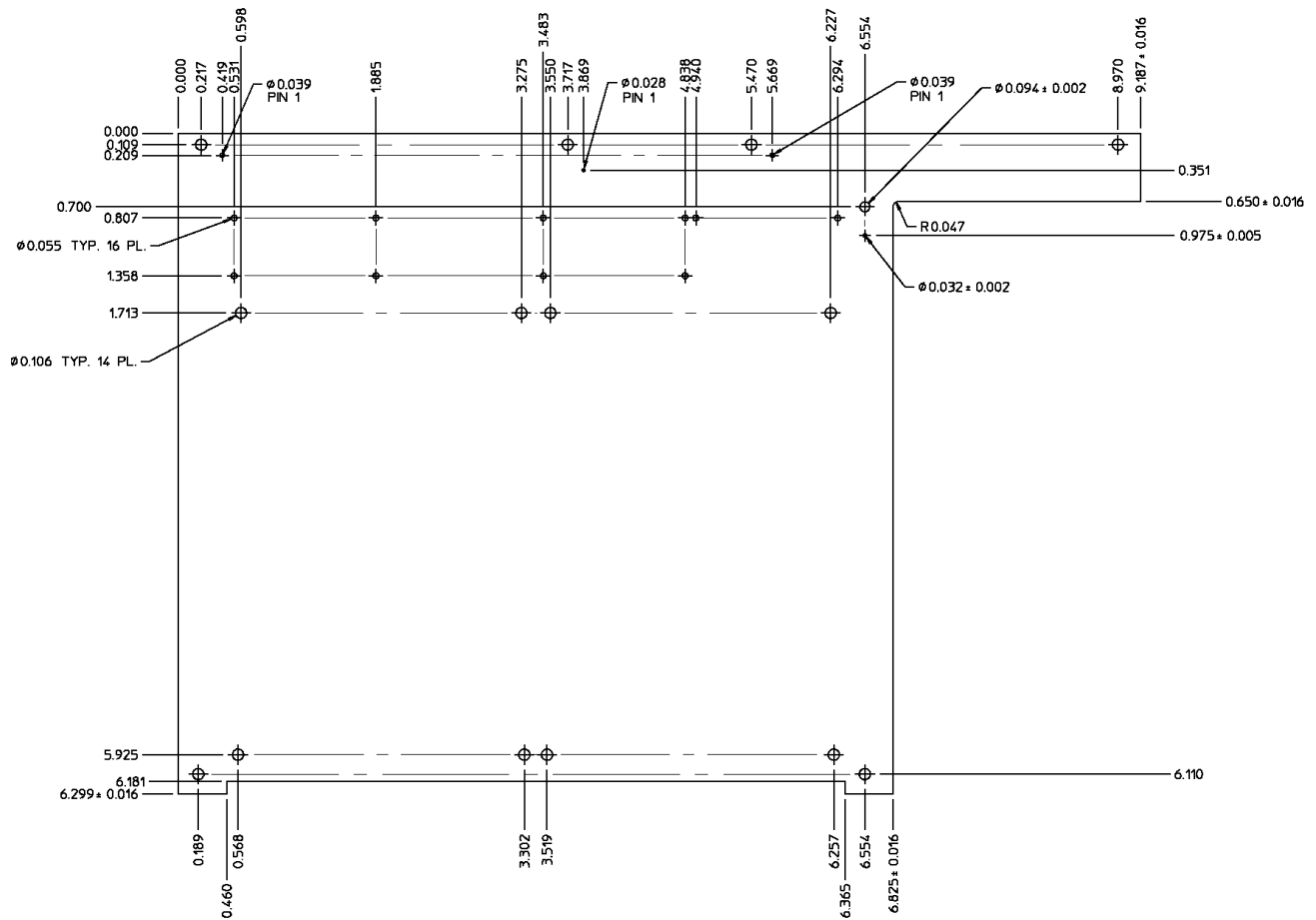
Mechanical Information  
**Model 744 Board Computers**



-  NO TRACES, VIAS, OR COMPONENTS ON OUTSIDE LAYERS EXCEPT J1 & J2
-  NO COMPONENTS
-  NO COMPONENTS EXCEPT J1 & J2

**Figure 4-20**      **Model 744 RAM Card (Continued)**

Figure 4-21 shows the dimensions of the optional PMC Bridge Adapter.



**Figure 4-21**                      **PMC Bridge Adapter**

Mechanical Information  
Model 744 Board Computers

Figure 4-22 shows the dimensions of the optional PMC Expansion Adapter.

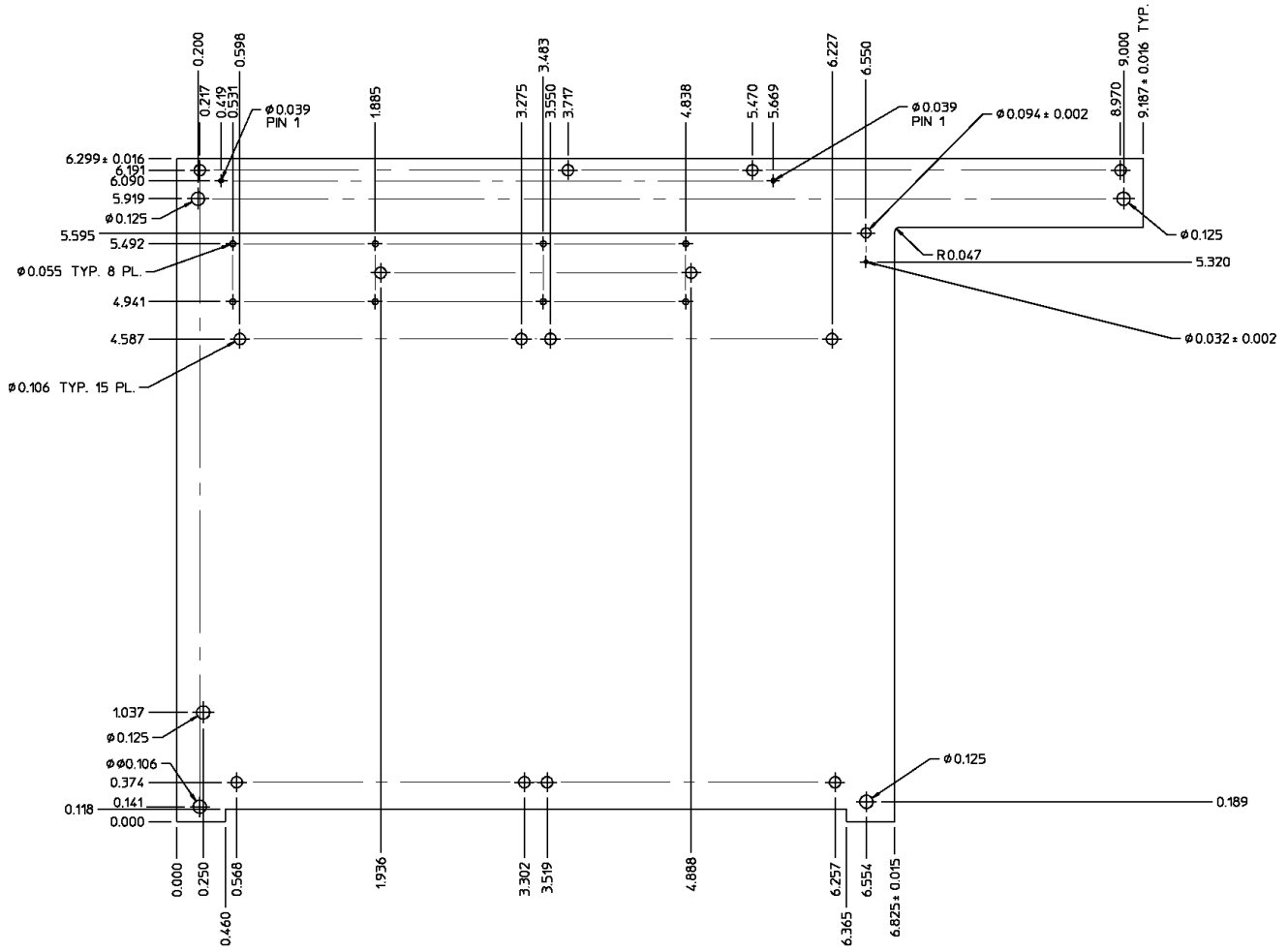


Figure 4-22 PMC Expansion Adapter

## Weights

Table 4-2 lists the weights of the components of the Model 745 system.

