HP 9000 Series 700 Workstations

Technical Reference Manual

Model 712 (SYSTEM)

Printed in USA January, 1994

Revision 1.0

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Printing History

New Editions of this manual incorporate all material updated since the previous edition. Update packages may be issued between editions and contain replacement and additional pages to be merged into the manual by the user.

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates which are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

January 1994 ... Edition 1

Electrostatic Discharge (ESD) Precautions

Electrostatic charges can damage the integrated circuits on printed circuit boards. To prevent such damage from occurring, observe the following precautions when unpacking and installing the board.

- Stand on a static–free mat.
- Wear a static strap to ensure that any accumulated electrostatic charge discharges from your body to ground.
- Connect all equipment together, including the static–free mat, static straps, routing nodes, and peripheral units.
- Keep uninstalled printed circuit boards in their protective antistatic bags.
- Once you have removed the printed circuit boards from their protective antistatic bags, handle them by their edges.

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General Information

Product Overview

Features

Hewlett−Packard's Model 712 Workstation is based on a 7100LC central processing unit (CPU) it provides a variety of interfaces, graphics, and mass storage.

Table 1−1. Model 712 Features

Features	Functionality
Operating system	HP–UX 9.03 (or later)
CPU	PA–RISC PA7100–LC
	Model 712/60 / Model 712/80
Frequency	60 MHz / 80 MHz
Performance	
SPECint92	58.1 / 84.3
SPECfp92	79 / 122.3
X11Perf	≥12K / ≥17K
Cache	64 KB / 256 KB
Time source	Battery–backed Real–Time Clock
Memory	4 slots 16 MB minimum required Upgradeable to 128 MB
Built–in interfaces	HP Parallel, SCSI–2, AUI & TP LAN, PS/2 Ports for keyboard and mouse, RS–232C, Headset Out, Line & Microphone In, Video out
Graphics	Depending on the monitor selected: ■ 8–bit Color (with Color Recovery) ■ 1024 by 768 resolution standard ■ 1280 by 1024 resolution with VRAM card ■ 15 pin PC VGA style female connector
Internal Mass storage module(s)	Optional 3.5–in. Flexible disk drive and Hard Disk Drive ■ 260 MB, 525 MB, or 1 GB Hard Disk Drives ■ PC style 3.5–in. Flexible disk drive
70–Watt Power supply	Low power consumption design

Memory

Standard memory is 16 MB of 70ns Error Checking and Correcting (ECC) RAM boards. 16 MB is the minimum required for HP−UX operating system. Each workstation has four RAM slots. Options may add more factory installed memory. Memory must always be added in pairs. Memory upgrades include:

HP A2577A 8 MB RAM Upgrade, two 4 MB RAM boards.
HP A2578A 16 MB RAM Upgrade, two 8 MB RAM boards.
HP A2829A 32 MB RAM Upgrade, two 16 MB RAM boards.
HP A2827A 64 MB RAM Upgrade, two 32 MB RAM boards.

Mass Storage

Internal

The Model 712 workstation can have an optional hard disk drive and an optional flexible disk drive factory−installed. Mass storage devices include:

HP A4065A 260 MB Hard Disk Drive Upgrade.
HP A4066A 525 MB Hard Disk Drive Upgrade.
HP A4067A 1 GB Hard Disk Drive Upgrade.
HP A4068A 3.5−in. Flexible Disk Drive Upgrade.

External

There are external storage devices that have been especially designed for the Model 712 workstation, they are the following:

HP A2655A External CD ROM Drive.
HP A2657A External 1 GB Hard Disk Drive.
HP A2656A External 2 GB DDS Tape Drive.

System Graphics

System Board Graphics

The Model 712 workstation comes with 8−bit color, 1024 by 768 resolution graphics. With use of an optional video RAM (VRAM) daughter card (HP A4025A), the graphics resolution can be increased to 1280 by 1024. The external video port is 15 pin VGA style connection. Table 1−2 lists the monitors supported.

Table 1−2. Supported Monitors

Product No.	Type	Resolution	Refresh Rate
HP A2882A	11.8–inch Flat panel	1024 by 768	75 Hz
HP D1196A	15–inch Color	1024 by 768	70 Hz
HP A2287A	17–inch Color	1024 by 768	75 Hz
HP A4032A	17–inch Color	1280 by 1024	Multi–Mode
HP A2094A	19–inch Color	1280 by 1024	72 Hz

Built−In Interfaces

System Board Interfaces

The system board's built−in interfaces have ports on the connector panel.

PS/2 Keyboard and Mouse Interfaces

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

HP Parallel Interface

The parallel port is compatible with PS/2 standards, plus some additional features found in HP Series 700 workstations. The basic PS/2 supports a bi−directional register model interface in addition to printer only DMA. There is support for both of these features in addition to providing the additional printer DMA handshakes found on Series 700 workstations. The register model interface will be able to support the new "Bitronics" printer interface. The Series 700 Scanjet interface will not be supported.

RS−232 Serial Interface.

There will be one PS/2 type serial interface. This standard interface is based on a 9−pin D−sub connector and supports CTS/RTS hardware handshaking. This port is based on the National 16550 serial interface chip.

Small Computer Systems Interface (SCSI−2)

The built−in SCSI−2 port is implemented using an NCR710 macrocell inside the I/O ASIC chip. This 8−bit single ended implementation is compatible with the current 700 series products and supports 5 MB/sec data transfer rates.

The SCSI bus is terminated to 3.3 volts through 127kΩ on the CPU board. The terminator must be removed from the internal disk drive. If an external disc drive is used an active terminator must be used on the drive at the end of the cable.

Local Area Network Interface.

The IEEE 802.3 Ethernet Local Area Network (LAN) circuit provides both the AUI interface for conventional coaxial Ethernet and a direct interface to a twisted pair (TP) 10BASE−T network. Only one interface can be used at a time, the system auto−selects the correct port that is being used. Ethernet is a 10 Mbit/s packet−switched serial interface employing Carrier Sense Multiple Access/Collision Detection (CSMA/CD). Table 1−3 lists the supported LAN adapters and other network devices.

Table 1−3.Supported AUI LAN Adapters and Devices

LAN Adaptor	Network Devices
HP 28641B ThinLAN Transceiver HP 30241A 10Base4 ThickLAN MAU	HP 28692A ThinLAN Hub Plus HP 28673A 10:10 LAN Bridge HP 28683A Fiber Optic Transceiver

Audio Interface

The 712 workstation provides compact disk quality audio input and output in stereo with a 16−bit CODEC (coder−decoder) over a frequency range of 25−20000Hz. A small internal speaker and a stereo headphone mini−plug (118Ω impedance) are provided for output. A stereo line−in and mono microphone mini−plugs are provided for input.

Some of the audio features and specifications are listed below:

- Programmable rates of 8, 11.025, 16, 22.05, 32, 44.1, and 48KHz.,
- Programmable output attenuation of 0− 96db. (1.5dB. steps)
- Programmable input gain of 0−22.5dB. (1.5dB. steps)
- Input monitoring
- 16 bit linear, 8 bit μ −Law , or A−Law coding
- Signal to Noise of 61dB. for Headphone and Line In and 57dB. for Microphone
- Input sensitivity 2.0V_{pk} (47kΩ) Line−In and 22mV_{pp} (1kΩ) Microphone
- Headphone Max. output level of 2.75V_{pp} (50Ω)

A Digital Signal Processor (DSP) based option card is provided to enhance the audio subsystem by providing phone and modem functions. Other special DSP applications can also be down−loaded to this card.

Expansion Slot

The expansion I/O slot connects to the same signals on the General System Connect (GSC) as does the I/O ASIC. Arbitration signals are provided so that the expansion slot can be a bus master. On the Model 712 Workstation, the expansion slot will be used to provide an optional IEEE 802.5 (token ring) or a second IEEE 802.3 (ethernet) network connection, or other optional I/O interfaces that are covered in Chapter 3.

HP Teleshare Slot

The Teleshare slot will accommodate the HP Teleshare card that is composed of two complete telephone interfaces. One interface could be devoted to voice applications, and the other could be equipped with V.32bis and V.42bis data modem and fax. In addition to these features, Teleshare will include:

- Caller ID
- Call Waiting
- Conference Calling
- Data Rate conversion and mixing
- Call Recording and Voice Mail
- A multitude of DTMF–based applications

**Note: Some of the features listed such as Caller ID and DTMF−based applications might not be supported by all international phone systems.

Hardware Architecture

Most of the functionality is on one assembly, the system board. The system board has the interface controllers, CPU circuits, memory controller, and graphics/video circuits. RAM boards plug into sockets on the system board.

Operating System

HP–UX

HP−UX 9.03 (or later) is supported on the Model 712 workstation. It is booted from an internal hard disk drive factory installed with Instant Ignition. HP−UX may also be installed from external DDS or CD−ROM drives. If the workstation is a client on LAN, HP−UX can be booted over the LAN.

Table 1−4 lists the HP−UX operating systems and languages for the workstation.

Table 1−4. HP–UX Operating Systems and Languages

Operating system:	HP–UX 9.03 or later. HP–UX complies with the UNIX® System V Interface Definition X/Open and POSIX Specifications and will be fully compliant with Operating Systems Foundation (OSF)
Languages	C/ANSI C FORTRAN 9000 Pascal HP C++ C++ Developer
User Interface and Graphics Libraries	HP GKS X11R5 Motif 1.2 VUE 3.0 Architect 2.0

Product Identification

On the back of the Model 712 workstation, a label lists the product's serial number. The information can be interpreted as shown below for an example serial number 6247A00001:

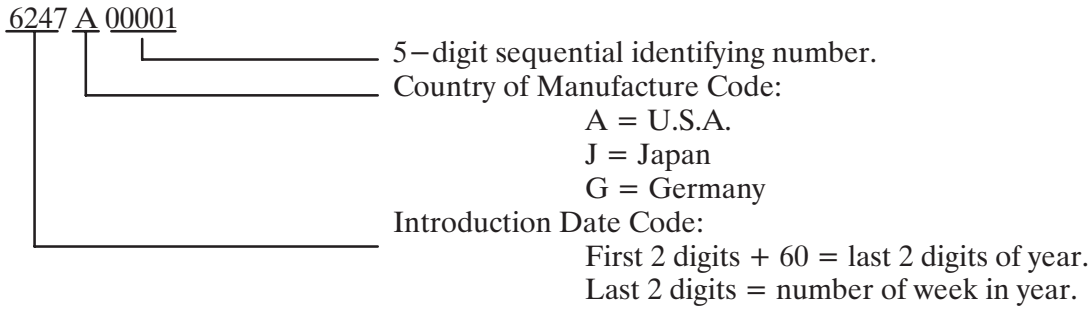


Figure 1−1. Product Serial Number Label Interpretation

Board Products

HP A2877A System Board
HP A4012A Telephony Card (US, Canada, Japan)
HP A4011A IBM Token Ring Card
HP A4013A 2nd Serial Card
HP A4014A 2nd LAN/Serial Card
HP A4015A X.25/Serial Card
HP A2878A 2nd Monitor Card

Support Documentation

Tables 1−5, and 1−6 list the service and support documentation.

Table 1−5. Service Documentation

Manual Title	Part Number
Service Handbook; HP 9000 Model 712 Workstations Servicing Hewlett–Packard Workstation Monitors	A2615–90602 5960–1511

Table 1−6. System Installation and Getting Started Documentation

Manual Title	Part Number
HP Apollo 9000 Series 700 Model 712 Owner's Guide	A2615–90616
HP 9000 Model 712 Hardware Installation Guide	A2615–90600
HP A2655A CD–ROM Drive Installation Guide	A2615–90603
HP A4021A DDS–Format Tape Drive Installation Guide	A2615–90604
HP A4020A SCSI Disk Installation Guide	A2615–90605
HP A4068A Floppy Disk Drive Installation Note	A2615–90606
HP A4064A Hard Disk Drive Installation Note	A2615–90607
HP A4012A Teleshare Hardware Installation Guide (Domestic Kit)	A2615–90608
HP A4012A Teleshare Hardware Installation Guide (International Kit)	A2615–90609
HP Options Installation Note	A2615–90610
HP A2577A/A2578A/A2576A/A2575 Memory Installation Note	A2615–90611
HP A4011A HP Token Ring/9000 Configuration Guide	A2615–90614
HP A4025A Video RAM Board Installation Guide	A2615–90612
HP A2882A Flat panel display Installation Guide	A2615–90613
HP A2878A 2nd Monitor Card Hardware Installation Guide	A2878–90010
SCSI Tech Data	5951–7100
HP–UX Device Driver Manual	98577–9014
SCSI Tech Reference Manual	98265–90010

Quality Assurance Information

Safety

Approvals

- UL1950
- CSA22.2 950–M
- TUV EN60950
- Finland TSH
- EMKO TUE (74) DK203
- Sweden's SS 43614 50
- Sweden SP to SSFS 1980: 2 (with CD)

Ergonomics

Approvals

- TUV ZH1/618
- ISO 9241

Acoustics

- ISO 7779/ISO 9296 Methods

EMC

Approvals

- FCC 47 cfr, part 15 sub−part J, Class B
- Korean RRL, Class B
- VCCI, Class 2
- EN55022/CISPR 22 Class B
- Canadian DOC Class B

Environmental Specifications

With Internal Mass Storage

Temperature

Operating: 5 to 40deg. C; 20deg. C/hr rate of change maximum
Non−operating: −40 to 60deg. C

Altitude

Operating: 3050m (10,000 ft)
Non–operating: 4600m (15,000 ft)

Shock

Operating: 30 in/sec − approx. 60 G peak < 3.0 msec half sine wave or 5 G < 11.0 msec half sine waveform. (This is less severe than class C1).
Survival (non−operating): 292 in/sec − approx. 30 G peak < 25 msec trapezoidal waveform
Packaged (non−operating): 30” freefall, 10 impacts (6 faces, 4 bottom corners).