**Table 4-2**                      **Weights of Model 745 Product and Modules**

Part Name	Metric Weight	English Weight
Model 745 Industrial System base chassis (does not include backplanes, board computer, power supply, fans, cables, or switches)	4.9 Kg	10.8 lbs.
Mid-tray module (without disk carriers, fans, cables)	2.9 Kg	6.55 lbs.
Disk Carrier (2 per system)	0.83 Kg	1.85 lbs.
Fan (3 per system)	0.1 Kg	0.25 lb.
Top Cover	2.7 Kg	6.0 lbs.
Front Bezel	0.79 Kg	1.75 lbs.
Chassis Backplane	0.3 Kg	0.65 lb.
EISA converter board/backplane	0.4 Kg	0.85 lb.
PCI converter board/backplane	0.34 Kg	0.75 lb.
Power supply	2.65 Kg	5.9 lbs.
Disk drives (maximum weight)	0.95 Kg	2.1 lbs.
Slot cover	0.05 Kg	0.1 lb.
Model 744 Board Computer with on-board graphics (no other options)	0.62 Kg	1.1 lb.
Model 744 RAM card	0.05 Kg	0.1 lb.
PMC bridge board with mounting hardware (no blank bezels)	0.27 Kg	0.5 lb.
PMC expansion board with mounting hardware (no blank bezels or sleeves)	0.24 Kg	0.4 lb.
PMC blank bezels (each)	0.03 Kg	0.05 lb.
PMC ejector handle sleeves	0.02 Kg	0.04 lb.

### **Mounting and Support**

Each Model 745 workstation is shipped with a rack mount kit including flanges, spacers, and screws. In this section, the term "back" refers to the cable-out side of the workstation. Model 745 may be rack mounted either front out or back out.

Power switching is accessible from both front and back. A power LED is located with each power switch. Status and test LEDs are located on the Model 744 Board Computer. If the board computer LEDs must be visible, mount the system back out. Devices within the mass storage module can be arranged for front or back accessibility.

### **Mechanical Drawings**

For OEMs that have signed a Hewlett-Packard non-disclosure agreement, the mechanical drawings are available by request through your Hewlett-Packard OEM Sales Representative. These drawings are Hewlett-Packard confidential and cannot be redistributed.

When you ask for drawings, please specify the following:

- Drawing part number, size, and page number, if needed
- Name, assembly or subassembly

The drawings are sent to your Sales and Service Office.

### **Conversion Cables**

All conversion cables are 762 plus or minus 30 mm (30 plus or minus 1.18 inch) long. The end of the cable that connects to the board computer uses a micro D-sub male (MDSM) connector. The other end of the cable uses a standard D-sub or other connector.



### Chassis Parts and Models

Table 4-3 shows the assembly group, included subassemblies, and mechanical drawing reference number for the Model 745 chassis parts and modules.

**Table 4-3 Mechanical Drawings for Chassis Parts and Modules**

Assembly Group	Included Subassemblies	Subassembly Drawing Number
Model 745/132L chassis	Front bezel	D-A4964-00005-10
	Base chassis	D-A4964-00004-10
	Top cover	D-A4964-00003-10
	Mid-tray module	D-A4964-00006-10
	Chassis backplane	D-A4964-66006-10
	PCI backplane	D-A4964-66003-10
	EISA backplane	D-A4964-66004-10
Power supply module		D-0950-2690-10
Model 744 system board	Front panel	D-A2636-00001-10
	Blank bulkhead	D-A2636-00004-10
PMC expansion	PMC bridge adapter	D-A4504-66001-10
	PMC expansion adapter	D-A4505-66002-10



---

## **Electrical Information**

The Electrical Information Chapter contains information on the connector pinouts, real-time clock battery, and video output signal specifications.

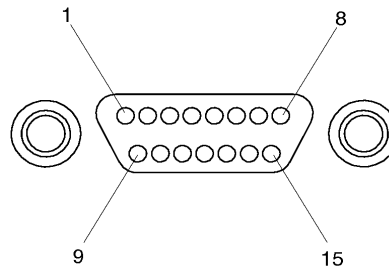
## Electrical Information

The sections that follow contain figures and tables of the connector pinouts and the wiring tables for video, audio, HP parallel, RS-232, AUI LAN, single-ended SCSI, PS/2, and PMC; specifications for the real-time battery clock, video output signals, and video timing.

## Video Connector Pinouts

This section contains a figure of the video connector, a table of the video connector pinouts, the HP4304A conversion video cable connectors diagrams, and the conversion video cable wiring table.

Figure 5-1 illustrates the video connector pin locations for the Model 744 I/O panel.



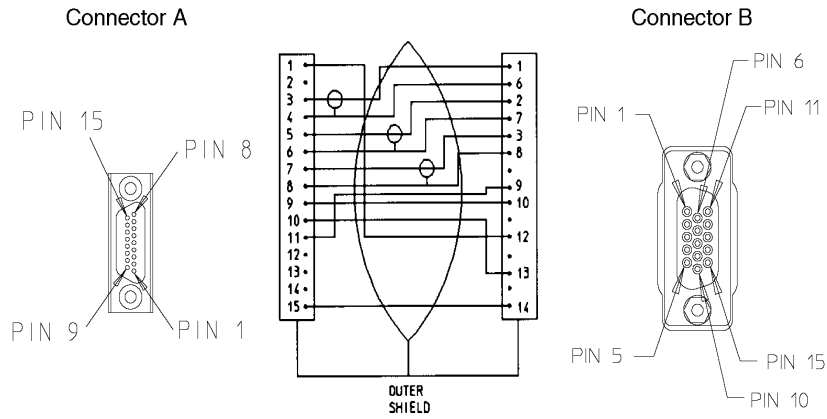
**Figure 5-1** Video Connector

Table 5-1 identifies the pins on the Model 744 I/O panel video connector.

**Table 5-1** Video Connector Pinouts

Pin Number	Signal	Pin Number	Signal	Pin Number	Signal
1	DDC	6	GND	11	+5
2	GND	7	BLUE	12	GND
3	RED	8	GND	13	SSYNC
4	GND	9	GND	14	GND
5	GREEN	10	HSYNC	15	VSYNC

Figure 5-2 illustrates the connector pin locations on each end of the HP A4223A conversion video cable.



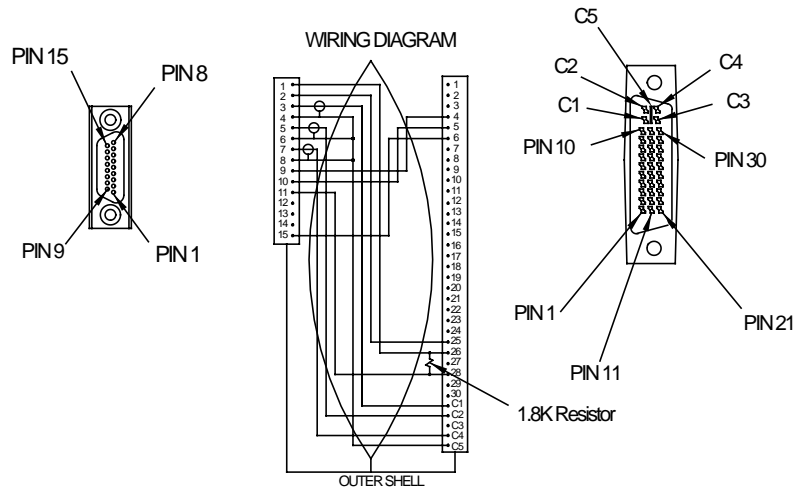
**Figure 5-2 HP A4223A Conversion Video Cable Connectors**

Table 5-2 identifies HP A4223A conversion video cable pins.

**Table 5-2 A4223A Conversion Video Cable Wiring Table**

15-Pin MDSM	15-Pin D-Sub
Pin 1	Pin 12
Pin 2	
Pin 3	Pin 1
Pin 4	Pin 6
Pin 5	Pin 2
Pin 6	Pin 7
Pin 7	Pin 3
Pin 8	Pin 8
Pin 9	Pin 10
Pin 10	Pin 13
Pin 11	Pin 9
Pin 12	
Pin 13	
Pin 14	
Pin 15	Pin 14

Figure 5-3 illustrates the connector pin locations on each end of the HP A4305A conversion video cable.



**Figure 5-3 HP A4305A Conversion Video Cable Connectors**

Table 5-3 identifies HP A4305A conversion video cable pins.

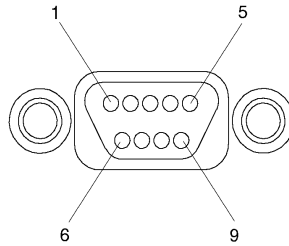
**Table 5-3 A4305A Conversion Video Cable Wiring Table**

15-Pin MDSM	35-Pin EVC
Pin 1	Pin 26
Pin 2	Pin 25
Pin 3	Pin C1
Pin 4	Pin C5
Pin 5	Pin C2
Pin 6	Pin C5
Pin 7	Pin C4
Pin 8	Pin C5
Pin 9	Pin 4
Pin 10	Pin 5
Pin 11	Pin 28
Pin 12	
Pin 13	
Pin 14	
Pin 15	Pin 6

### Audio Connector Pinouts

This section contains a figure of the audio connector and a table of the audio connector pinouts.

Figure 5-4 illustrates the audio connector pin locations.



**Figure 5-4** Audio Connector

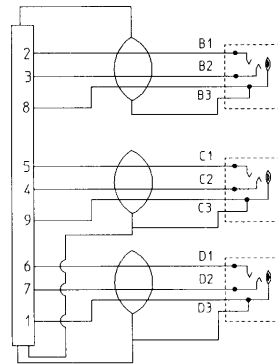
Table 5-4 identifies the audio connector pins.

**Table 5-4** Audio Connector Pinouts

Pin Number	Signal
1	Mic in GND
2	Line in left
3	Line in right
4	Headset right
5	Headset left
6	Mic in A
7	Mic Vref
8	Line in GND
9	Headset GND



Figure 5-5 illustrates the connector pin locations on each end of the HP A4302A conversion audio cable.

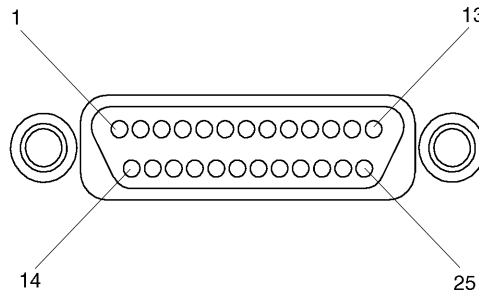


**Figure 5-5**                      **HP A4302A Conversion Audio Cable Connectors**

### HP Parallel Connector Pinouts

This section contains a figure of the HP parallel connector, a table of the HP parallel connector pinouts, the HP4300A conversion HP parallel cable connectors diagrams, and the conversion HP parallel cable wiring table.

Figure 5-6 illustrates the HP parallel connector pin locations.



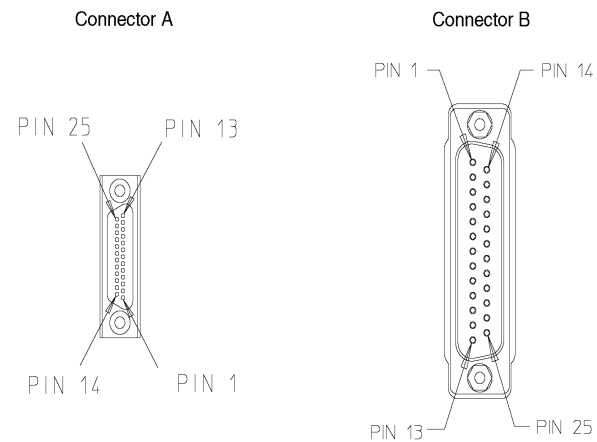
**Figure 5-6** HP Parallel Connector

Table 5-5 identifies the HP parallel connector pins.

**Table 5-5** HP Parallel Connector Pinouts

Pin Number	Signal	Pin Number	Signal
1	STROBE	14	AFD
2	Data 0	15	ERROR
3	Data	16	INIT
4	Data	17	SCT IN
5	Data	18	GND
6	Data	19	GND
7	Data	20	GND
8	Data	21	GND
9	Data	22	GND
10	ACK	23	GND
11	BUSY	24	GND
12	PE	25	GND
13	SLCT		

Figure 5-7 illustrates the connector pin locations on each end of the HP A4300A conversion HP parallel cable



**Figure 5-7 HP A4300A Conversion HP Parallel Cable Connectors**

Table 5-6 identifies the HP A4300A conversion HP parallel cable pins.

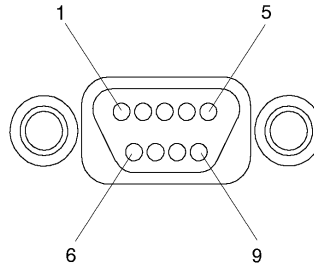
**Table 5-6 Conversion HP Parallel Cable Wiring Table**

25-Pin MDSM	25-Pin D-Sub	25-Pin MDSM	25-Pin D-Sub
Pin 1	Pin 1	Pin 14	Pin 14
Pin 2	Pin 2	Pin 15	Pin 15
Pin 3	Pin 3	Pin 16	Pin 16
Pin 4	Pin 4	Pin 17	Pin 17
Pin 5	Pin 5	Pin 18	Pin 18
Pin 6	Pin 6	Pin 19	Pin 19
Pin 7	Pin 7	Pin 20	Pin 20
Pin 8	Pin 8	Pin 21	Pin 21
Pin 9	Pin 9	Pin 22	Pin 22
Pin 10	Pin 10	Pin 23	Pin 23
Pin 11	Pin 11	Pin 24	Pin 24
Pin 12	Pin 12	Pin 25	Pin 25
Pin 13	Pin 13		

### RS-232 Connector Pinouts

This section contains a figure of the RS-232 connector, a table of the RS-232 connector pinouts, the HP 4301A conversion RS-232 cable connectors diagrams, and the conversion RS-232 cable wiring table.

Figure 5-8 illustrates the RS-232 connector pin locations.



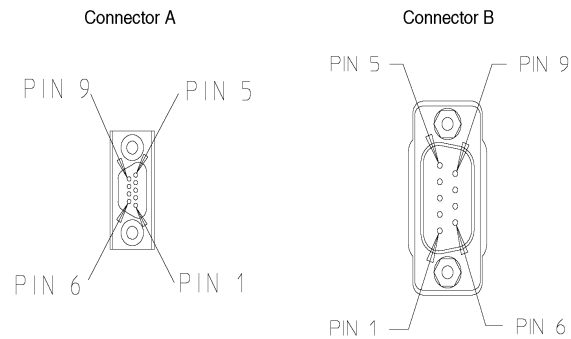
**Figure 5-8 RS-232 Serial Connector**

Table 5-7 identifies the RS-232 connector pins.

**Table 5-7 RS-232-C Connector Pinouts**

Pin Number	Signal	Pin Number	Signal
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	GND		

Figure 5-9 illustrates the connector pin locations on each end of the HP A4301A conversion RS-232 cable.



**Figure 5-9 HP A4301A Conversion RS-232 Cable Connectors**

Table 5-8 is the wiring table for the HP A4301A conversion RS-232 cable.

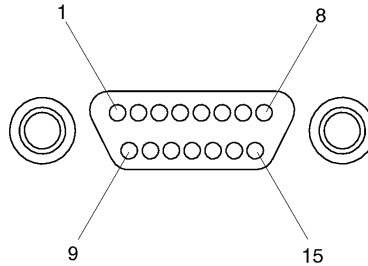
**Table 5-8 Conversion RS-232 Cable Wiring Table**

9-Pin MDSM	9-Pin D-Sub
Pin 1	Pin 1
Pin 2	Pin 2
Pin 3	Pin 3
Pin 4	Pin 4
Pin 5	Pin 5
Pin 6	Pin 6
Pin 7	Pin 7
Pin 8	Pin 8
Pin 9	Pin 9

### AUI LAN Connector Pinouts

This section contains a figure of the AUI LAN connector, a table of the AUI LAN connector pinouts, the HP 4303A conversion AUI LAN cable connectors diagrams, and the conversion AUI LAN cable wiring table.

Figure 5-10 illustrates the AUI LAN connector pin locations.



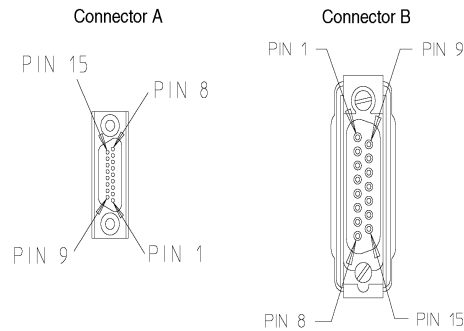
**Figure 5-10** AUI LAN Connector

Table 5-9 identifies the AUI LAN connector pins.

**Table 5-9** AUI LAN Connector Pinouts

Pin Number	Signal	Pin Number	Signal	Pin Number	Signal
1	GND	6	GND	11	DO-S (GND)
2	CI-A	7	CO-A (NC)	12	DI-B
3	DO-A	8	CO-S (NC)	13	+ 12 V
4	DI-S (GND)	9	CI-B	14	GND
5	DI-A	10	DO-B	15	CO-B (NC)

Figure 5-11 illustrates the connector pin locations on each end of the HP A4303A conversion LAN cable.



**Figure 5-11 HP A4303A Conversion LAN Cable Connectors**

Table 5-10 is the wiring table for the HP A4303A conversion LAN cable.