Vibration

Operating Random: 0.21 G rm
Survival Random: 2.09 G rms
Survival Sine: 0.5G peak, 5−500 Hz

Noise Output

Less than 4.4 Bels Sound Power Level at 5−30deg. C ambient temperature.
Less than 5.2 Bels Sound Power Level at 30−40 deg. C ambient temperature.

Reliability

The estimated Annualized Failure Rate (AFR) is based on 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.. Mean Time Between Failures (MTBF) is the reciprocal of the AFR.

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 which occurs in the first few months of use and before long−term wear out which occurs after many years of use. This product assumes an 8000 hour usage year, which is 91% duty. Actual customer experience may vary slightly.

Table 1−7. ATF and MTBF

Product	Configuration	AFR	MTBF
Model 712	16 MB, no mass storage	9.30%	10.75 years
Model 712	16 MB, with mass storage	13.3%	7.5 years

Mechanical

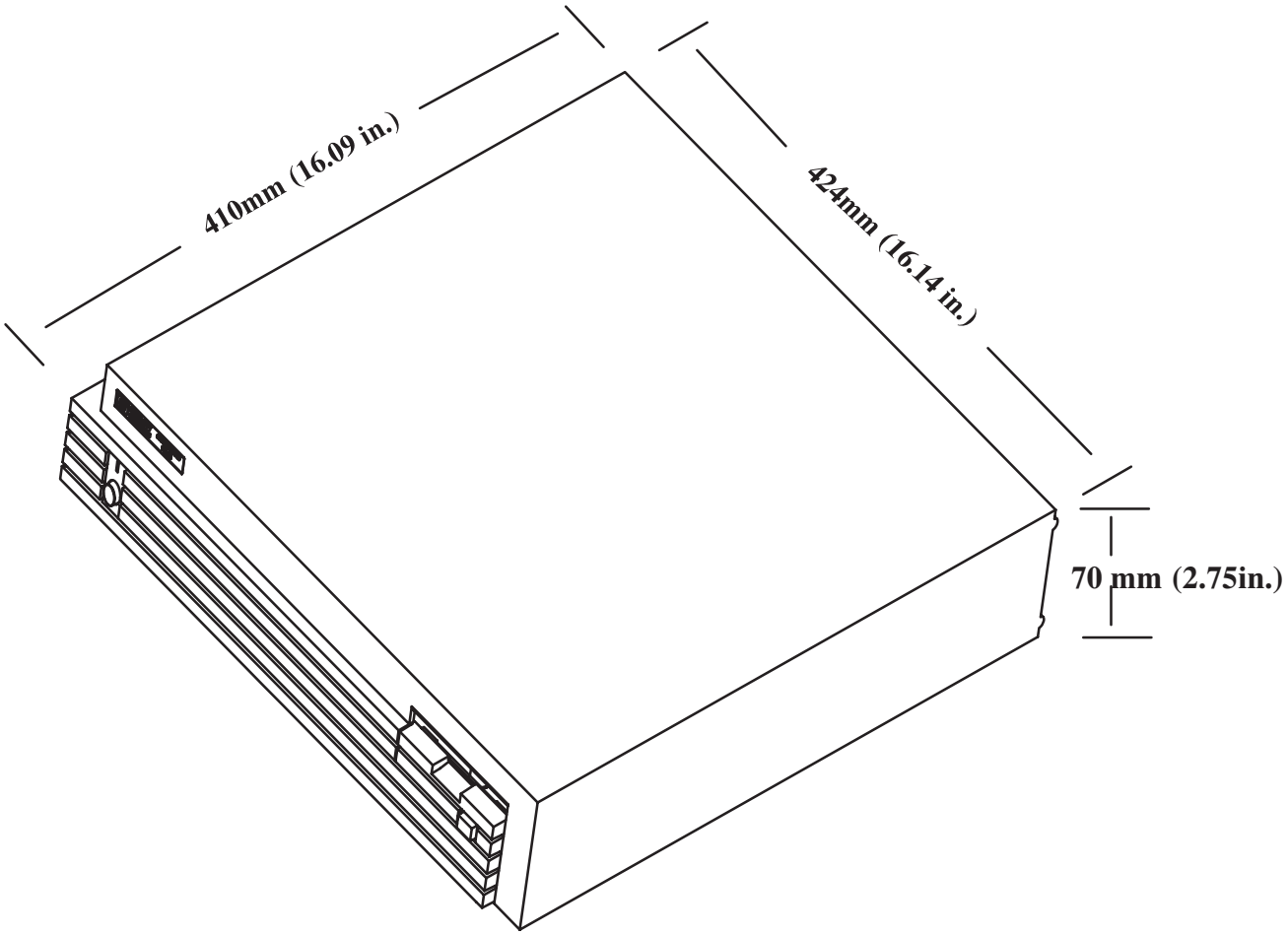


Figure 1−2. Chassis Dimensions

Air Flow

The Model 712 workstation is cooled by forced convection. One dual−speed 80mm DC fan provides the airflow across the entire operating temperature range. Airflow is primarily front to back. The total airflow through the box is approximately 12 CFM, with about 3.6 CFM of that air going to the power supply. At 30C ambient temperature, the fan switches to its faster speed for more efficient cooling.

In order to cool the bottom side of the system board, there are holes in the sheet metal chassis along the bottom edge to allow a small amount of air to travel under the processor. The PCX−L processor requires a heatsink. The heatsink is an extruded aluminum cross−cut design to maximize the heat dissipation.

Technical Drawings and Schematics

These drawings are available by request through your Hewlett−Packard Sales Representative. Ask for the drawings you need by referencing them by Name and Drawing Number.

Table 1−8. Mechanical Drawings and Schematics

Description	Drawing Number
System Board Blank	D–A2263–66510–51
System Board Schematic	D–A2263–66510–40
Video RAM Board Blank	B–A2263–26520–51
Teleshare Board Blank	D–A2263–66530–51
Token Ring Board Blank	D–A2263–66531–51
Embossed Nameplate	B–A2263–84005–10

2

System Board

Functional Information

Diagnostics

Self−Test and Extended Self−Test

Self−Test is provided by the BOOT ROM and is executed as soon as the workstation is powered on. After power−on and boot, the front panel LED will flash, three quick flashes pause and repete if there is something wrong with the graphics subsystem. If the LED flashes in a three quarter of a second pattern the CPU is defective. Your system will run a series of diagnostic tests to check the hardware configuration. Figure 2−1 illustrates what you will see.

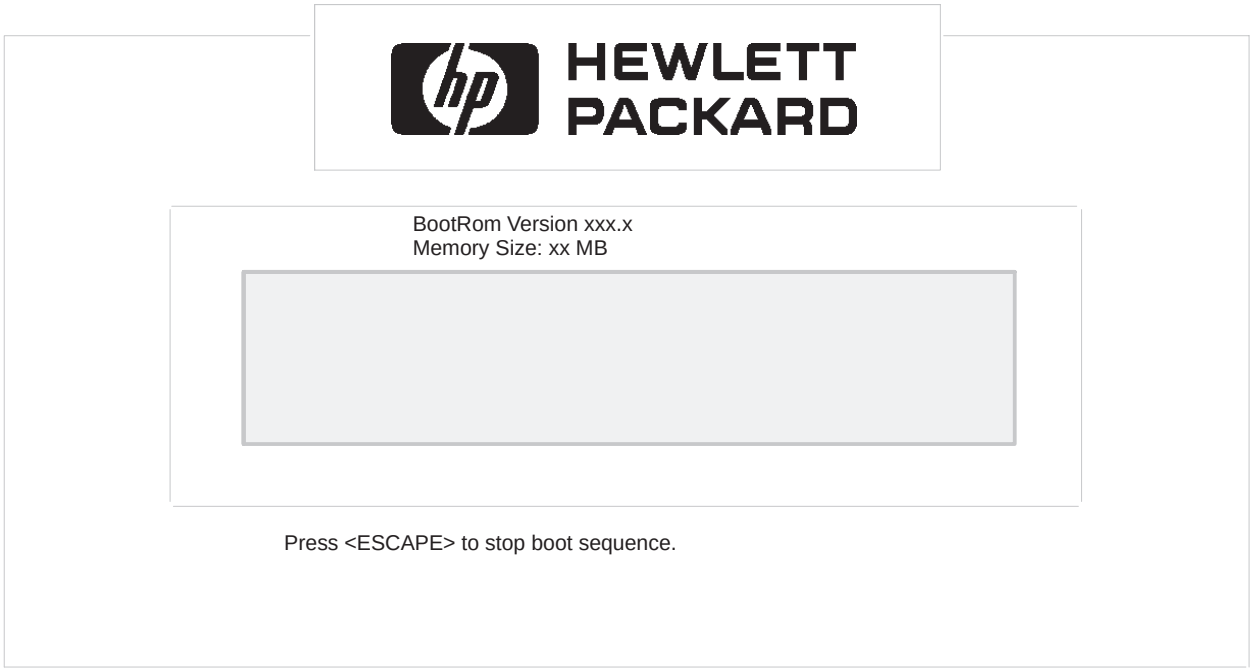


Figure 2−1. I/O Test During Self−Test

If an error occurs during the self test, you will see a second screen depicting an overview of the system unit components, as shown in Figure 2−2.

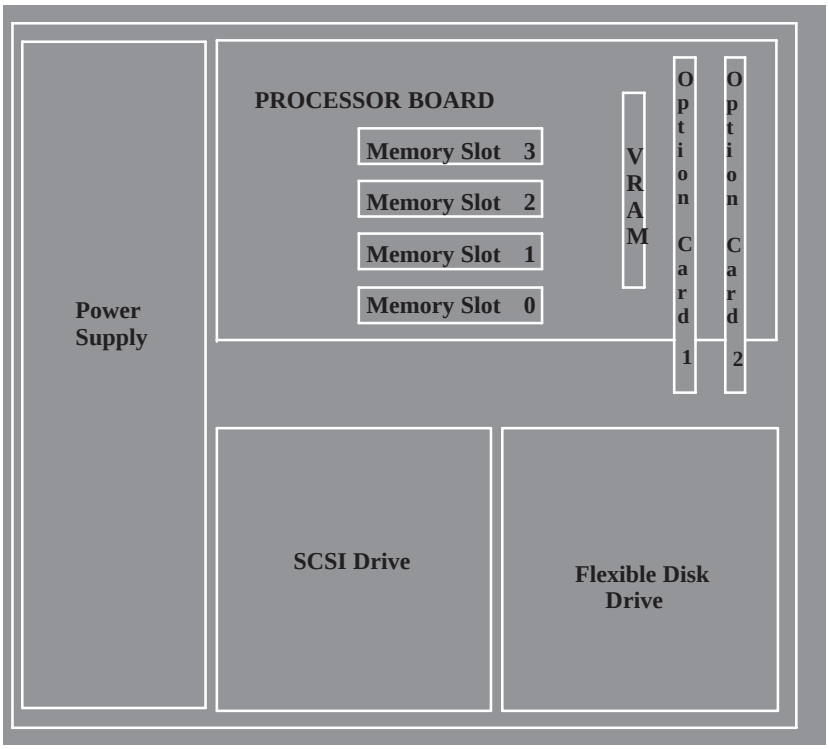


Figure 2−2. Self−Test Error Display

The defective component is highlighted on the screen. To the right or below the diagram, the self test calls out the defective component.

SupportWave Diagnostics

HP−UX uses a diagnostics product called SupportWave. SupportWave contains the Support Tools Manager so that you can verify your system operation.

As a superuser (logged in as **root**), you can access the Support Tools Manager while in a terminal window. If you are using HP VUE as your interface, you can also access the Support Tools Manager through the **sys_admin** directory.

Three interfaces are available with the Support Tools Manager: a command line interface (accessed through the **cstm** command), a menu−driven interface (accessed through the **mstm** command), and the graphical user interface (accessed trough the **xstm** command).

For more information on SupportWave user interfaces, see the online man pages by entering the following at a command line prompt:

man cstm
man mstm
man xstm

Interface Specifications

LAN−AUI and LAN−TP

IEEE−802.3 is an industry standard network used to connect HP and other vendor's systems together. Besides the built−in Twisted Pair (TP) and AUI connections, the system board provides connections to several alternatives via an AUI connector. Through this connector, the customer chooses the MAU (Media Access Unit) adaptor or transceiver necessary to meet the site requirements. Only one interface can be used at a time, the system auto−selects the correct port that is being used. Supported MAUs are listed in Table 2−1.

Table 2−1. Supported AUI LAN Adapters and Devices

LAN Adaptor	Network Devices
HP 28641B ThinLAN Transceiver HP 30241A 10Base4 ThickLAN MAU	HP 28692A ThinLAN Hub Plus HP 28673A 10:10 LAN Bridge HP 28683A Fiber Optic Transceiver

Below is a summary of the LAN interface on the system board:

- Intel 82596CA LAN Controller functionality.
- IEEE 802.3/Ethernet 1.0.
- Boot ROM source support for diskless.

The LAN interface technical information is listed in Table 2−2.

Table 2−2. LAN Interface Technical Information

Function	Data
Type:	IEEE 802.3, Ethernet 1.0
Data rate:	10 Mbits/second
Connector types:	AUI LAN – 15–pin Twisted Pair – 8–pin

Video

A proprietary graphics controller chip is the basis for system board graphics. The Graphics ASIC outputs the standard HP workstation video signal. This signal consists of three analog channels of color Red, Green, and Blue. The analog output of each channel conforms to the RS343A specifications when driving a doubly terminated 75 Ohm line. Video cable length should not exceed 30 feet, due to signal degradation. The system provides HPs' Color Recovery.
The graphics subsystem supports the following:

- 1024 by 768 by 8 bit color at 60 Hz to 75 Hz.
- 1280 by 1024 by 8 bit color at 60 Hz to 72 Hz (with optional VRAM Card).
- 15 pin VGA style connection.
- NGLE compatible.
- Support of the following VESA timings:
  1280 by 1024 at 75 Hz.
  1024 by 768 at 75 Hz.
  800 by 600 at 75 Hz.
  640 by 480 at 75 Hz.