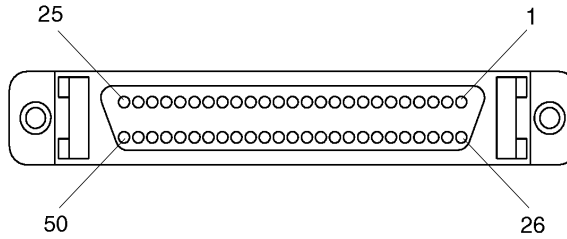
**Table 5-10 Conversion LAN Cable Wiring Table**

15-Pin MDSM	15-Pin D-Sub	15-Pin MDSM	15-Pin D-Sub
Pin 1	Pin 1	Pin 9	Pin 9
Pin 2	Pin 2	Pin 10	Pin 10
Pin 3	Pin 3	Pin 11	Pin 11
Pin 4	Pin 4	Pin 12	Pin 12
Pin 5	Pin 5	Pin 13	Pin 13
Pin 6	Pin 6	Pin 14	Pin 14
Pin 7	Pin 7	Pin 15	Pin 15
Pin 8	Pin 8		

### Single-Ended SCSI Connector Pinouts

The section that follows contains a figure of the single-ended SCSI connector and a table of the single-ended SCSI connector pinouts.

Figure 5-12 illustrates the single-ended SCSI connector pin locations.



**Figure 5-12**      **Single-Ended SCSI Connector**



Table 5-11 identifies the single-ended SCSI connector pins.

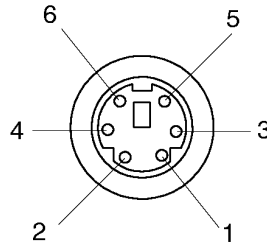
**Table 5-11 Single-Ended SCSI Connector Pinouts**

Pin Number	Signal	Pin Number	Signal
1	GND	26	DATA 0
2	GND	27	DATA 1
3	GND	28	DATA 2
4	GND	29	DATA 3
5	GND	30	DATA 4
6	GND	31	DATA 5
7	GND	32	DATA 6
8	GND	33	DATA 7
9	GND	34	Data Parity
10	GND	35	GND
11	GND	36	GND
12	GND	37	GND
13	GND	38	Term_Pwr
14	GND	39	GND
15	GND	40	GND
16	GND	41	ATN
17	GND	42	GND
18	GND	43	BSY
19	GND	44	ACK
20	GND	45	RST
21	GND	46	MSG
22	GND	47	SEL
23	GND	48	CD
24	GND	49	REQ
25	GND	50	IO

### PS/2 Connector Pinouts

The following section contains a figure of the PS/2 connector and a table of the PS/2 connector pinouts.

Figure 5-13 illustrates the PS/2 connector pin locations.



**Figure 5-13** PS/2 Connector

Table 5-12 identifies the PS/2 connector pins.

**Table 5-12** PS/2 Connector Pinouts

Pin Number	Signal
1	Data
2	Not used
3	GND
4	+5
5	Clock
6	Not used

**Backplane Connector Pinouts**

This section contains tables for the Model 745/Model 744 P1/J1 pin assignments and signal mnemonics; the Model 745 P2/J2, slots 2-3, pin assignments and signal mnemonics.

Table 5-13 identifies the backplane connector pin assignments and signal mnemonics for the Model 745/744 P1/J1.

**Table 5-13 Model 745/744 P1/J1 Pin Assignments and Signal Mnemonics**

Pin Number	Row A	Row B	Row C
1	D00	BBSY	D08
2	D01	BCLR	D09
3	D02	ACFAIL	D10
4	D03	BG0IN	D11
5	D04	BG0OUT	D12
6	D05	BG1IN	D13
7	D06	BG1OUT	D14
8	D07	BG2IN	D15
9	GROUND	BG2OUT	GROUND
10	SYSCLOCK	BG3IN	SYSFAIL
11	GROUND	BG3OUT	BERR
12	DS1	BR0	SYSRESET
13	DS0	BR1	LWORD
14	WRITE	BR2	AM5
15	GND	BR3	A23
16	DTACK	AM0	A22
17	GND	AM1	A21
18	AM2	AM2	A20
19	AM3	AM3	A19
20	GND	GND	A18
21	IACKIN	NC	A17
22	IACKOUT	NC	A16
23	AM4	GND	A15
24	A07	IRQ7	A14
25	A06	IRQ6	A13
26	A05	IRQ5	A12
27	A04	IRQ4	A11
28	A03	IRQ3	A10
29	A02	IRQ2	A09
30	A01	IRQ1	A08
31	-12Vdc	NC	+12Vdc
32	+5Vdc	+5Vdc	+5Vdc

Table 5-14 identifies the connector pin assignments and signal mnemonics for the Model 744 P2 (in slot 1).

**Table 5-14 Model 744 P2 Pin Assignments and Signal Mnemonics**

Pin Number	Row A	Row B	Row C
1	SYNCHWAXL	+5 V	GSC_AD0
2	SYNCHWAXH	GND	GSC_AD1
3	NC	Reserved	GSC_AD2
4	WAX_RST_L	A24	GSC_AD3
5	NC	A25	GSC_AD4
6	GSC_BR_L(2)	A26	GSC_AD5
7	GSC_BG_L(2)	A27	GSC_AD6
8	NC	A28	GSC_AD7
9	GSC_ADDV_L	A29	GSC_AD8
10	GSC_READY_L	A30	GSC_AD9
11	NC	A31	GSC_AD10
12	GSC_ERROR_L	GND	GSC_AD11
13	GSC_PARITY_L	+5 V	GSC_AD12
14	GSC_XQ_L	D16	GSC_AD13
15	GSC_LS_L	D17	GSC_AD14
16	NC	D18	GSC_AD15
17	GSC_TYPE0	D19	GSC_AD16
18	GSC_TYPE1	D20	GSC_AD17
19	GSC_TYPE2	D21	GSC_AD18
20	GSC_TYPE3	D22	GSC_AD19
21	NC	D23	GSC_AD20
22	SYNCTTL	GND	GSC_AD21
23	SP_DETECT	D24	GSC_AD22
24	ALT_BR_L	D25	GSC_AD23
25	ALT_BG_L	D26	GSC_AD24
26	NC	D27	GSC_AD25
27	NC	D28	GSC_AD26
28	TDO	D29	GSC_AD27
29	TDI	D30	GSC_AD28
30	TCK	D31	GSC_AD29
31	TMS	GND	GSC_AD30
32	TRST	+5 V	GSC_AD31

Table 5-15 identifies the backplane connector pin assignments and signal mnemonics for the Model 745 P2/J2, slots 2 and 3.

**Table 5-15 Model 745 P2/J2 Pin Assignments and Signal Mnemonics**

Pin Number	Row A	Row B	Row C
1	User defined	+5Vdc	User defined
2	User defined	GND	User defined
3	User defined	Reserved	User defined
4	User defined	A24	User defined
5	User defined	A25	User defined
6	User defined	A26	User defined
7	User defined	A27	User defined
8	User defined	A28	User defined
9	User defined	A29	User defined
10	User defined	A30	User defined
11	User defined	A31	User defined
12	User defined	GND	User defined
13	User defined	+5Vdc	User defined
14	User defined	D16	User defined
15	User defined	D17	User defined
16	User defined	D18	User defined
17	User defined	D19	User defined
18	User defined	D20	User defined
19	User defined	D21	User defined
20	User defined	D22	User defined
21	User defined	D23	User defined
22	User defined	GND	User defined
23	User defined	D24	User defined
24	User defined	D25	User defined
25	User defined	D26	User defined
26	User defined	D27	User defined
27	User defined	D28	User defined
28	User defined	D29	User defined
29	User defined	D30	User defined
30	User defined	D31	User defined
31	User defined	GND	User defined
32	User defined	+5Vdc	User defined

Table 5-25 identifies the PMC JN1 signals on the PMC Bridge J21 connectors.

**Table 5-16**      **PMC JN1 Signals (Bridge J21)**

Pin Number	Signal	Pin Number	Signal
1	TCK	2	-12V
3	Ground	4	INTC
5	INTB#	6	INTA
7	BUSMODE1#	8	+5V
9	INTD#	10	PCI-RESERVED
11	Ground	12	PCI-RESERVED
13	CLK	14	Ground
15	Ground	16	GNTB#
17	REQB#	18	+5V
19	VDD(I/O)	20	AD31
21	AD28	22	AD27
23	AD25	24	Ground
25	Ground	26	C/BE3#
27	AD22	28	AD21
29	AD19	30	+5V
31	VDD(I/O)	32	AD17
33	FRAME#	34	Ground
35	Ground	36	IRDY#
37	DEVSEL#	38	+5V
39	Ground	40	LOCK#
41	SDONE#	42	SBO#
43	PAR	44	Ground
45	VDD(I/O)	46	AD15
47	AD12	48	AD11
49	AD09	50	+5V
51	Ground	52	C/BE0#
53	AD06	54	AD05
55	AD04	56	Ground
57	VDD(I/O)	58	AD03
59	AD02	60	AD01
61	AD00	62	+5V
63	Ground	64	REQ64#

Table 5-25 identifies the PMC JN2 signals on the PMC Bridge J22 connectors.

**Table 5-17**      **PMC JN2 Signals (Bridge J22)**

Pin Number	Signal	Pin Number	Signal
1	+12V	2	TRST#
3	TMS	4	TDO
5	TDI	6	Ground
7	Ground	8	PCI-RESERVED
9	PCI-RESERVED	10	PCI-RESERVED
11	BUSMODE2#	12	+3.3V
13	RST	14	BUSMODE3
15	+3.3V	16	BUSMODE4
17	PCI-RESERVED	18	Ground
19	AD30	20	AD29
21	Ground	22	AD26
23	AD24	24	+3.3V
25	IDSEL(1)	26	AD23
27	+3.3V	28	AD20
29	AD18	30	Ground
31	AD16	32	C/BE2#
33	Ground	34	PMC-RSVD
35	TRDY#	36	+3.3V
37	Ground	38	STOP#
39	PERR#	40	Ground
41	+3.3V	42	SERR#
43	C/BE1#	44	Ground
45	AD14	46	AD13
47	Ground	48	AD10
49	AD08	50	+3.3V
51	AD07	52	PMC-RSVD
53	+3.3V	54	PMC-RSVD
55	PMC-RSVD	56	Ground
57	PMC-RSVD	58	PMC-RSVD
59	Ground	60	PMC-RSVD
61	ACK64#	62	+3.3V
63	Ground	64	PMC-RSVD



Table 5-24 identifies the PMC JN1 signals on the PMC Bridge J11 connectors.

**Table 5-18**      **PMC JN1 Signals (Bridge J11)**

Pin Number	Signal	Pin Number	Signal
1	TCK	2	-12V
3	Ground	4	INTB
5	INTC#	6	INTD
7	BUSMODE1#	8	+5V
9	INTA#	10	PCI-RESERVED
11	Ground	12	PCI-RESERVED
13	CLK	14	Ground
15	Ground	16	GNTA#
17	REQA#	18	+5V
19	VDD(I/O)	20	AD31
21	AD28	22	AD27
23	AD25	24	Ground
25	Ground	26	C/BE3#
27	AD22	28	AD21
29	AD19	30	+5V
31	VDD(I/O)	32	AD17
33	FRAME#	34	Ground
35	Ground	36	IRDY#
37	DEVSEL#	38	+5V
39	Ground	40	LOCK#
41	SDONE#	42	SBO#
43	PAR	44	Ground
45	VDD(I/O)	46	AD15
47	AD12	48	AD11
49	AD09	50	+5V
51	Ground	52	C/BE0#
53	AD06	54	AD05
55	AD04	56	Ground
57	VDD(I/O)	58	AD03
59	AD02	60	AD01
61	AD00	62	+5V
63	Ground	64	REQ64#

Table 5-25 identifies the PMC JN2 signals on the PMC Bridge J12 connectors.

**Table 5-19**      **PMC JN2 Signals (Bridge J12)**

Pin Number	Signal	Pin Number	Signal
1	+12V	2	TRST#
3	TMS	4	TDO
5	TDI	6	Ground
7	Ground	8	PCI-RESERVED
9	PCI-RESERVED	10	PCI-RESERVED
11	BUSMODE2#	12	+3.3V
13	RST	14	BUSMODE3
15	+3.3V	16	BUSMODE4
17	PCI-RESERVED	18	Ground
19	AD30	20	AD29
21	Ground	22	AD26
23	AD24	24	+3.3V
25	IDSEL(2)	26	AD23
27	+3.3V	28	AD20
29	AD18	30	Ground
31	AD16	32	C/BE2#
33	Ground	34	PMC-RSVD
35	TRDY#	36	+3.3V
37	Ground	38	STOP#
39	PERR#	40	Ground
41	+3.3V	42	SERR#
43	C/BE1#	44	Ground
45	AD14	46	AD13
47	Ground	48	AD10
49	AD08	50	+3.3V
51	AD07	52	PMC-RSVD
53	+3.3V	54	PMC-RSVD
55	PMC-RSVD	56	Ground
57	PMC-RSVD	58	PMC-RSVD
59	Ground	60	PMC-RSVD
61	ACK64#	62	+3.3V
63	Ground	64	PMC-RSVD

Table 5-21 identifies the PMC JN4 User Defined pin outs on the PMC Bridge J14 connector that is wired to the backplane P2 connector.

**Table 5-20**      **PMC JN4 Pin Outs (Bridge J14)**

Pin Number	Signal	Pin Number	Signal
1	P2-C1	2	P2-A1
3	P2-C2	4	P2-A2
5	P2-C3	6	P2-A3
7	P2-C4	8	P2-A4
9	P2-C5	10	P2-A5
11	P2-C6	12	P2-A6
13	P2-C7	14	P2-A7
15	P2-C8	16	P2-A8
17	P2-C9	18	P2-A9
19	P2-C10	20	P2-A10
21	P2-C11	22	P2-A11
23	P2-C12	24	P2-A12
25	P2-C13	26	P2-A13
27	P2-C14	28	P2-A14
29	P2-C15	30	P2-A15
31	P2-C16	32	P2-A16
33	P2-C17	34	P2-A17
35	P2-C18	36	P2-A18
37	P2-C19	38	P2-A19
39	P2-C20	40	P2-A20
41	P2-C21	42	P2-A21
43	P2-C22	44	P2-A22
45	P2-C23	46	P2-A23
47	P2-C24	48	P2-A24
49	P2-C25	50	P2-A25
51	P2-C26	52	P2-A26
53	P2-C27	54	P2-A27
55	P2-C28	56	P2-A28
57	P2-C29	58	P2-A29
59	P2-C30	60	P2-A30
61	P2-C31	62	P2-A31
63	P2-C32	64	P2-A32

Table 5-21 identifies the PMC Bridge J3 connector that routes signals from the bridge board to the PMC expander board.

**Table 5-21**      **PMC Bridge J3 Connector**

Pin Number	Signal	Pin Number	Signal	Pin Number	Signal
1	SYNC-EXP1	39	GSC-AD23	114	PCI-STOP-L
2	GSC-READY-L	40	GSC-AD24	115	PCI-AD0
3	GSC-RESET-L	41	GSC-AD25	116	PCI-AD1
4	GSC-ADDV-L	42	GSC-AD26	117	PCI-AD2
5	SYNC-EXP1-L	43	GSC-AD27	118	PCI-AD3
6	GSC-BR-L	44	GSC-AD28	119	PCI-AD4
7	GSC-BG-L	45	GSC-AD29	120	PCI-AD5
8	GSC-INTR-L	46	GSC-AD30	121	PCI-AD6
9	GSC-ERROR-L	47	GSC-AD31	122	PCI-AD7
10	GSC-PARITY	48	GSC-TYPE0	123	PCI-AD8
11	GSC-XO-L	49	GSC-TYPE1	124	PCI-AD9
12	GSC-LS-L	50	GSC-TYPE2	125	PCI-AD10
13	TRSTL	51	GSC-TYPE3	126	PCI-AD11
14	TMS	52	VDL	127	PCI-AD12
15	VDL	53	VDL	128	PCI-AD13
16	GSC-AD0	54	VDL	129	PCI-AD14
17	GSC-AD1	55	VDL	130	PCI-AD15
18	GSC-AD2	56	VDL	131	PCI-AD16
19	GSC-AD3	57	VDL	132	PCI-AD17
20	GSC-AD4	58-95	No connect	133	PCI-AD18
21	GSC-AD5	96	PCI-RST-L	134	PCI-AD19
22	GSC-AD6	97	PCI-SL3-CLK	135	PCI-AD20
23	GSC-AD7	98	PCI-FRAME-L	136	PCI-AD21
24	GSC-AD8	99	PCI-SL4-CLK	137	PCI-AD22
25	GSC-AD9	100	PCI-CBEO	138	PCI-AD23
26	GSC-AD10	101	PCI-CBE1	139	PCI-AD24
27	GSC-AD11	102	PCI-CBE2	140	PCI-AD25
28	GSC-AD12	103	PCI-CBE3	141	PCI-AD26
29	GSC-AD13	104	PCI-SERR-L	142	PCI-AD27
30	GSC-AD14	105	PCI-PERR-L	143	PCI-AD28
31	GSC-AD15	106	PCI-PAR	144	PCI-AD29
32	GSC-AD16	107	PCI-REQC-L	144	PCI-AD30
33	GSC-AD17	108	PCI-GNTC-L	146	PCI-AD31
34	GSC-AD18	109	PCI-REQD-L	147	PCI-INTA-L
35	GSC-AD19	110	PCI-GNTD-L	148	PCI-INTB-L
36	GSC-AD20	111	PCI-TRDY-L	149	PCI-INTC-L
37	GSC-AD21	112	PCI-IRDY-L	150	PCI-INTD-L
38	GSC-AD22	113	PCI-LOCK-L	151	PCI-DEVSEL-L
				152	VDL

Table 5-22 identifies the PMC JN1 signals on the PMC Expander J31 connectors.