RS−232

The RS−232 port is full modem control with RTS hardware flow control. The port is implemented using a 9−pin male D−sub connector. Some devices which are supported on RS−232C include modems, plotters, printers, terminals, digitizers, and other input devices.

Table 2−3 lists technical information for the RS−232 interface.

Table 2−3. RS−232 Technical Information

Function	Data
Type:	RS–232C
Baud rate:	50 to 454k Up to 227k input w/handshaking
Word size:	5 to 8 bits
Parity	Odd, even, one, zero, none
Device Type:	1 per interface connector
Connector Type:	9–pin male D–sub connector

HP Parallel

The Parallel Interface is an 8 bit parallel, synchronous interface commonly used for printers. The hardware implementation has bidirectional capabilities compatible with PS/2 standards, also know as Centronics R interface. The hardware is also capable of interfacing to BiTronics type printers which transmit status information back to the workstation. The HP Scanjet parallel port interface is NOT supported on this workstation, even through software handshaking.
Technical information for the HP Parallel interface is listed in Table 2−4.

Table 2−4. HP Parallel Interface Information

Function	Data
Type:	Centronics, NACK and BUSY handshakes
Data rate:	>400 Kbytes/second with DMA 250 Kbytes/second sustained
Device Limit:	1
Connector Type:	25–pin female DB25 connector; IBM PS/2

PS/2

The keyboard and mouse interfaces are implemented by simple serial ports conforming to the de−facto industry standard PS/2 specification. Both the keyboard and mouse have a dedicated serial port of its own. The interface ports rely on the software to provide all of their intelligence; therefore, they do not interpret the characters passing through them in either direction. The interface to the host processor is through 6 one−byte registers for each port. The keyboard and mouse are connected to the system via standard PC−style, miniature DIN connectors. The keyboard is a PC compatible 101 and 102 key layout PS/2−style with a cable length of 7.5 feet. The 3−button mouse (A2839A) comes with a 9 foot cable, the mouse can be ordered separately. It is not recommended to extend the keyboard or mouse cables beyond 15 feet, due to signal degradation.

Audio

The heart of the audio system is the CODEC (coder−decoder). The CODEC combines CD and DAT quality stereo A/D converters for microphone and line input levels, as well as D/A converters for driving headset and the speaker. The input sampling rate and format are programmable, as are the input gain control (used for software control of recording levels) and output attenuation. There will be a single output jack provided with this product that provides headset output. Although this output is capable of driving 8 Ohms, it can also be used for higher impedance devices with little or no additional distortion, thus a line level input can be driven by the headset output. The following describes the input and output specifications:

- 16 bit resolution.
- Sampling rate up to 48 KHz.
- 1/8–in. connectors for the mono microphone, stereo line in, and stereo headset out.

SCSI−2

The primary function of the SCSI−2 interface circuit is to take data from the CPU bus, translate it to SCSI format, and transmit it down the SCSI bus to a mass storage device, and vice versa. A secondary function is to keep track of the status of the SCSI bus and inform the CPU of the status. SCSI circuits must have terminating resistors installed on them. When using the external SCSI configuration, you must use an active SCSI terminator at the last external device on the SCSI bus. All other devices, external or internal, must not be terminated. If your workstation contains the external cable but you have no external devices, the terminator need not be installed in the rear−panel SCSI connector. Use only HP K2291 terminators to ensure reliable system operation. Recommended SCSI−2 mass storage device bus addresses are listed in Table 2−5., and SCSI interface technical information is listed in Table 2−6.

Table 2−5. Recommended SCSI−2 Bus Addresses

Application	Unit or Mass Storage Device	Recommended Bus Address
High Use/Priority	CPU Root Hard Disk Drive Most Used Hard Disk Drive Least Used Hard Disk Drive	7 6 5 4
Other devices Medium Use/Priority Optional Use Low Use/Priority	DDS Tape Drives CD ROM Disk Drives (the 712 will not support a SCSI Floppy)	3 2 1 0

Table 2−6. SCSI−2 Interface Technical Information

Function	Data
Type:	SCSI–II (ANSI X3.131–1986), single–ended
Data rate:	Synchronous – 5 MBs/second
Device limits:	7 internal and/or external peripherals
Connector type:	SCSI–II, ALT–1 50–pin high–density thumb-screw
Maximum external cable length:	4 meters (13.1 feet)

Expansion Slot

The Expansion Slot is one of eight master capable devices on the GSC. The other seven are: CPU, SCSI, LAN, Parallel, Audio, Interrupts, and floppy. All devices serviced by the arbitration controller are given equal priority. The CPU is the only device that will be granted the bus without having requested it. The Expansion Slot is connected to the GSC with the same signals as does the I/O ASIC.

The slot currently supports the following cards:

HP A4011A IBM Token Ring Card
HP A4013A 2nd Serial Card
HP A4014A 2nd LAN/Serial Card
HP A4015A X.25/Serial Card
HP A2878A 2nd Monitor Card

HP Teleshare Slot

The Teleshare Slot is a non−industry standard I/O option slot. Currently this slot only supports the A4012A Teleshare card. System connections are made through the I/O ASIC. The ASIC has circuitry that implements two standard TTY interfaces. These TTY interfaces use the standard TTY driver. They connect directly (not through RS−232 hardware) to the Teleshare hardware. Serial control bits are implemented allowing for ”normal” RTS/CTS hardware handshake. The workstation digital audio signals to the built−in CODEC flow through the Teleshare hardware so that telephone audio may be mixed in. The existing audio connections (headphones and microphone) are used for the user interface. The I/O panel of the Teleshare card has twin RJ−14 jacks for connecting directly to the PSTN. RJ−14 jacks support two phone lines as opposed to RJ−11 which supports only one. The second RJ−14 jack can be used to connect a second line to the PSTN or connect to a user provided one or two line phoneset or fax to the Model 712 workstation platform. The international version of this card has two 15 pin, custom jacks for connections of external (localized) DAA modules.

Mechanical Information

Figures 2–3 and 2–4 show the system board dimensions and keepouts.

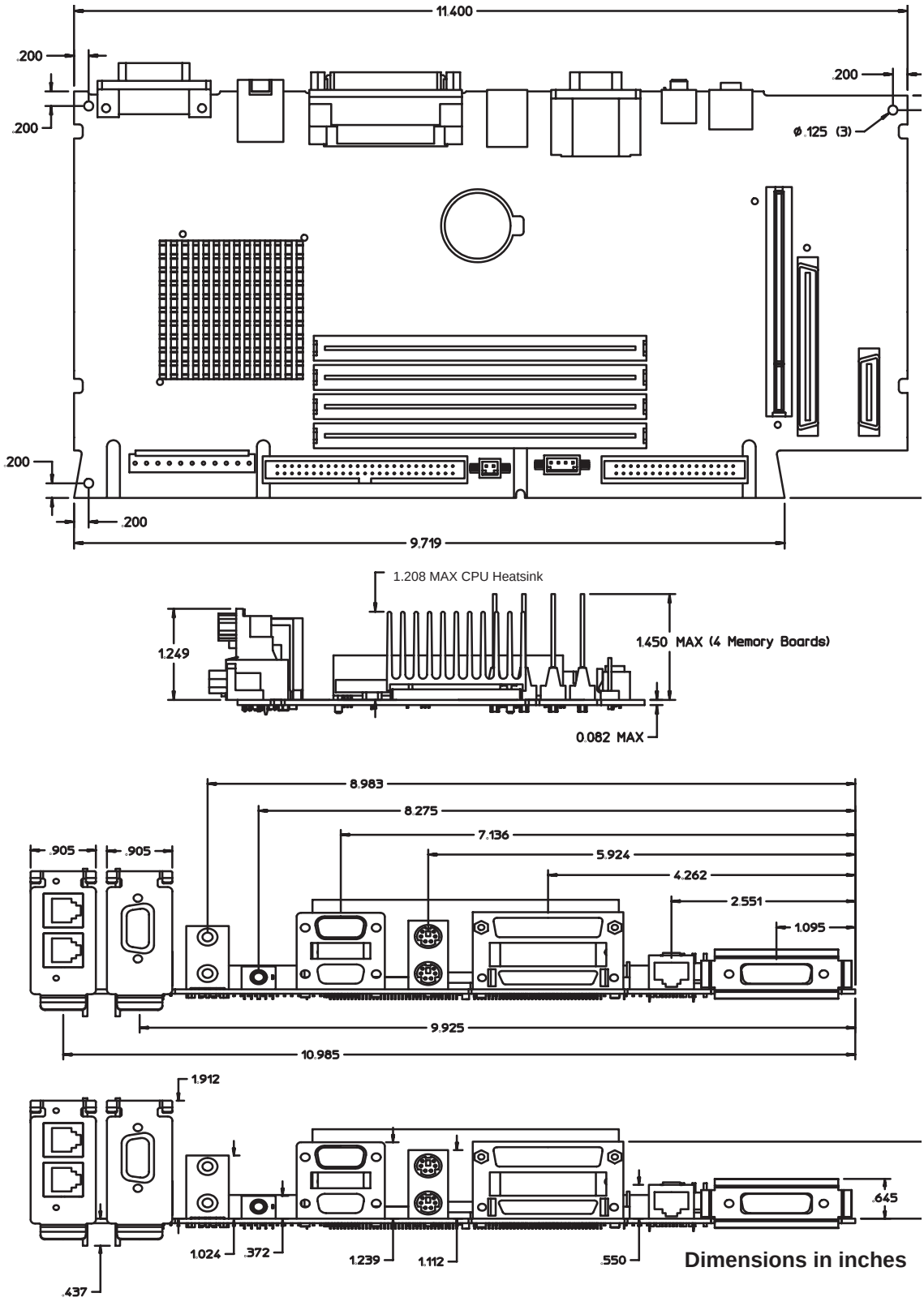


Figure 2−3. System Board Dimensions

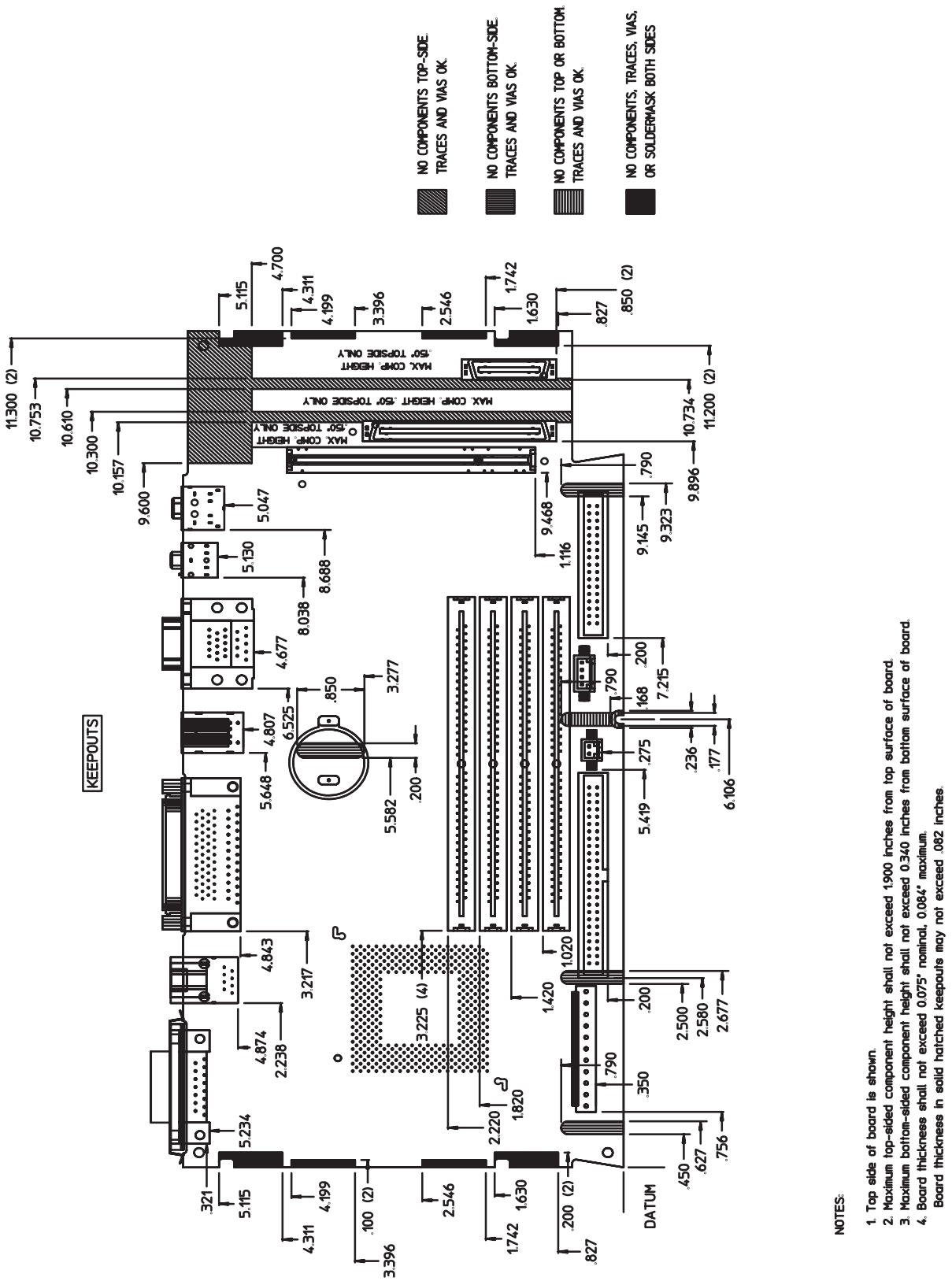


Figure 2−4. System Board Keepouts

Connector Pinouts

Slot Connectors

Expansion Slot

Table 2−7 lists the Expansion Slot connector's pin numbers and signals.