**Table 5-22**      **PMC JN1 Signals (Expander J31)**

Pin Number	Signal	Pin Number	Signal
1	TCK	2	-12V
3	Ground	4	INTD
5	INTA#	6	INTB
7	BUSMODE1#	8	+5V
9	INTC#	10	PCI-RESERVED
11	Ground	12	PCI-RESERVED
13	CLK	14	Ground
15	Ground	16	GNTC#
17	REQC#	18	+5V
19	VDD(I/O)	20	AD31
21	AD28	22	AD27
23	AD25	24	Ground
25	Ground	26	C/BE3#
27	AD22	28	AD21
29	AD19	30	+5V
31	VDD(I/O)	32	AD17
33	FRAME#	34	Ground
35	Ground	36	IRDY#
37	DEVSEL#	38	+5V
39	Ground	40	LOCK#
41	SDONE#	42	SBO#
43	PAR	44	Ground
45	VDD(I/O)	46	AD15
47	AD12	48	AD11
49	AD09	50	+5V
51	Ground	52	C/BE0#
53	AD06	54	AD05
55	AD04	56	Ground
57	VDD(I/O)	58	AD03
59	AD02	60	AD01
61	AD00	62	+5V
63	Ground	64	REQ64#

Table 5-23 identifies the PMC JN2 signals on the PMC Expander J32 connectors.

**Table 5-23**      **PMC JN2 Signals (Expander J32)**

Pin Number	Signal	Pin Number	Signal
1	+12V	2	TRST#
3	TMS	4	TDO
5	TDI	6	Ground
7	Ground	8	PCI-RESERVED
9	PCI-RESERVED	10	PCI-RESERVED
11	BUSMODE2#	12	+3.3V
13	RST	14	BUSMODE3
15	+3.3V	16	BUSMODE4
17	PCI-RESERVED	18	Ground
19	AD30	20	AD29
21	Ground	22	AD26
23	AD24	24	+3.3V
25	IDSEL(3)	26	AD23
27	+3.3V	28	AD20
29	AD18	30	Ground
31	AD16	32	C/BE2#
33	Ground	34	PMC-RSVD
35	TRDY#	36	+3.3V
37	Ground	38	STOP#
39	PERR#	40	Ground
41	+3.3V	42	SERR#
43	C/BE1#	44	Ground
45	AD14	46	AD13
47	Ground	48	AD10
49	AD08	50	+3.3V
51	AD07	52	PMC-RSVD
53	+3.3V	54	PMC-RSVD
55	PMC-RSVD	56	Ground
57	PMC-RSVD	58	PMC-RSVD
59	Ground	60	PMC-RSVD
61	ACK64#	62	+3.3V
63	Ground	64	PMC-RSVD

Table 5-24 identifies the PMC JN1 signals on the PMC Expander J41 connectors.

**Table 5-24**      **PMC JN1 Signals (Expander J41)**

Pin Number	Signal	Pin Number	Signal
1	TCK	2	-12V
3	Ground	4	INTA
5	INTB#	6	INTC
7	BUSMODE1#	8	+5V
9	INTD#	10	PCI-RESERVED
11	Ground	12	PCI-RESERVED
13	CLK	14	Ground
15	Ground	16	GNTD#
17	REQD#	18	+5V
19	VDD(I/O)	20	AD31
21	AD28	22	AD27
23	AD25	24	Ground
25	Ground	26	C/BE3#
27	AD22	28	AD21
29	AD19	30	+5V
31	VDD(I/O)	32	AD17
33	FRAME#	34	Ground
35	Ground	36	IRDY#
37	DEVSEL#	38	+5V
39	Ground	40	LOCK#
41	SDONE#	42	SBO#
43	PAR	44	Ground
45	VDD(I/O)	46	AD15
47	AD12	48	AD11
49	AD09	50	+5V
51	Ground	52	C/BE0#
53	AD06	54	AD05
55	AD04	56	Ground
57	VDD(I/O)	58	AD03
59	AD02	60	AD01
61	AD00	62	+5V
63	Ground	64	REQ64#

Table 5-25 identifies the PMC JN2 signals on the PMC Expander J42 connectors.

**Table 5-25**      **PMC JN2 Signals (Expander J42)**

Pin Number	Signal	Pin Number	Signal
1	+12V	2	TRST#
3	TMS	4	TDO
5	TDI	6	Ground
7	Ground	8	PCI-RESERVED
9	PCI-RESERVED	10	PCI-RESERVED
11	BUSMODE2#	12	+3.3V
13	RST	14	BUSMODE3
15	+3.3V	16	BUSMODE4
17	PCI-RESERVED	18	Ground
19	AD30	20	AD29
21	Ground	22	AD26
23	AD24	24	+3.3V
25	IDSEL4)	26	AD23
27	+3.3V	28	AD20
29	AD18	30	Ground
31	AD16	32	C/BE2#
33	Ground	34	PMC-RSVD
35	TRDY#	36	+3.3V
37	Ground	38	STOP#
39	PERR#	40	Ground
41	+3.3V	42	SERR#
43	C/BE1#	44	Ground
45	AD14	46	AD13
47	Ground	48	AD10
49	AD08	50	+3.3V
51	AD07	52	PMC-RSVD
53	+3.3V	54	PMC-RSVD
55	PMC-RSVD	56	Ground
57	PMC-RSVD	58	PMC-RSVD
59	Ground	60	PMC-RSVD
61	ACK64#	62	+3.3V
63	Ground	64	PMC-RSVD



## Real-Time Clock (RTC) Battery Information

The following section contains information on the real-time clock battery.

### Battery Specifications

Table 5-26 summarizes the RTC battery specifications.

**Table 5-26**

### RTC Battery Specifications

Type	Voltage	Manufacturer	Manufacturer Part No	HP Part No.	Battery Life Power Off	Battery Life Power On
Lithium	3 Vdc	RAYOVAC	BR-1225	1420-0541	6 Months	10 Years

---

**WARNING:**

**Danger of explosion if battery is incorrectly replaced.**

**Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.**

---

### Video Output Signal Specifications

The following input signal specifications are typical for all HP monitors:

- Output connector - 15-pin MDSM
- Impedance - 75 ohms Signal levels -
- Signal levels follow EIA standard RS-343A; white is positive. The composite sync is supplied on the green signal only. Horizontal sync pulses do not need to be supplied during the vertical sync pulse. However, the 75 Hz VESA-standard timing should use separate TTL horizontal and vertical syncs. Sync-on-green should not be supplied simultaneously with the separate syncs.

### Video Timing Specifications

This section contains information on video timing specifications. These specifications are not the output timing specifications for any particular graphics option. They are the input specifications for Hewlett-Packard monitors.

Table 5-27 summarizes the timing specifications for the 1280 x 1024 monitors at 72 Hz.

**Table 5-27 Timing Specifications at 72 Hz (A4490A)**

<b>Signal</b>	<b>1280x1024 72 Hz</b>
Horizontal active scan	9.482 $\mu$ s
Horizontal “back porch”	1.422 $\mu$ s
Horizontal blanking	3.318 $\mu$ s
Horizontal “front porch”	0.474 $\mu$ s
Horizontal period (“1H”)	12.800 $\mu$ s
Horizontal sweep frequency	78.125KHz
Horizontal sync width	1.422 $\mu$ s
Pixel clock rate	135.000MHz
Vertical active period	13.107ms
Vertical “back porch”	704.00 $\mu$ s (55H)
Vertical blanking	0.780ms
Vertical frame rate	72.005Hz (non-in)
Vertical “front porch”	38.400 $\mu$ s (3H)
Vertical period	13.887ms
Vertical sync width	38.400 $\mu$ s (3H)

Table 5-28 summarizes the timing specifications for the 1280 x 1024 monitors at VESA 75 Hz standard.

**Table 5-28 Timing Specifications for VESA 75 HZ Standard (A4490A and A4575A)**

<b>Signal</b>	<b>1280x1024</b>
Horizontal active scan	9.481 $\mu$ s
Horizontal "back porch"	1.837 $\mu$ s
Horizontal blanking	3.022 $\mu$ s
Horizontal "front porch"	0.119 $\mu$ s
Horizontal period ("1H")	12.504 $\mu$ s
Horizontal sweep frequency	79.976KHz
Horizontal sync width	1.067 $\mu$ s
Pixel clock rate	135.000Mhz
Vertical active period	12.804ms
Vertical "back porch"	475.15 $\mu$ s
Vertical blanking	0.525ms
Vertical frame rate	75.025Hz (non-in)
Vertical "front porch"	13.000 $\mu$ s (1H)
Vertical period	13.329ms
Vertical sync width	37.520 $\mu$ s (3H)

In the past, Hewlett-Packard workstation timing was set with sync-on-green. The VESA standard provides separate TTL syncs, thereby providing an unambiguous way for the monitor to distinguish them.



---

## **Power Requirements**

This chapter discusses power distribution and monitor ac power specifications.

## Power Supply Specifications

The power supply for the Model 745/132L is a 400 Watt output direct current (dc) power supply system with a universal ac front end operating from a 115/230 volt source. The input frequencies are 50 Hz and 60 Hz. The power supply also contains power factor correction.

The power supply accommodates the needs of all devices and options available for the Model 745/132L (within specifications for the options and applicable interface specifications). No power budgeting is required.

Table 6-1 shows the power supply specifications.

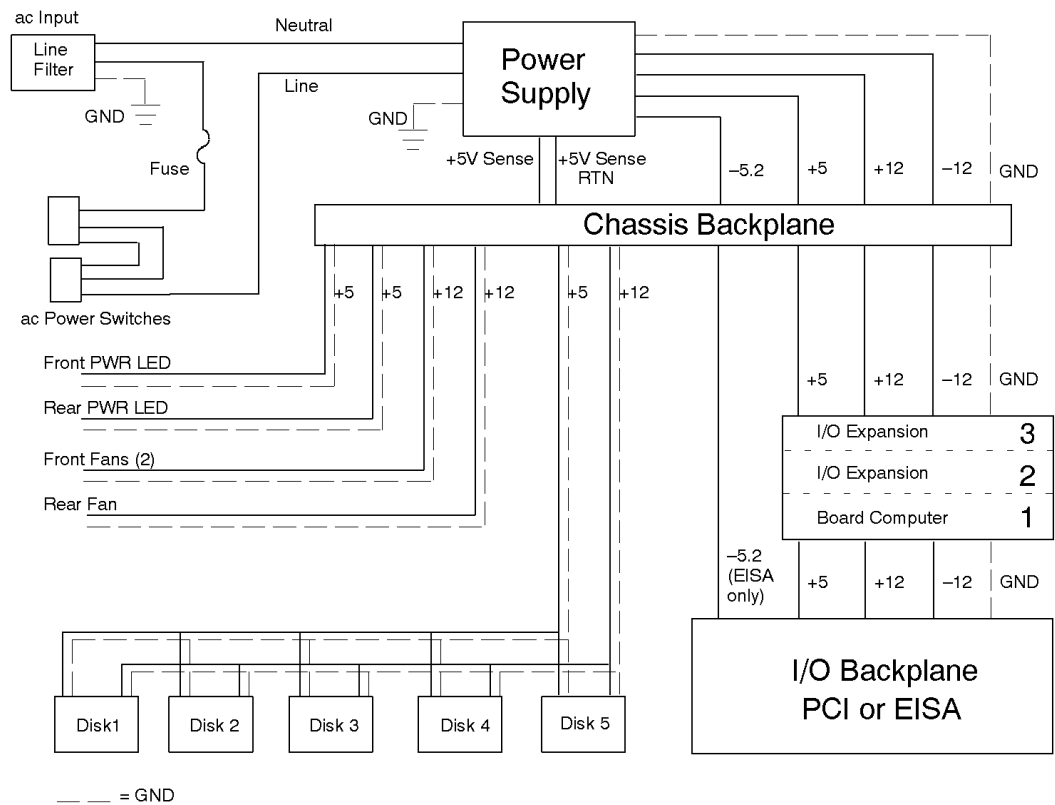
**Table 6-1 Model 745/132L Power Supply Specifications (for reference only)**

Output	+5.1 V		+12 V		-12 V		-5.2 V	
	Min	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Total Regulation	4.95 V	5.25 V	11.65 V	12.60 V	-11.65 V	-12.60 V	-4.94 V	-5.46 V
Output Current - Peak	0 A	42.5 A	0 A	10.0 A	0 A	2.0 A	0 A	1.0 A
Line Regulation		25 mV		120 mV		120 mV		100 mV
Load Regulation		50 mV		120 mV		120 mV		100 mV
Cross Regulation		50 mV		120 mV		120 mV		100 mV
PARD to 20MHz BW		100 mV pk to pk		120 mV pk to pk		180 mV pk to pk		100 mV pk to pk
PARD to 200MHz BW		100 mV pk to pk		180 mV pk to pk		200 mV pk to pk		100 mV pk to pk
Dynamic Response		50 mV		120 mV		120 mV		100 mV
Recovery		500 $\mu$ s		500 $\mu$ s		500 $\mu$ s		500 $\mu$ s
Over Voltage Protection	6.0 V	6.6 V	15 V	17 V	-15 V	-17 V	-6.0 V	-7.0 V
Current Limit	45.0 A	55.0 A	15.5 A	20.0 A	4.0 A	8.0 A	1.5 A	4.0 A

## Chassis Power Distribution

Figure 6-1 shows the power distribution for the Model 745/132L csystem. Power is distributed to the chassis backplane from the power supply through a set of cables. The board computer module and I/O backplane modules connect directly to the chassis backplane, not requiring cables. A series of cables provide power to the LEDs, fans, and disk drives.

The front and rear ac power switches are three-way switches -- either can power on or off the system independently of the other.



**Figure 6-1**

**Model 745/132L Chassis Power Distribution**

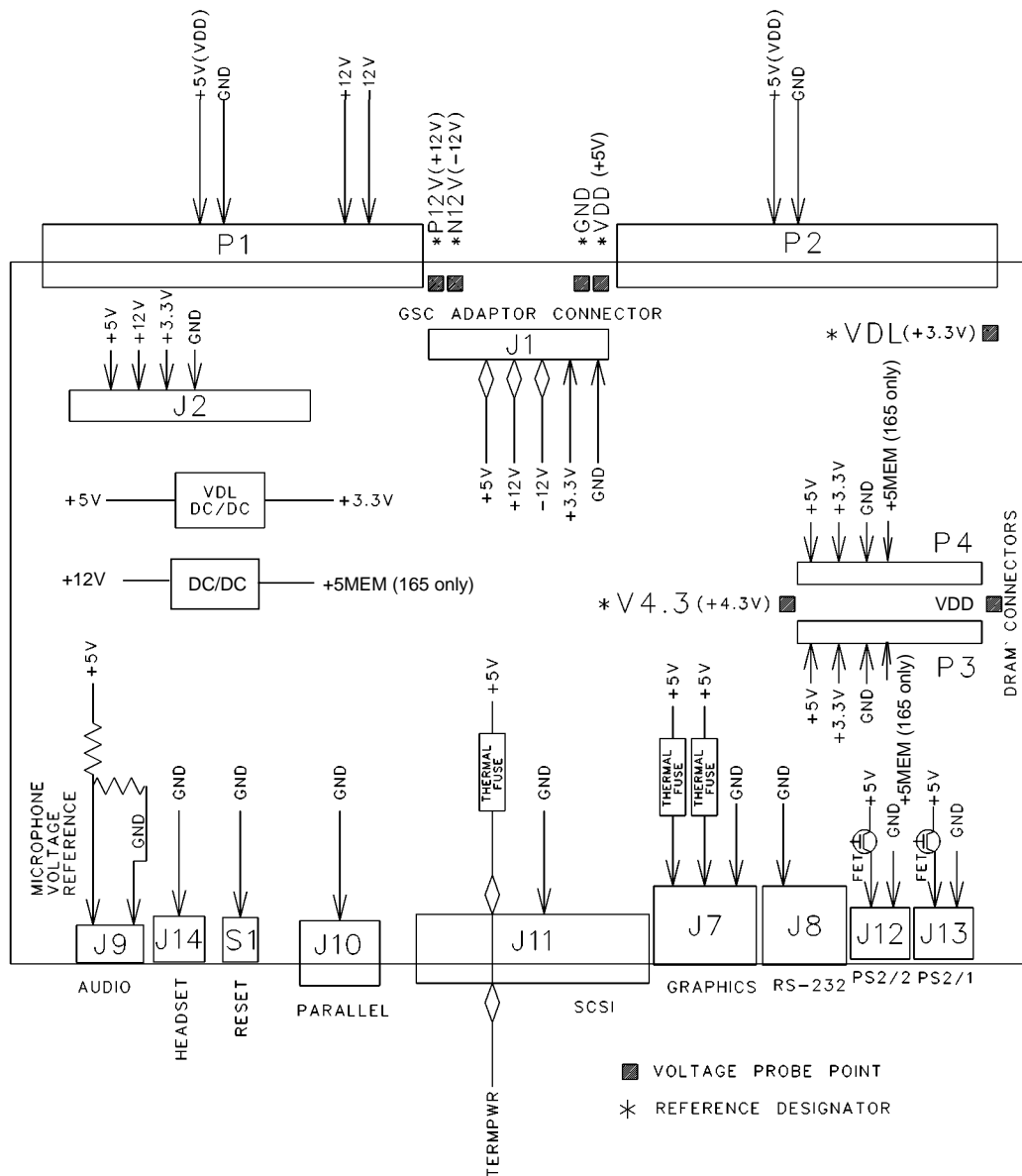
**Power Requirements**  
**Chassis Power Distribution**

The backplane connectors P1 and P2 distribute power to the Model 744 board computer, RAM cards, PMC adapters, and PMC option cards.