Table 2−7. Expansion Slot Connector Pinout

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
A1	EPR_D[2]	A28	Ground	B15	GSC[17]
A2	Ground	A29	ADDV_L	B16	Ground
A3	Spare2	A30	EGRANT_L	B17	GSC[21]
A4	Ground	A31	EREQUEST_L	B18	GSC[22]
A5	Spare3	A32	VDD	B19	GSC[23]
A6	Ground	A33	LS_L	B20	VDD
A7	GSC[6]	A34	INTERRUPT_L	B21	GSC[27]
A8	GSC[7]	A35	ART2EXP	B22	GSC[28]
A9	GSC[8]	A36	Ground	B23	GSC[29]
A10	VDD	A37	SYNC4H	B24	Ground
A11	GSC[12]	A38	Ground	B25	TYPE[3]
A12	GSC[13]	A39	SYNC4L	B26	TYPE[2]
A13	GSC[14]	A40	Ground	B27	PARITY
A14	Ground	B1	GSC[0]	B28	VDL
A15	GSC[18]	B2	GSC[1]	B29	ERROR_L
A16	GSC[19]	B3	GSC[2]	B30	READY_L
A17	GSC[20]	B4	VDD	B31	EXP_RESET_L
A18	VDD	B5	GSC[3]	B32	Ground
A19	GSC[24]	B6	GSC[4]	B33	EXP2CON
A20	GSC[25]	B7	GSC[5]	B34	TMS
A21	GSC[26]	B8	Ground	B35	TCK
A22	Ground	B9	GSC[9]	B36	PWR_RST_L
A23	GSC[30]	B10	GSC[10]	B37	VDL
A24	GSC[31]	B11	GSC[11]	B38	Ground
A25	VDD	B12	VDD	B39	XQL
A26	TYPE[1]	B13	GSC[15]	B40	p12V
A27	TYPE[0]	B14	GSC[16]		

Teleshare Slot

Table 2−8 lists the Teleshare Slot connector's pin numbers and signals.

Table 2−8. Teleshare Slot Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
A1	VDD	A11	CFSYNC	B6	AUD_SDIN
A2	p12V	A12	Ground	B7	Ground
A3	AUD_RESET_L	A13	CSDOUT	B8	AUD_FSYNC
A4	Ground	A14	Ground	B9	Ground
A5	AUD_SDOUT	A15	VDD	B10	TSPARE
A6	Ground	B1	PWR_RST_L	B11	VDD
A7	AUD_SCLK	B2	AUD_ALEX_HER	B12	CSCLK
A8	VDD	B3	VDD	B13	Ground
A9	DATA_ENABLE	B4	AUD_DNC	B14	CSDIN
A10	Ground	B5	Ground	B15	Ground

Interface Connector Pinouts

Tables 2−9 through 1−16 list the System board connector's pin numbers and signals.

Table 2−9. Fan Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	FAN+	3	THERM–		
2	FAN–	4	THERM+		

Table 2−10. LAN−AUI Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	CI–S	7	CO–A	13	VP
2	CI–A	8	CO–S	14	VS
3	DO–A	9	CI–B	15	CO–B
4	DI–S	10	DO–B	16	Ground (Shield)
5	DI–A	11	DO–S	17	Ground (Shield)
6	VC	12	DI–B		

Table 2−11. LAN−TP Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	TD+	5	Unused	9	Ground (Shield)
2	TD–	6	RD–	10	Ground (Shield)
3	RD+	7	Unused		
4	Unused	8	Unused		

Video

Table 2−12. Video Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	Red	6	Analog Ground	11	(No Connect)
2	Green	7	Analog Ground	12	(No Connect)
3	Blue	8	Analog Ground	13	Horizontal Sync
4	Reserved	9	(No Connect)	14	Vertical Sync
5	Digital Ground	10	Digital Ground	15	(No Connect)

Table 2−13. RS−232 Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	DCD	4	DTR	7	RTS
2	RXD	5	Ground	8	CTS
3	TXD	6	DSR	9	RI

Table 2−14. HP Parallel Connector Pinout

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	NSTROBE	10	NACK	19	Ground
2	DATA0	11	BUSY	20	Ground
3	DATA1	12	PE	21	Ground
4	DATA2	13	SLCT	22	Ground
5	DATA3	14	NAFD	23	Ground
6	DATA4	15	NERROR	24	Ground
7	DATA5	16	NINIT	25	Ground
8	DATA6	17	NSCT IN	26	Ground (Shield)
9	DATA7	18	Ground	27	Ground (Shield)

Table 2−15. SCSI Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	Ground	18	Ground	35	Ground
2	Ground	19	Ground	36	Ground
3	Ground	20	Ground	37	Ground
4	Ground	21	Ground	38	+5V (VTerm)
5	Ground	22	Ground	39	Ground
6	Ground	23	Ground	40	Ground
7	Ground	24	Ground	41	SCSI_ATN
8	Ground	25	Ground	42	Ground
9	Ground	26	Data[0]	43	SCSI_BSY
10	Ground	27	Data[1]	44	SCSI_ACK
11	Ground	28	Data[2]	45	SCSI_RST
12	Ground	29	Data[3]	46	SCSI_MSG
13	NC	30	Data[4]	47	SCSI_SEL
14	Ground	31	Data[5]	48	SCSI_CND
15	Ground	32	Data[6]	49	SCSI_REQ
16	Ground	33	Data[7]	50	SCSI_INO
17	Ground	34	Data[P]		

Table 2−16. Flexible Disk Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	Ground	13	Ground	25	Ground
2	LDI	14	NC	26	TK00
3	NC	15	Ground	27	Ground
4	MID	16	MON	28	WPT
5	NC	17	Ground	29	Ground
6	NC	18	DRTN	30	RDD
7	Ground	19	Ground	31	Ground
8	IDX	20	STP	32	SLL
9	Ground	21	Ground	33	Ground
10	DS0	22	WTD	34	DCH
11	Ground	23	Ground		
12	DS1	24	WTG		

Note: If a standard untwisted PC floppy cable is used the system will select the drive as unit 1, The system will select the drive as unit 0 if a twisted PC cable is used (to make a twisted cable reverse pins10 through 16, 10−>16, 11−>15 etc.).

Parts List

New Parts

New parts that have been assigned a part number are available direct from:

Support Materials Organization
Hewlett−Packard Company
8050 Foothills Boulevard
Roseville, California 95678 USA
Telephone: (916) 786−8000

Parts Center Europe
Hewlett−Packard GmbH
Wolf−Hirth Strasse 33
D−7030 Bobligen, Germany
Telephone: +41 7031 14−2253

Exchange Parts

Exchange parts are available for some items at a reduced cost. When an exchange part is ordered, your account will be charged for a new part.

Place failed exchange parts in anti−static bags and package them securely in a sturdy container. It's a good idea to save the containers and static−free bags you receive parts in and use them to ship parts in. Please return failed exchange parts to your exchange parts source as soon as possible. Customers have 15 days to return the failed part to receive credit for the difference between a new and exchange part.
Exchange only parts are available direct from:

Support Materials Organization
Hewlett−Packard Company
8050 Foothills Boulevard
Roseville, California 95678 USA
Telephone: (916) 786−8000

Support Material & Services Europe
Hewlett−Packard Ltd.
Filton Road − Stoke Gifford
Bristol BS12 6QZ United Kingdom
Telephone: +44 272 799910

Phone number for ordering new or exchange parts **1−800−227−8164.**

System Module Parts

Table 2−17. System Module (Unit Exchange) Parts List

Ref. No.	Exchange Part Number	Description
10	A2263–69510	CPU, 60 MHz
10	A2263–69511	CPU, 80 MHz
9	A2577–69001	4 MB SIMM
9	A2578–69001	8 MB SIMM
9	A2576–69001	16 MB SIMM
9	A2575–69001	32 MB SIMM
19	A2084–69002	1.0 GB Disk
18	A2084–69001	525 MB Disk
18	A2615–69001	260 MB Disk

Table 2−18. System Module (Unit Non−Exchange) Parts List

Ref. No.	Exchange Part Number	Description
8	0950–2356	Power Supply
12	A2263–66520	VRAM Assembly
*	A2263–62005	Floppy Cable
17	0950–2377	3.5” Flexible Disk Drive
21	A2263–40018	Hard Disk 1/2 Hi HPPAC
23	A2263–40019	Hard Disk Full Hi HPPAC
*	A2263–62004	SCSI Disk Cable
16	A2263–40016	HPPAC (Bottom)
20	A2263–40017	HPPAC (Flexible Disk)
2	A2263–62007	Speaker S assy
4	A2263–62003	Fan Assy
6	A2263–40048	Power Supply Button
*	A2263–40047	Tower Base
*	A2263–40049	Rubber Feet (4)
15	A2263–62036	Chassis Assembly
3	A2263–40002	Power Supply cover
5	A2263–62017	Led Cable Assy
1	A2263–62040	Top Cover Assy
24	A2263–62037	Flexible Disk Bezel
25	A2263–40051	Filler Bezel
22	A2263–00019	HP–Pack Support Bracket
13	A2263–66534	Teleshare Board (International)
13	A2263–66530	Teleshare Board (domestic)
14	A2263–69538	A2878A Graphics
14	A2263–66531	HP 9000 Token Ring
14	A2263–66535	RS–232
14	A2263–66536	RS–232/LAN
14	A2263–66537	RS–232/X.25

* Not Shown

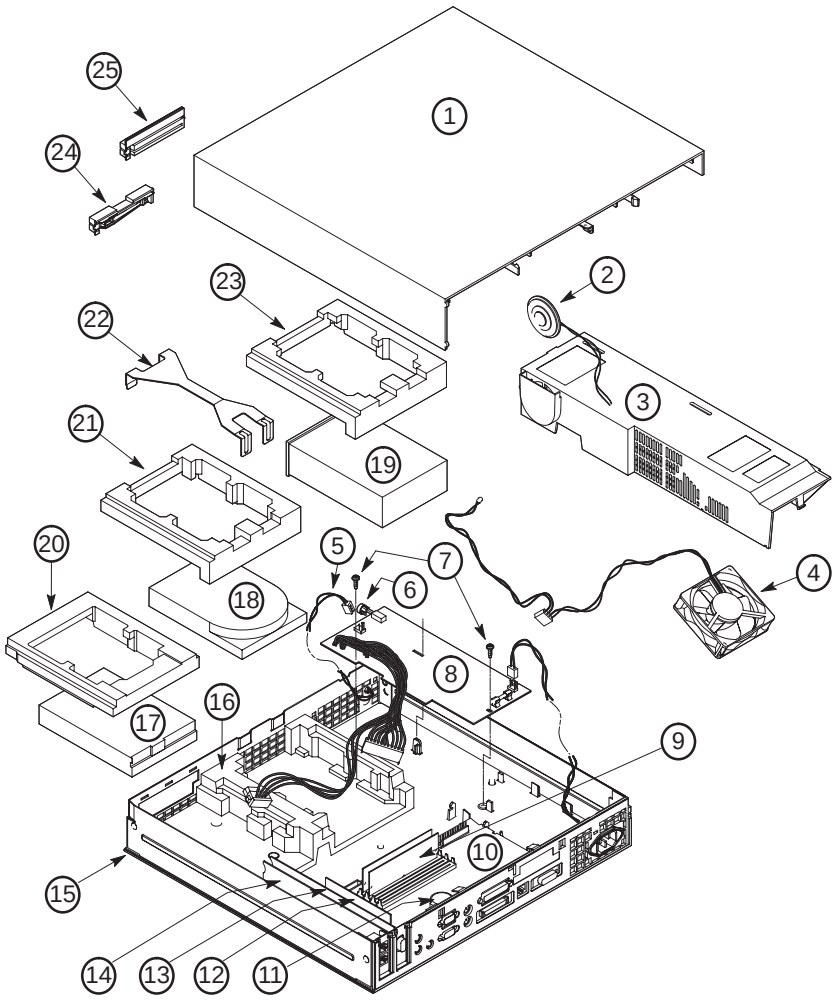


Figure 2−5. Model 712 Exploded View

3

Expansion Slot Cards

Card Specifications

HP A4011A HP Token Ring/9000 Card

Description

The HP A4011A HP Token Ring/9000 Card (ITR) is a industry–standard IEEE 802.5.

Features

- Compatible with IEEE 802.5 (IBM) Protocols
- 4−16 Mbps data rate

Physical Specifications

Length:	193 mm (7.6 in)
Height:	64 mm (2.5 in)

Environmental Specifications

Temperature:	5 to 40 deg. C (41 to 104 deg. F)
Relative Humidity:	80% RH max at 40 deg. C (104 deg. F)
Altitude:	3,048 meters (10,000 feet)

Power Consumption (Max.)

4.4 Watts

Ordering Information

The HP A4011A HP Token Ring/9000 Card includes:
A2615−90614 Documentation
212100 Media Filter (included with card)
#AAH Device Driver on DDS tape.

HP A4012A Teleshare Card

Description

The HP A4012A Teleshare Card is composed of two independent Public Switched Telephone Network (PSTN) network connections. Either of these lines may be used in voice or data mode. When both lines are being used for voice, they may be ”conferenced” together.