**NOTE:**

Backplane P1 and P2 connectors use two or more pins to carry power or grounds to the board computer. Check the P1 and P2 pinout tables for exact pin identification for power and grounds.

Figure 6-2 illustrates the power distribution for the Model 744 board computers. Figure 6-3 illustrates the power distribution for the PMC adapters.



**Figure 6-2 Model 744 Board Computer Power Distribution Diagram**



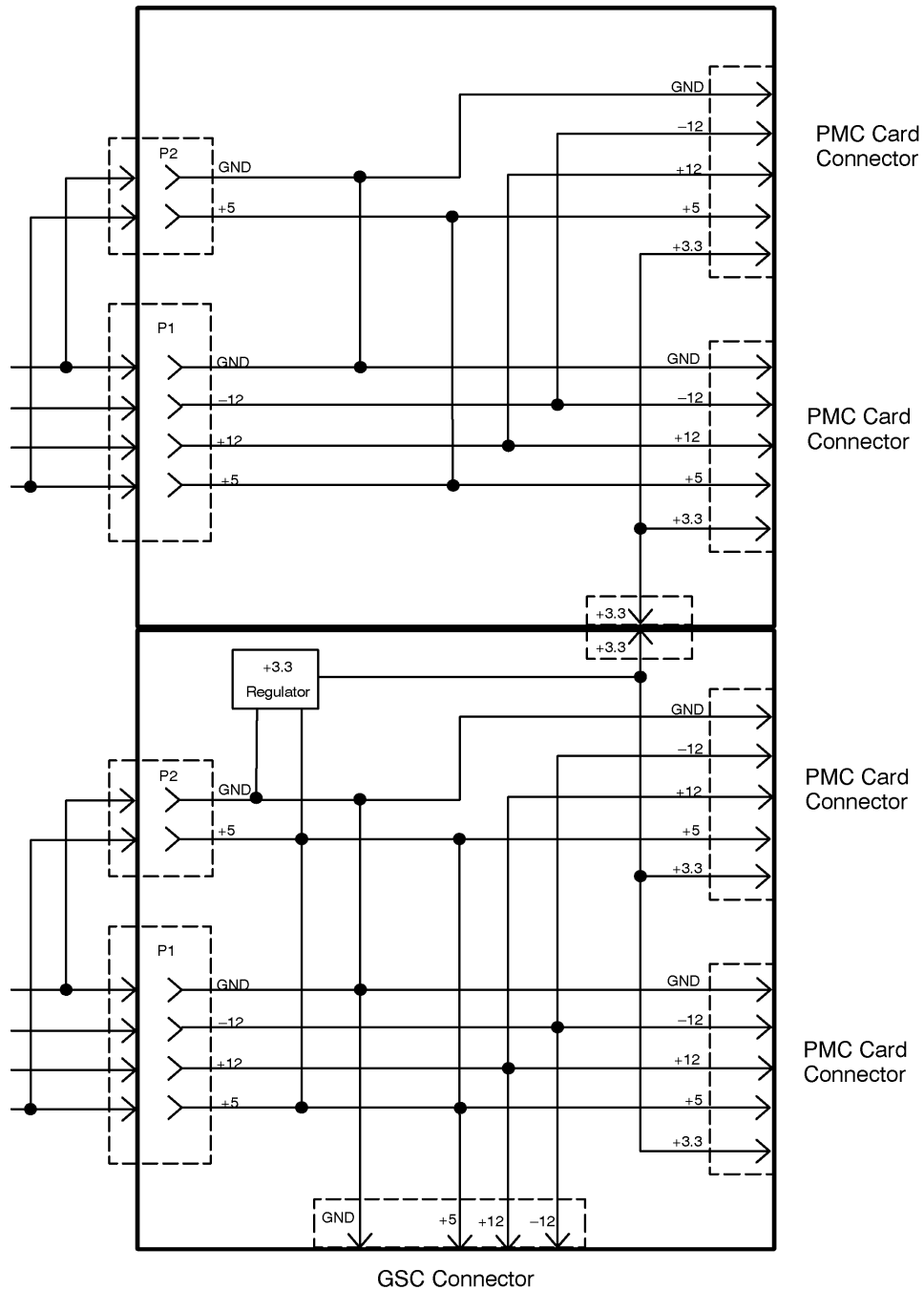


Figure 6-3 PMC Adapters Power Distribution

## Monitor Power Specifications

The following section describes the ac power specifications for the 17-inch and 19-inch monitors.

Table 6-2 summarizes the ac power specifications.

**Table 6-2**      **Monitor Power Specifications**

<b>Voltage Type</b>	<b>60 Hz</b>	<b>50 Hz</b>
Maximum operating (Vac)	132	288
Minimum operating (Vac)	90	198
Nominal rated (Vac)	110	230
Rated line current (Arms)	2.7	1.5
Frequency range (not-strappable)	47 Hz to 63 Hz	47 Hz to 63 Hz

---

# Index

---

## A

AFR projections 15  
annualized failure rate 15  
audio 1-16  
AUI LAN 1-17

## B

boot ROM circuit 1-13

## C

cables  
  conversion 1-10, 4-22  
Canadian Standards Association 6  
chassis  
  modules 4-23  
  parts 4-23  
clock, battery backed real-time 1-19  
clocks 1-8  
CODEC 1-16  
component weights 4-21  
conversion audio cable 5-7  
conversion cables 1-10, 4-22  
conversion HP parallel cable 5-9  
conversion LAN cable 5-13  
conversion RS-232 cable 5-11  
conversion video cable 5-4, 5-5  
CPU 1-8  
CPU circuit 1-13

## D

dimensions  
  chassis backplane 4-9  
  chassis base module 4-4  
  chassis mid-tray 4-5  
  chassis top cover 4-3  
  disk adapter bracket 4-7  
  disk carrier 4-6  
  disk carrier lower shield 4-8  
  disk carrier upper shield 4-7  
  EISA backplane 4-8  
  Model 744 RAM card 4-17  
  Model 744 system board 4-12  
  Model 745 chassis 4-2  
  PCI backplane 4-9  
  PMC bridge adapter 4-19  
  PMC expansion adapter 4-20

## E

EISA module 1-4

## F

FCC 7  
features, standard  
  Model 744 1-8

## G

graphics circuit 1-13

## H

HP parallel port 1-18

## I

I/O controller 1-15  
I/O controller ASIC 1-15  
input specifications 5-31  
interface  
  SCSI 1-3  
interface connector 4-11

## K

key components  
  Model 744 4-10

## M

main memory 1-8  
manuals  
  hardware 2-1  
mass storage 1-3  
mean time between failure 15  
mechanical drawings 4-22  
memory  
  Model 744 1-9  
memory controller circuit 1-14  
monitor  
  ac power specifications 6-1, 6-6  
monitors  
  environmental specifications 1-6  
  supported 1-3  
MTBF computations 15

## O

OEM support 1-21  
operating system 1-8

## P

PCI module 1-4  
pinouts  
  audio connector 5-6  
  AUI LAN 5-12  
  backplane connector 5-17  
  HP parallel connector 5-8  
  PS/2 5-16  
  RS-232 5-10  
  single-ended SCSI connector 5-14  
  video connector 5-3  
PMC  
  power distribution 6-5  
PMC bridge adapter 4-19  
PMC connectors 5-21, 5-22, 5-23, 5-24, 5-25,  
  5-26, 5-27, 5-28, 5-29, 5-30  
PMC expansion adapter 4-20  
power 6-4  
power distribution 6-1  
  Model 744 6-4  
  PMC 6-5  
product description  
  Model 744 1-7  
PS/2 ports 1-18

## Q

quality 5

## R

RAM cards 1-14  
real-time clock battery 5-31  
RS-232 serial interface 1-19  
RTC battery specifications 5-31

## S

safety compliance programs 6  
SCSI  
  terminators 1-3  
SCSI interface 1-3  
SE SCSI 1-17  
single-ended SCSI 1-17  
single-ended SCSI connector pins 5-15  
specifications

video 5-31  
standard support 1-21  
statistical reliability 15  
support  
  OEM 1-21  
  standard 1-21  
supported configurations 1-9  
  Model 745 1-2

## T

terminators, SCSI 1-3  
tests  
  acoustics 13  
  climatic and environmental 12  
  power level 13  
  shock 14  
  vibration 14  
TUC Rheinland 6

## U

Underwriter's Laboratories 6  
upgrades, three slots 1-8  
upgrades, two slots 1-8  
user interface 1-8

## V

VCCI statement 8  
video timing 5-31  
Voluntary Control Council for Interference 8

---

# Index

---