Features

- Caller ID
- Call Waiting
- Call Forwarding
- Conference Calling
- Data Rate conversion and mixing
- Call Recording and Voice Mail
- Industry Standard ”AT” command set for modem communications
- V.32bis Modem (14,400 baud) with V.42bis and MNP5
- Class II Fax Modem
- Dual Tone Multi−Frequency (DTMF) based applications
- Supports Two Voice Lines or One Voice Line and One Data Line

**Note: Some of the features listed such as Caller ID and DTMF–based applications might not be supported by all international phone systems.

Detailed Information

The Teleshare Card plugs into a non−industry standard I/O option slot built into the Model 712 workstation. System connections are made through the I/O ASIC. The ASIC has circuitry that implements two standard TTY interfaces. These TTY interfaces use the standard TTY driver. They connect directly (not through RS−232 hardware) to the Teleshare hardware. Serial control bits are implemented allowing for ”normal” RTS/CTS hardware handshake. The workstation digital audio signals to the built−in CODEC flow through the Teleshare hardware so that telephone audio may be mixed in. The existing audio connections (headphones and microphone) are used for the user interface. The I/O panel of the Teleshare card has twin RJ−14 jacks for connecting directly to the PSTN. RJ−14 jacks support two phone lines as opposed to RJ−11 which supports only one. The second RJ−14 jack can be used to connect a second line to the PSTN or connect to a user provided one or two line phoneset or fax to the Model 712 workstation platform. The international version of this card has two 15 pin, custom jacks for connections of external (localized) DAA modules.

Physical Specifications

Length:	193 mm (7.6 in)
Height:	64 mm (2.5 in)

Environmental Specifications

Temperature:	5 to 40 deg. C (41 to 104 deg. F)
Relative Humidity:	80% RH max at 40 deg. C (104 deg. F)
Altitude:	3,050 meters (10,000 feet)

Power Consumption (Max.)

6.5 Watts

Ordering Information

The HP A4012A Teleshare Card includes:
A2615−90609 Documentation
Localization. International versions require external DAA Modules.
#AAH Device Driver, AUI, GUI on DDS tape.

HP A4013A Serial Card

Description

The HP A4013A Serial Card adds a second RS−232−C interface to the Model 712 Workstation. The functionality is the same as the internal serial interface.

Features

- EIA RS−232−C (CCITT V.28/V.24 460.8 Kbps with CTS/RTS) compatibility
- Modem control
- Supports data transfer rates up to 454k baud
- Software selectable parity configuration
- Software selectable baud rate
- Interrupt capability through status or modem signal lines
- 9−pin male D−sub connector

Physical Specifications

Length:	193 mm (7.6 in)
Height:	64 mm (2.5 in)

Environmental Specifications

Temperature:	5 to 40 deg. C (41 to 104 deg. F)
Relative Humidity:	80% RH max at 40 deg. C (104 deg. F)
Altitude:	3,050 meters (10,000 feet)

Power Consumption (Max.)

5.0 Watts

Pin and Signal Assignment

Table 3−1. RS−232 Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	DCD	4	DTR	7	RTS
2	RXD	5	Ground	8	CTS
3	TXD	6	DSR	9	RI

Ordering Information

The HP A4013A Serial Card includes:
A2615−90610 Documentation

Recommended Cables:

Cables must be ordered from HP's Direct Marketing Division (DMK).

HP 24542G 9−pin F/25−pin M serial printer/plotter cable 3.0 meter (9.9 ft).
For use with the LaserJets, PaintJets, terminals, and Pen Plotters, except the HP 7550B Pen Plotter.
HP 24542H 9−pin F/25−pin F serial plotter cable, 3 meter (9.9 ft).
For use with the HP 7550B Pen Plotter.

HP A4014A LAN/Serial Card

Description

The HP A4014A LAN/Serial Card, provides a second AUI LAN connection and RS−232 serial connection to the Model 712 workstation. A single 26−pin connector is used on the card with all necessary signals for both RS232 and LAN−AUI. A "two−headed" external cable will allow simultaneous use of both functions.

Features

LAN–AUI

- IEEE 802.3/Ethernet 1.0.
- Intel 82596CA LAN Controller.
- 10 Mbits/second data rate.

Table 3−2. LAN−AUI Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	CI–S	7	CO–A	13	VP
2	CI–A	8	CO–S	14	VS
3	DO–A	9	CI–B	15	CO–B
4	DI–S	10	DO–B	16	Ground
5	DI–A	11	DO–S	17	Ground
6	VC	12	DI–B		

Serial

- EIA RS−232−C (CCITT V.28/V.24 460.8 Kbps with CTS/RTS) compatibility
- Modem control
- Supports data transfer rates up to 454k baud
- Software selectable parity configuration
- Software selectable baud rate
- Interrupt capability through status or modem signal lines
- 9–pin male D–sub connector

Table 3−3. RS−232 Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	DCD	4	DTR	7	RTS
2	RXD	5	Ground	8	CTS
3	TXD	6	DSR	9	RI

Physical Specifications

Length: 193 mm (7.6 in)
Height: 64 mm (2.5 in)

Environmental Specifications

Temperature:	5 to 40 deg. C (41 to 104 deg. F)
Relative Humidity:	80% RH max at 40 deg. C (104 deg. F)
Altitude:	3,050 meters (10,000 feet)

Power Consumption (Max.)

5.0 Watts

Ordering Information

The HP A4014A LAN/Serial Card includes:
A2615−90610 Documentation
A2263−62045 Two−headed cable

Recommended Cables:

Cables must be ordered from HP's Direct Marketing Division (DMK).

HP 24542G 9−pin F/25−pin M serial printer/plotter cable 3.0 meter (9.9 ft).
For use with the LaserJets, PaintJets, terminals, and Pen Plotters, except the HP 7550B Pen Plotter.
HP 24542H 9−pin F/25−pin F serial plotter cable, 3 meter (9.9 ft).
For use with the HP 7550B Pen Plotter.

HP A4015A X.25/Serial Card

Description

The HP A4015A X.25/Serial Card, provides a X.25 connection and a second RS−232 serial connection to the Model 712 workstation. A single 26−pin connector is used on the card with all necessary signals for both X.25 and RS−232. A ”two−headed” external cable will allow simultaneous use of both functions.

Features

X.25

- X.25 supports 1.2 to 19kbs.
- X.25 supports implementation of the LAP–B data–link protocol

Table 3−4. X.25 Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	Prot. Ground	10	Not Connected	18	Not Connected
2	TXD	11	Not Connected	19	Not Connected
3	RXD	12	Not Connected	20	DTR
4	RTS	13	Not Connected	21	Not Connected
5	CTS	14	Not Connected	22	Not Connected
6	DSR	15	TCLK	23	Not Connected
7	Signal Ground	16	Not Connected	24	TTE
8	DCD	17	RCLK	25	Not Connected
9	Not Connected				

Serial

- EIA RS–232–C (CCITT V.28/V.24 460.8 Kbps with CTS/RTS) compatibility
- Modem control
- Supports data transfer rates up to 454k baud
- Software selectable parity configuration
- Software selectable baud rate
- Interrupt capability through status or modem signal lines
- 9–pin male D–sub connector

Table 3−5. RS−232 Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	DCD	4	DTR	7	RTS
2	RXD	5	Ground	8	CTS
3	TXD	6	DSR	9	RI

Physical Specifications

Length: 193 mm (7.6 in)
Height: 64 mm (2.5 in)

Environmental Specifications

Temperature:	5 to 40 deg. C (41 to 104 deg. F)
Relative Humidity:	80% RH max at 40 deg. C (104 deg. F)
Altitude:	3,050 meters (10,000 feet)

Power Consumption (Max.)

5.0 Watts

Ordering Information

The HP A4015A X.25/Serial Card includes:
A2615−90610 Documentation
A2263−62046 Two−headed cable
#AAH Device Driver on DDS tape

Recommended Cables:

Cables must be ordered from HP's Direct Marketing Division (DMK).

HP 24542G 9−pin F/25−pin M serial printer/plotter cable 3.0 meter (9.9 ft).
For use with the LaserJets, PaintJets, terminals, and Pen Plotters, except the HP 7550B Pen Plotter.
HP 24542H 9−pin F/25−pin F serial plotter cable, 3 meter (9.9 ft).
For use with the HP 7550B Pen Plotter.

HP A2878A 2nd Monitor Card

Description

The HP A2878A 2nd Monitor Card, provides a second monitor connection to the Model 712 workstation. The card supports the same displays that the built−in video interface supports. The analog output of each channel conforms to the RS343A specifications when driving a doubly terminated 75 Ohm line. The monitor connected to this card is not supported as the boot console.

Features

- 1024 by 768 by 8 bit color at 60 Hz. to 75 Hz.
- 1280 by 1024 by 8 bit color at 60 Hz. to 72 Hz.
- 15 pin VGA style connection
- NGLE compatible.
- Support of the following VESA timings:
  1280 by 1024 at 75 Hz.
  1024 by 768 at 75 Hz.
  800 by 600 at 75 Hz.
  640 by 480 at 75 Hz.
- X Window support.

Table 3−6. Supported Monitors for the Model 712

Product No.	Type	Resolution	Refresh Rate
HP A2882A	11.8–inch Flat panel	1024 by 768	75Hz.
HP D1196A	15–inch Color	1024 by 768	70Hz.
HP A2287A	17–inch Color	1024 by 768	75Hz.
HP A4032A	17–inch Color	1280 by 1024	Multi–Mode
HP A2094A	19–inch Color	1280 by 1024	72Hz.

Table 3−7. Video Connector Pinouts

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	Red	6	Analog Ground	11	(No Connect)
2	Green	7	Analog Ground	12	(No Connect)
3	Blue	8	Analog Ground	13	Horizontal Sync
4	Reserved	9	(No Connect)	14	Vertical Sync
5	Digital Ground	10	Digital Ground	15	(No Connect)

Physical Specifications

Length: 193 mm (7.6 in)
Height: 64 mm (2.5 in)

Environmental Specifications

Temperature: 5 to 40 deg. C (41 to 104 deg. F)
Relative Humidity: 80% RH max at 40 deg. C (104 deg. F)
Altitude: 3,050 meters (10,000 feet)

Power Consumption (Max.)

5.0 Watts

Ordering Information

The HP A2878A 2nd Monitor Card includes:
A2878−90010 Documentation

Recommended Cables:

Cables must be ordered from HP's Direct Marketing Division (DMK).

4

Internal Mass Storage

SCSI Bus

Recommended SCSI mass storage device bus addresses are listed in Table 4−1. Mass storage device upgrades have these addresses factory set.

Table 4−1. Recommended SCSI Addresses

Application	Unit or Mass Storage Device	Recommended Bus Address
High Use/Priority	CPU Root Hard Disk Drive Most Used Hard Disk Drive Least Used Hard Disk Drive	7 6 5 4
Other devices Medium Use/Priority Optional Use Low Use/Priority	DDS Tape Drives CD ROM Disk Drives (the 712 will not support a SCSI Floppy)	3 2 1 0

SCSI circuits must have terminating resistors installed on them. Here is how the two configurations are terminated

- When using the external SCSI configuration, you must use an active SCSI terminator at the last external device on the SCSI bus.
- All other devices, external or internal, must not be terminated.
- If your workstation contains the external cable but you have no external devices, the terminator need not be installed in the rear–panel SCSI connector. Use only HP K2291 terminators to ensure reliable system operation.

Hewlett−Packard only supports SCSI devices that were designed for the Model 712 workstation. Even though disk drives that are supported on previous 700 workstations are similar, there are no plans to support these devices. Third−party SCSI drives are not supported, but if they meet SCSI−II specifications, they should work on the Model 712 workstation. These third−party devices may not perform as well as supported drives, due to special firmware (such as write caching) in the Model 712 SCSI drives that optimizes I/O performance. Refer to page 1−7 to find SCSI device driver guides that will assist in driver development.

Mass Storage Devices

The environmental specifications for the internal mass storage devices are for the standalone mechanisms. These specifications are not to be used for the Model 712 workstation. Please refer to pages 1−7 and 1−8 for the Model 712 workstation environmental specifications.

HP A4067A 1 Gbyte Hard Disk Drive

Capacity

Formatted:	1,050,347,520 Bytes

Performance

Seek Times

Track to track:	2.5 ms
Average:	10 ms
Maximum:	25 ms

Disk Speed/Rotational Latency

Average Latency:	5.56 msec or less
Disk Speed:	5400 RPM minimum

Data Transfer Rates

Internal (disk)	
Burst:	24 – 40 MHz
External (bus)	
Asyn:	5.0 MB/s
Syn:	10 MB/s

Error Rates

Soft Read Error Rate:	10 in 10^{11} bits read
Hard Read Error Rate:	10 in 10^{13} bits read
Seek Error Rate:	10 in 10^{7} seeks

Environmental Requirements

Temperature

Operating:	0 to 55 deg. C (32 to 131 deg. F) 24 deg. C/hr (75 deg. F/hr gradient)
Non–operating	–40 to 70 deg. C (–40 to 158 deg. F) 24 deg. C/hr (75 deg. F/hr gradient)

Altitude

Operating:	–61 to 4572 meters (–200 to 15,000 feet)
Non–operating:	–305 to 15,240 meters (–1,000 to 50,000 feet)

Relative Humidity

Operating:		10% to 90% non−condensing
Non−operating:		10% to 90% non−condensing
Maxi wetbulb temperature		26.7 deg. C (80 deg. F)

Shock

Operating:		2 G peak, 11 ms, 1/2 sinewave 10 G peak, 11 ms, 1/2 sinewave
Non−operating:		20 G peak, 11 ms + 3 ms, 1/2 sinewave 26 ms trapezoidal with 25 G peak amplitude

Vibration

Operating:	Swept Sine:	0.5 G peak, 5 − 500 Hz
	Random:	0.0001 G^2/Hz, 5 − 500 Hz
Non−operating:		
	Swept Sine:	0.2 inches pk−pk @ 5 − 30 Hz, 1.0 Gpk @ 30 − 500 Hz
	Random:	0.015 G^2/Hz, 5 − 500 Hz

HP A4066A 525 Mbyte Hard Disk Drive

Capacity

Formatted: 525,000,000 Bytes

Performance

Seek Times

Track to track:	2.6 ms
Average:	10 ms
Maximum:	25 ms

Disk Speed/Rotational Latency

Average Latency:	6.7 msec or less
Disk Speed:	4500 RPM minimum

Data Transfer Rates

Internal (disk)	
Burst:	24 to 40 MHz
External (bus)	
Asyn:	5.0 MB/s
Syn:	10 MB/s

Error Rates

Soft Read Error Rate:	10 in 10^{11} bits read
Hard Read Error Rate:	10 in 10^{13} bits read
Seek Error Rate:	10 in 10^7 seeks

Environmental Requirements

Temperature		
	Operating:	0 to 55 deg. C (32 to 131 deg. F) 24 deg. C/hr (75 deg. F/hr gradient)
	Non−operating	−40 to 70 deg. C (−40 to 158 deg. F) 24 deg. C/hr (75 deg. F/hr gradient)
Altitude		
	Operating:	−61 to 4572 meters (−200 to 15,000 feet)
	Non−operating:	−305 to 15,240 meters (−1,000 to 50,000 feet)
Relative Humidity		
	Operating:	10% to 90% non−condensing
	Non−operating:	10% to 90% non−condensing
	Max wetbulb temperature	26.7 deg. C (80 deg. F)
Shock		
	Operating:	2 G peak, 11 ms, 1/2 sinewave 10 G peak, 11 ms, 1/2 sinewave
	Non−operating:	20 G peak, 11 ms + 3 ms, 1/2 sinewave 26 ms trapezoidal with 25 G peak amplitude

Vibration			
	Operating:	Swept Sine:	0.5 G peak, 5 − 400 Hz
		Random:	0.0001 G^2/Hz, 5 − 400 Hz
	Non−operating:		
		Swept Sine:	0.2 inches pk−pk @ 5−30 Hz, 1.0 Gpk @ 30−400 Hz
		Random:	0.015 G^2/Hz, 5 − 500 Hz

HP A4065A 260 Mbyte Hard Disk Drive

Capacity

Formatted: 270,000,000 Bytes

Performance

Seek Times		
	Track to track:	2.6 ms
	Average:	10 ms
	Maximum:	25 ms
Disk Speed/Rotational Latency		
	Average Latency:	6.7 msec or less
	Disk Speed:	4500 RPM minimum

Data Transfer Rates

Internal (disk)	
Burst:	24 to 40 MHz
External (bus)	
Asyn:	5.0 MB/s
Syn:	10 MB/s

Error Rates

Soft Read Error Rate:	10 in 10^{11} bits read
Hard Read Error Rate:	10 in 10^{13} bits read
Seek Error Rate:	10 in 10^{7} seeks

Environmental Requirements

Temperature

Operating:	0 to 50 deg. C (32 F to 122 deg. F) 24 deg. C/hr (75 deg. F/hr gradient)
Non−operating:	−40 to 70 deg. C (−40 to 158 deg. F) 24 deg. C/hr (75 deg. F/hr gradient)

Altitude

Operating:	−61 to 4572 meters (−200 to 15,000 feet)
Non−operating:	−305 to 15,240 meters (−1,000 to 50,000 feet)

Relative Humidity

Operating:	10% to 90% non−condensing
Non−operating	10% to 90% non−condensing
Max wetbulb temperature	26.7 deg. C (80 deg. F)

Shock

Operating:	2 G peak, 11 ms, 1/2 sinewave 10 G peak, 11 ms, 1/2 sinewave
Non−operating:	20 G peak, 11 ms + 3 ms, 1/2 sinewave 26 ms trapezoidal with 25 G peak amplitude

HP A4068A 3.5–in. Flexible Disk Drive(PC Interface)

Capacity and Performance

Table 4−2. Flexible Drive Specifications

Feature	Low Density	High Density	High Density
Data Capacity:			
Unformatted:	1.0 MB	2.0 MB	1.6 MB
Formatted	720KB @ 9 sectors/track	1.474 MB @18 sectors/track	1.228 MB @ 15 sectors/track
Internal Data Buffer:	31KB	31 KB	31 KB
Data Transfer Rate:			
Off Media:	250 Kbits/sec	500 Kbits/sec	500 Kbits/sec
Disk Performance:			
Rotational Speed:	300 rpm ±2%	300 rpm ±2%	360 rpm ±2%
Start Time:	500 msec. max.	500 msec. max.	480 msec. max.
Ave. Latency:	100 msec.	100 msec.	83.3 msec.
Media Specification:			
Density:	2S/DD	2S/HD	2S/HD
Sides:	2	2	2
Cylinders:	80	80	80
Track Construction:			
Tracks per Side:	80	80	80
Tracks per Disk:	160	160	160
Density:	135 tpi	135 tpi	135 tpi
Inner Bit Density:	8,717 bpi	17,434 bpi	14,528 bpi
Positioning Error:	< ±15 um	< ±15 um	< ±15 um
Access Times:			
Track–to–track:	3 msec. max.	3 msec. max.	3 msec. max.
Seek settling time:	15 msec. max	15 msec. max.	15 msec. max.
Index Detection:	1 per rev.	1 per rev.	1 per rev.
Detection Cycle:	200 msec ±1.5%	200 msec ±1.5%	166.7 msec ±1.5%
Timing Error:	±500 usec.	±500 usec.	±500 usec.
Window Margin:	600 nsec. min.	300 nsec. min.	300 nsec. min.

Environmental Requirements

Temperature

Operating:	4 to 50 deg. C (39 to 122 deg. F) 20 deg. C/hr (27 deg. F/hr gradient)
Non−operating:	−22 to 60 deg. C (−8 to 140 deg. F) 30 deg. C/hr (54 deg. F/hr gradient)

Altitude

Operating:	Less than 5,000 meters (16,500 feet)
Non−operating:	Less than 12,000 meters (40,000 feet)

Relative Humidity

Operating:		20% to 80% non−condensing
Max wetbulb temperature		29 deg. C (84 deg. F)
Non−operating:		10% to 90% non−condensing
Maximum wetbulb temperature		40 deg. C (104 deg. F)

Shock

Operating:		Less than 5 G peak, 11 ms, 1/2 sinewave
Non−operating:		Less than 50 G peak, 11 ms + 3 ms, 1/2 sinewave

Vibration

Operating:	Swept Sine:	0.25 G peak, 5 − 500 Hz, 20 minute
	Random:	0.25 G peak , 5 − 500 Hz, 10 minute
Non−operating:	Swept Sine:	0.5 G peak, 5 − 500 Hz, 20 minute
	Random:	2 G peak , 5 − 500 Hz, 10 minute

Electrical Information

Power Requirements

Table 4−3.Mass Storage Power Requirements

Voltage	260 MB	525 MB	1 GB	Floppy Drive
+5 V	.75A	.75A	1.0A	0.3A ave.
+12 V	.9A	.65A	0.7A	n/a

Connector Pinouts

Table 4−4. SCSI Interface Signals

Pin No.	Signal	To	Description
02	DB[0]	B	Data Bus (LSB)
04	DB[1]	B	Data Bus
06	DB[2]	B	Data Bus
08	DB[3]	B	Data Bus
10	DB[4]	B	Data Bus
12	DB[5]	B	Data Bus
14	DB[6]	B	Data Bus
16	DB[7]	B	Data Bus (MSB)
18	DB[P]	B	Data Bus Parity
20			
22			
24			
26	Termpwr	B	Terminator Power
28			Reserved
30			Not Used (GND)
32	ATN	D	Indicates message available for drive
34			Not Used (GND)
36	BSY	B	Signal indicating bus is in use
38	ACK	D	Data/Command transfer handshake
40	RST	D	Or–tied signal indicating reset condition
42	MSG	H	Indicates message phase
44	SEL	B	Signal indicating selection/reselction phase
46	C/D	H	Indicates whether control or data info. is on data bus
48	REQ	H	DataCommand transfer handshake
50	I/O	H	Indicates direction of information transfer. Assertion indicates transfer to host.

H = Host D = Drive B = Bidirectional

Note: All odd pins shall be signal returns and shall be connected to signal GND at the drive, except pin 25 which is left free to protect against mis–insertion.

5

External Mass Storage

SCSI Bus

Recommended SCSI mass storage device bus addresses are listed in Table 5−1. Mass storage device upgrades have these addresses factory set.

Table 5−1. Recommended SCSI Addresses

Application	Unit or Mass Storage Device	Recommended Bus Address
High Use/Priority	CPU Root Hard Disk Drive Most Used Hard Disk Drive Least Used Hard Disk Drive	7 6 5 4
Other devices Medium Use/Priority Optional Use Low Use/Priority	DDS Tape Drives CD ROM Disk Drives (the 712 will not support a SCSI Floppy)	3 2 1 0

SCSI circuits must have terminating resistors installed on them. Here is how the two configurations are terminated:
When using the external SCSI configuration, you must use an active SCSI terminator at the last external device on the SCSI bus. All other devices, external or internal, must not be terminated.
If you workstation contains the external cable but you have no external devices, the terminator must be installed in the rear−panel SCSI connector. Use only HP K2291 terminators to ensure reliable system operation.
Hewlett−Packard only supports SCSI devices that were designed for the Model 712 workstation. Even though disk drives that are supported on previous 700 workstations are similar, there are no plans to support these devices. Third−party SCSI drives are not supported, but if they meet SCSI−II specifications, they should work on the Model 712 workstation. These third−party devices may not perform as well as supported drives, due to special firmware (such as write caching) in the Model 712 SCSI drives that optimizes I/O performance. Refer to page 1−6 to find SCSI device driver guides that will assist in driver development.

Mass Storage Devices

HP A2657A 1 Gbyte Hard Disk Drive

Capacity

Formatted:	1,050,347,520 Bytes

Performance

Seek Times		
	Track to track:	2.5 ms
	Average:	10 ms
	Max:	25 ms
Data Transfer Rates		
	Internal (disk)	
	Burst:	24 − 40 MHz
	External (bus)	
	Asyn:	5.0 MB/s
	Syn:	10 MB/s
Error Rates		
	Soft Read Error Rate:	10 in 10^{11} bits read
	Hard Read Error Rate:	10 in 10^{13} bits read
	Seek Error Rate:	10 in 10^{7} seeks

Environmental Requirements

Temperature		
	Operating:	0 to 55 deg. C (32 to 121 deg. F) 24 deg. C/hr (75 deg. F/hr gradient)
	Non−operating:	−40 to 70 deg. C (−40 to 158 deg. F) 24 deg. C/hr (75 deg. F/hr gradient)
Altitude		
	Operating:	−61 to 4572 meters (−200 to 15,000 feet)
	Non−operating:	−305 to 15,240 meters (−1,000 to 50,000 feet)
Relative Humidity		
	Operating:	10% to 90% non deg. Condensing
	Non−operating:	10% to 90% non deg. Condensing
	Max wetbulb temperature	26.7 deg. C (80 deg. F)
Shock		
	Operating:	2 G peak, 11 ms, 1/2 sinewave 10 G peak, 11 ms, 1/2 sinewave
	Non−operating:	20 G peak, 11 ms + 3 ms, 1/2 sinewave 26 ms, trapezoidal with 25 G peak amplitude

Vibration			
	Operating:	Swept Sine:	0.5 G peak, 5 − 500 Hz
		Random:	0.0001 G^2/Hz, 5 − 500 Hz
	Non−operating:		
		Swept Sine:	0.2 inches pk−pk @ 5 − 30 Hz, 1.0 Gpk @ 30 − 500 Hz
		Random:	0.015 G^2/Hz, 5 − 500 Hz

HP A2655A CD ROM Disk Drive

Capacity

Data Format Capacity:	650 MB min.
Audio Format Capacity:	74 minutes max.
Blocks per Disc:	Approx. 300,000 Blocks
Data Block Size:	Mode−1: 2048, Mode−2: 2336 Blocks
Data Buffer Capacity:	64 Kbytes
Applicable Discs:	Red Book, Yellow Book, CDROM−XA, CD−Graphics, Photo deg. CD Multisession, CD−Bridge, and CD−I Ready

Performance

Burst Data Transfer Rate	
Asyn:	1.5 MB/s
Syn:	4.2 MB/s
Sustained Block Transfer Rate	
1X:	75 Blocks/s
2X:	150 Blocks/s
Sustained Data Transfer Rate	
1X, Mode−1:	150 KB/s
2X, Mode−1:	300 KB/s
1X, Mode−2:	171 KB/s
2X, Mode−2:	342 KB/s
Random Average Access Time	
1X:	325 msec., typ.; 350 msec., max.
2X:	250 msec., typ.; 300 msec., max.
Full Stroke Average Access Time	
1X:	480 msec., typ.; 660 msec., max.
2X:	350 msec., typ.; 550 msec., max.
Average Disc Spin Up Time:	1.2 sec., typ; 1.5 sec., max.
Disc Rotational Speed	
1X:	Approx. 200 − 530 rpm
2X:	Approx. 400 − 1060 rpm

Environmental Requirements

Temperature		
Operating:		5 to 50 deg. C (41 to 122 deg. F) 11 deg. C/hr (52 deg. F/hr gradient)
Non−operating:		−10 deg. C to 65 deg. C (14 deg. F to 149 deg. F) 20 deg. C/hr (68 deg. F/hr gradient)
Altitude		
Operating:		0 to 4600 meters (0 to 15,000 feet)
Non−operating:		0 to 15,300 meters (0 to 50,000 feet)
Relative Humidity		
Operating:		8% to 80% non deg. Condensing
Non−operating:		5% to 95% non deg. Condensing
Max wetbulb temperature		27 deg. C (81 deg. F)
Shock		
Operating:		Less than 5 G peak, 11 ms, 1/2 sinewave
Non−operating:		Less than 50 G peak, 11 ms, 1/2 sinewave
Vibration		
Operating:	Swept Sine:	0.5 G peak, 5 − 400 Hz, 20 min.
	Random:	0.25 G peak, 5 − 400 Hz, 10 min.
Non−operating:		
	Swept Sine:	0.5 G, 5 − 400 Hz, 20 min.
	Random:	2.09 G, 5 − 400 Hz, 10 min.

Reliability and Life Data

Soft Read Error Rate:	Less than 1 in 10^9 bits read
Hard Read Error Rate:	Mode−1: Less than 1 in 10^{12} bits read Mode−2: Less than 1 in 10^9 bits read
Seek Error Rate:	Less than 1 in 10^8 seeks
MTBF:	50,000 POH @ 20% duty cycle
MTTR:	30 minutes
Caddy Load/Unload:	10,0000 times minimum
Interface Connector:	500 connections

HP A2656A DDS Tape Drive

Capacity

Data Capacity:	2 GB; 90 meter (295 feet) tape

Performance

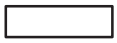
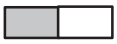
Burst Data Transfer Rate			
	Asyn:		1.58 MB/sec.
	Syn:		5 MB/sec.
Load Time:			25 seconds from cassette inserted until ready to perform first command.
Error Rates			
	Uncorrectable Bit Error Rate:		1 in 10^{15} bits read

Environmental Requirements

Temperature			
	Operating:		5 to 40 deg. C (41 to 104 deg. F)
	Non−operating:		−40 to 70 deg. C (−40 deg. to 154 deg. F)
Altitude			
	Operating:		0 to 4600 meters (0 to 15,000 feet)
	Non−operating:		0 to 15,200 meters (0 to 50,000 feet)
Relative Humidity			
	Operating:		20% to 80% non deg. Condensing
	Non−operating:		5% to 95% non deg. Condensing
	Max wetbulb temperature		26 deg. C (78.8 deg. F)
Shock			
	Operating:		5 G peak, 3 ms, 1/2 sinewave (1 Axis) 8 G peak, 11 ms, 1/2 sinewave (2 Axis)
	Non−operating:		90 G peak, 3 ms, 1/2 sinewave (3 Axis)
Vibration			
	Operating:	Swept Sine:	0.3 G peak, 5 − 500 Hz @ 1 octave/min
		Random:	5 − 350 Hz @ 0.0002 G^2/Hz 350 − 500 Hz @ −6 dB/octave 500 Hz @ 0.0001 G^2/Hz (approx. 0.3 g rms)
	Non−operating:	Swept Sine:	0.75 G peak, 5 − 500 Hz, @ 1 octave/min.
		Random:	5 − 100 Hz @ 0.020 G^2/Hz 100 − 137 Hz @ −6 dB/octave 137 − 350 Hz @ 0.0107 G^2/Hz 350 − 500 Hz @ −6 dB/octave 500 Hz @ 0.0052 G^2/Hz (approx. 2.41 g rms)

Table 5−2. DDS Tape LED Guide

	Cassette	Drive	Meaning
Read/Write States			Cassette (un)loading
			Cassette loaded/online
			Cassette loaded/Activity
			Cassette loaded/offline
Write–Protect States			Cassette (un)loading
			Cassette loaded/online
			Cassette loaded/Activity
			Cassette loaded/offline
Error States			Media wear (caution)
			High humidity/No terminator
			Self–test (normal)
			Self–test (failure)

Key	Meaning
	Off
	Green
	Amber
	Pulse Green
	Pulse Amber

6

Model 712 Packaging

Chassis

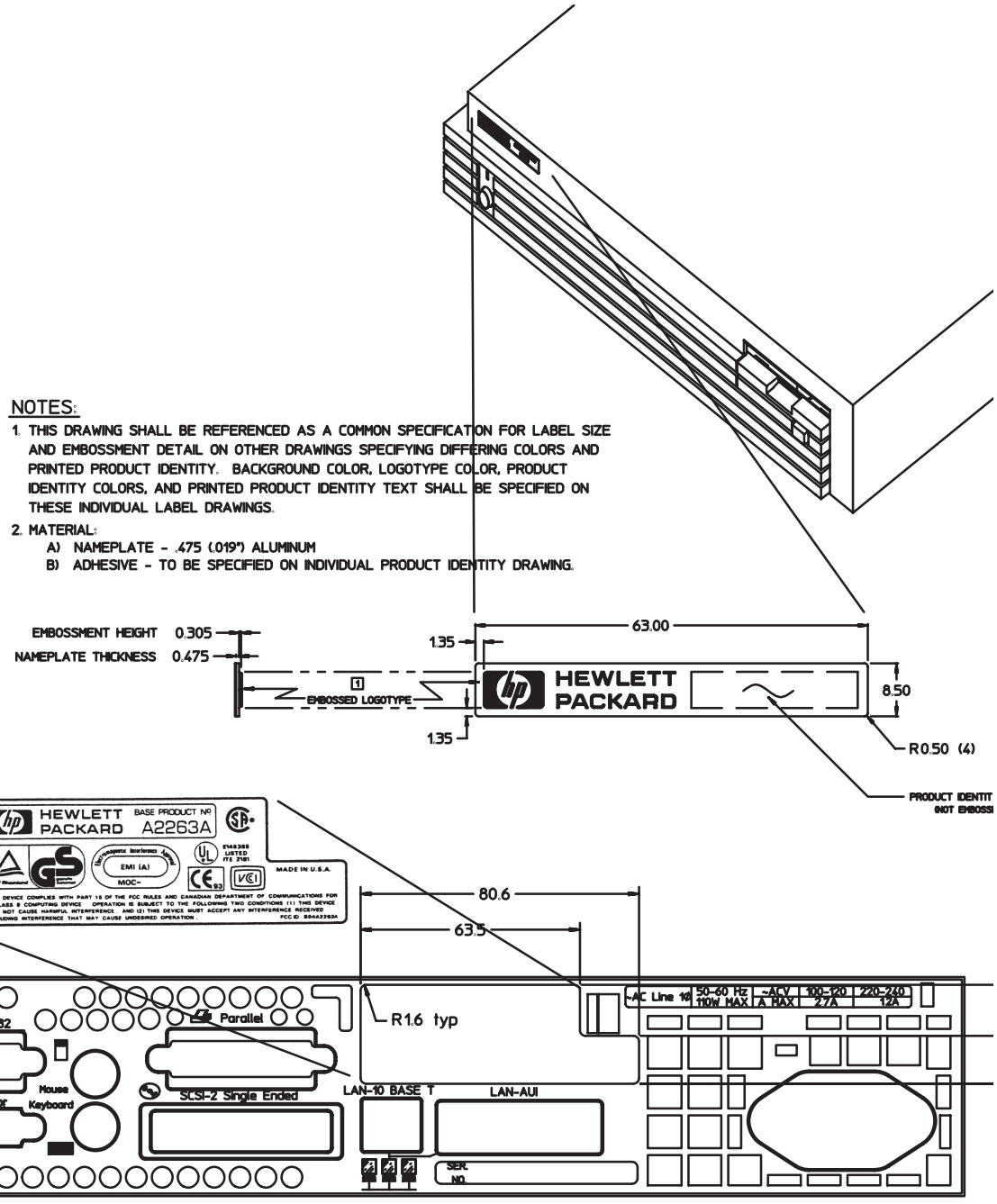


Figure 6−1. Chassis Labels and Dimensions

Shipping Carton

Box Specifications

Type: 275 PSI, Double wall corrugated, regular slotted carton.
Color: KRAFT
Dimensions:
L − 21.375−in, W − 20.5−in, .D − 11.75−in.
Closure: Inner tuck, glued seam
Markings: Print with ink to match
GCMI No. 31 BLUE
Print per Photomasters:

5955−6667	HP company Logotype 6.5−in.
5955−6696	ISO Symbol
5955−6673	Environmental Statement
016691	Open Me First
A1630−84023−2	Install. Instruction Enclosure
A1658−84023−2	Disk Drive Warning
A1658−84021−2	CE Mark (no year indicated) (sized to match ISO symbols)
A1658−84030−11	AW Recycle foam (US only)

Note: Film positive artworks will be supplied by Hewlett−Packard.
Box part number printed next to certification stamp.
Refer to Figure 6−2 for graphics layout and 6−3 for carton layout.

Carton Markings and Placement

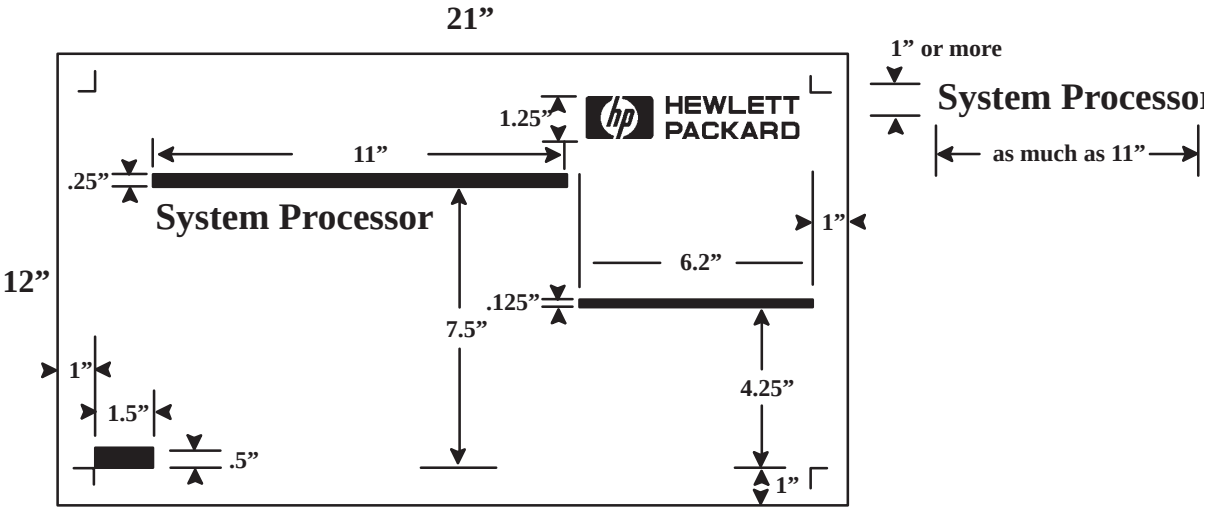


Figure 6−2. Carton Side Panel Markings and Placement

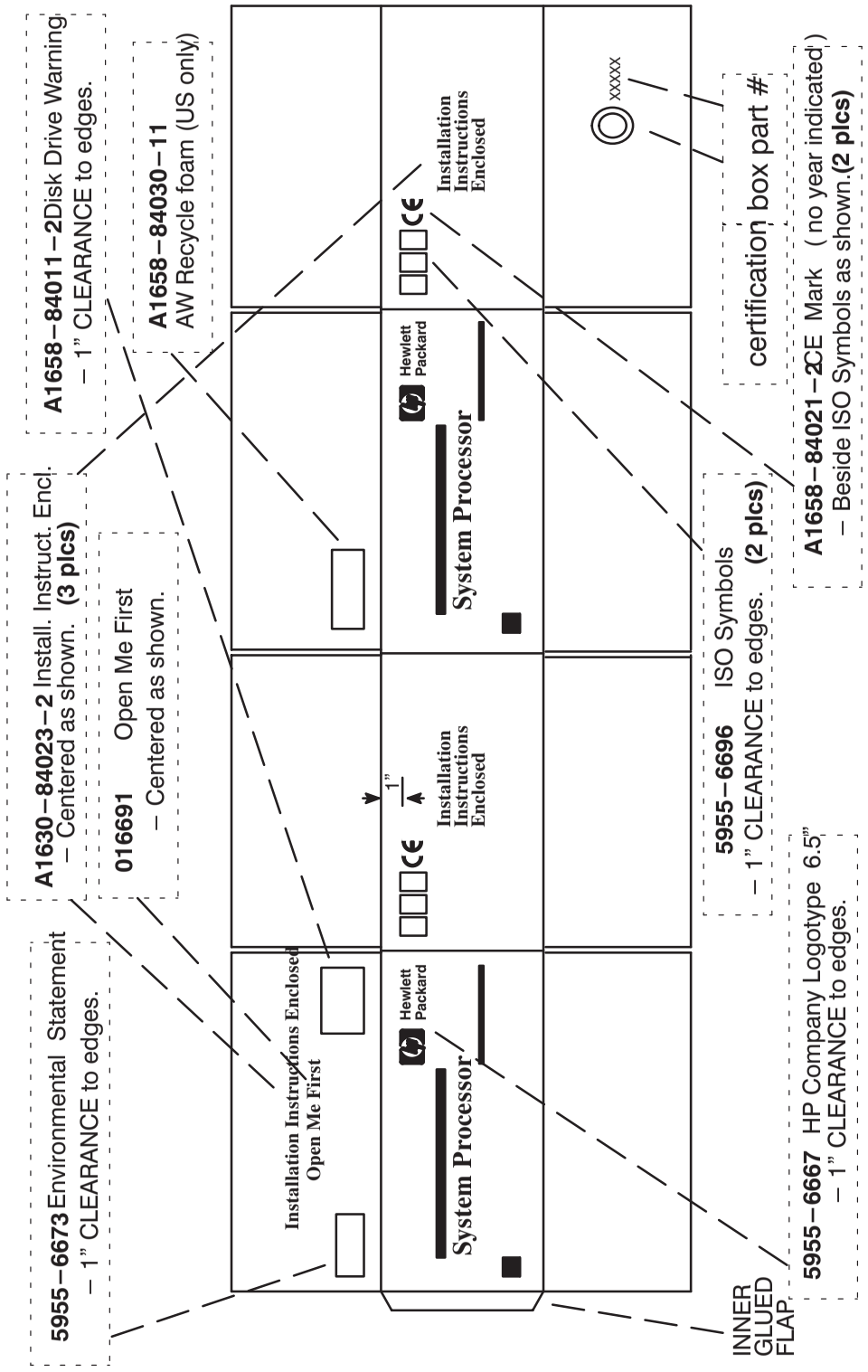


Figure 6–3. Carton Layout

7

Power Supply

Functional Information

The power supply is a semi−custom design. It is a 100KHz single−FET forward convertor with +5V and +12V as the two main outputs. Both of the main ouputs are sensed and fed back to provide an average regulation for the two outputs. The total continuous output power shall not exceed 70 Watts The power supply has a universal ac input to automaticlly sense line input voltage. An ”Easy Power Off” feature is included in the power supply in order to allow the user to turn the system off without first doing a shutdown −h, which is usually required on Unix machines. With the ”Easy Power Off” feature, when a user turns the On/Off switch off, a START_PWR_DOWN_L signal is coupled through an opto−coupler to the CPU chip, which causes the required shutdown routines to be initiated. When these routines have been completed, the I/O ASIC causes the POWER_UP_L signal to go high. This signal is coupled through another opto−coupler to the power supply, which then shuts down. The power supply will be customer removable with a screw driver after removing the top case of the computer.

Power Supply Specifications

Table 7−1. Power supply Output Specifications

Voltage	Current
+5.1 V dc	11.5 A
+12.0 V dc	1.0 A
+3.3 V dc	1.0 A
+5.0 V dc (SCSI)	0.5 A

Table 7−2. Power Supply Input Specifications

Input Power	**110 W Max Input**
Input Voltage (115V range)	90–132VAC
Input Current (115V range)	2.7A RMS max.
Input Voltage (230V range)	198–264 VAC
Input Current (230V range)	1.2A RMS max.
Line Frequency	47 – 66 Hz

Table 7−3. Power Supply Demand

Description	Max Power (Watts)
CPU*	
Cache*	
Buffers*	
Graphics*	
Core I/O and PDH*	
SCSI Term Power* (internal)	
Audio*	
Active RAM (32 Mbytes)*	
Standby RAM*	
System board Total 712/60	23.6
System board Total712/80i	29.8
Expansion Slot	5.0
Keyboard & Mouse	1.5
Disk Drive (One 3.5 in)	13.4
Flexible Disk Drive	2.5
Fan	1.2
SCSI Term Power (external)	2.5
Teleshare	6.5

* = measured as unit

LED Indicator

The LED on the power supply (front panel) indicates:
Green: power on.
Flashing: There is a problem with your graphics subsystem (after boot).

Mechanical Information

Dimensions

100 mm (3.9 in) by 230 mm (9.0 in)

Electrical Information

Connector Pinouts

Table 7−4. System Board Connector

Terminal	Voltage/Signal	Wire Gauge	Color	Load Current
1	START_PWR_DOWN_L	22	white	N/A
2	POWER_ON_L	22	blue	N/A
3	+5 Volt	18	orange	3.2
4	Ground	18	black	3.6
5	+12 Volt	18	red	0.15
6	Ground	18	black	3.6
7	+5 Volt	18	orange	3.2
8	+3.3 Volt	18	yellow	1.0
9	+5 Volt (SCSI)	18	violet	0.5
10	Ground	18	black	3.6
11	+5 Volt	18	orange	3.2

Table 7−5. Hard Drive Connector

Terminal	Voltage/Signal	Wire Gauge	Color	Load Current
1	+12 Volt	22	red	0.7
2	Ground	22	black	0.85
3	Ground	22	black	0.85
4	+5 Volt	22	orange	1.0

Table 7−6. Flexible Disk Drive Connector

Terminal	Voltage/Signal	Wire Gauge	Color	Load Current
1	+5 Volt	22	orange	0.8
2	Ground	22	black	0.8

Table 7−7. LED Connector

Terminal	Voltage/Signal	Wire Gauge	Color	Load Current
1	Cathode (–)	N/A	N/A	0.01
2	Anode (+)	N/A	N/A	0.01

Note: Load Current values are maximums.

Parts List

Table 7−8. Power Supply Module Parts List

Ref. No.	New Part Number	Description	Notes
1	0950–2356	Power Supply	
2	A2263–62003	Fan	
3	A2263–40002	Power Supply Cover	

8

Monitors

Monitor Control Location and Physical Dimensions

The figures (8–1 thru 8–5) and tables (8–1 thru 8–5) in this chapter provide the monitor control location and physical dimensions for the following monitors:

- HP A2882A 11.8−in Flat Panel 1024 by 768 Color Monitor
  (figure 8−1 page 8−2 and table 8−1, page 8−3)
- HP D1196A 15−in. 1024 by 768 Color Monitor
  (figure 8−2 , page 8−4 and table 8−2, page 8−5)
- HP A2287A/B 17−in. 1024 by 768 Color Monitor
  (figure 8−3 page 8−6 and table 8−3, page 8−7)
- HP A4032A/B 17−in. Multi−Sync 1280 by 1024 Color Monitor

- HP A2094A/B 19−in 1280 by 1024 Color Monitor
  (figure 8−5 page 8−10 and table 8−5, page 8−11)

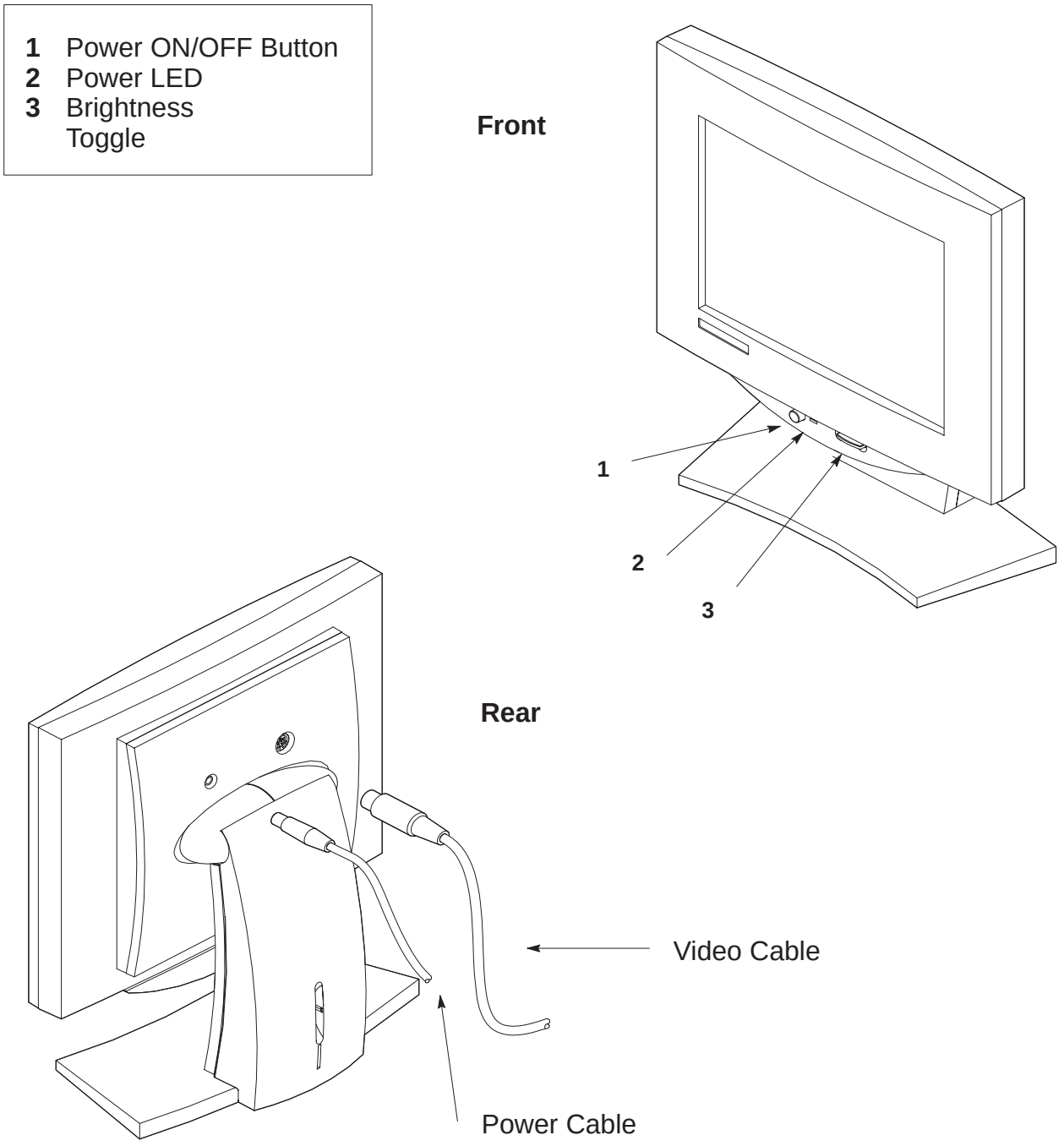


Figure 8−1. HP A2882A 11.8−in. Flat Panel Color Monitor Controls

Table 8−1. HP A2882A 11.8−in. Flat Panel Color Monitor Dimensions

Height	35.6 cm, 27.4 cm w/o stand (14.8 in)
Width	33 cm (13 in)
Depth	15.2 cm, 7.6 cm w/o stand (6 in, 3 in)
Weight	5.5 Kg (12 lb)
External Power Module	383.5 gr. (13.5 oz.)

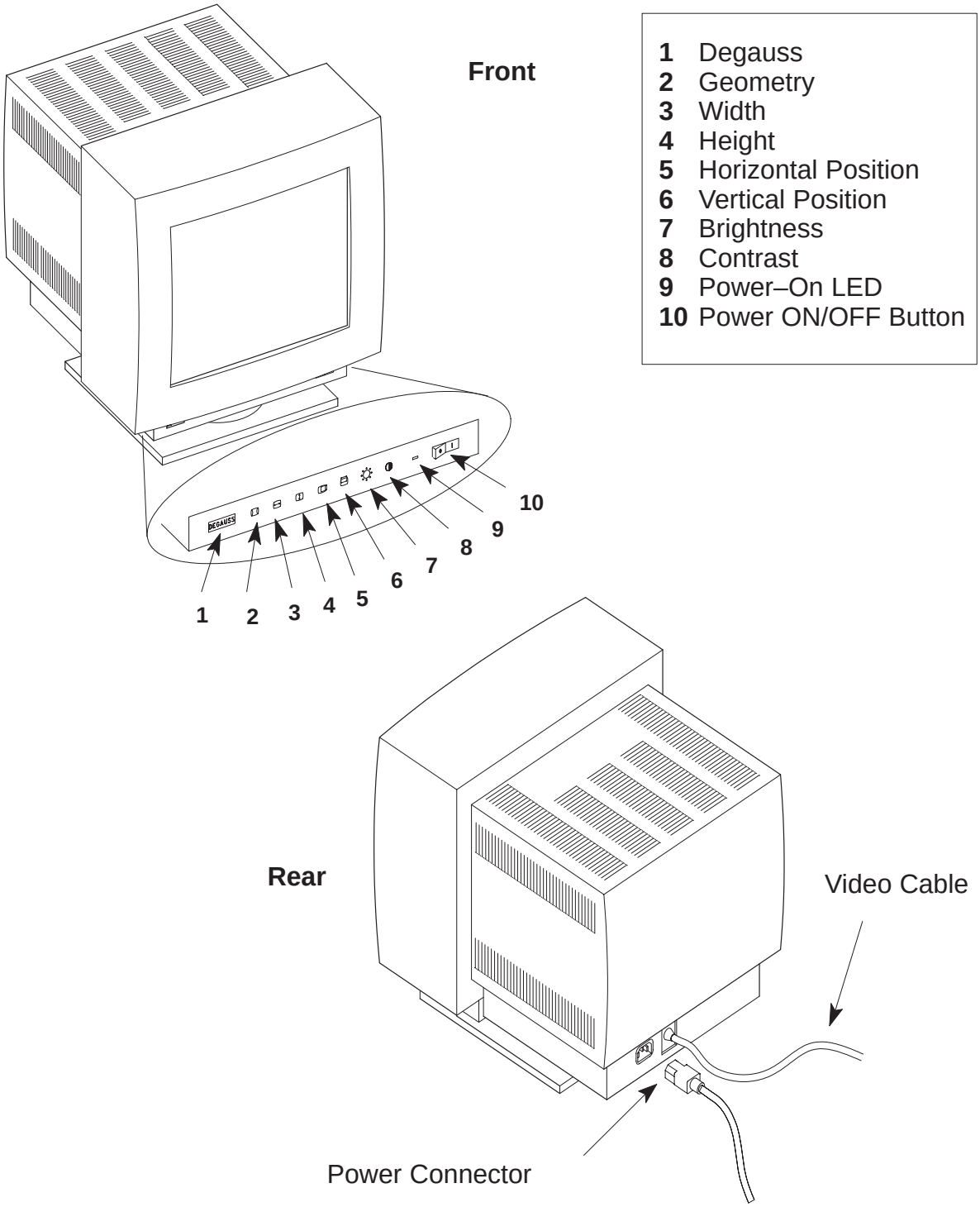


Figure 8−2. HP D1196A 15−in. Color Monitor Controls

Table 8−2. HP D1196A 15−in. Color Monitor Dimensions

Height	36.6 cm (14.4 in)
Width	35.4 cm (13.9 in)
Depth	40.0 cm (15.8 in)
Weight	14.0 Kg (31 lb)

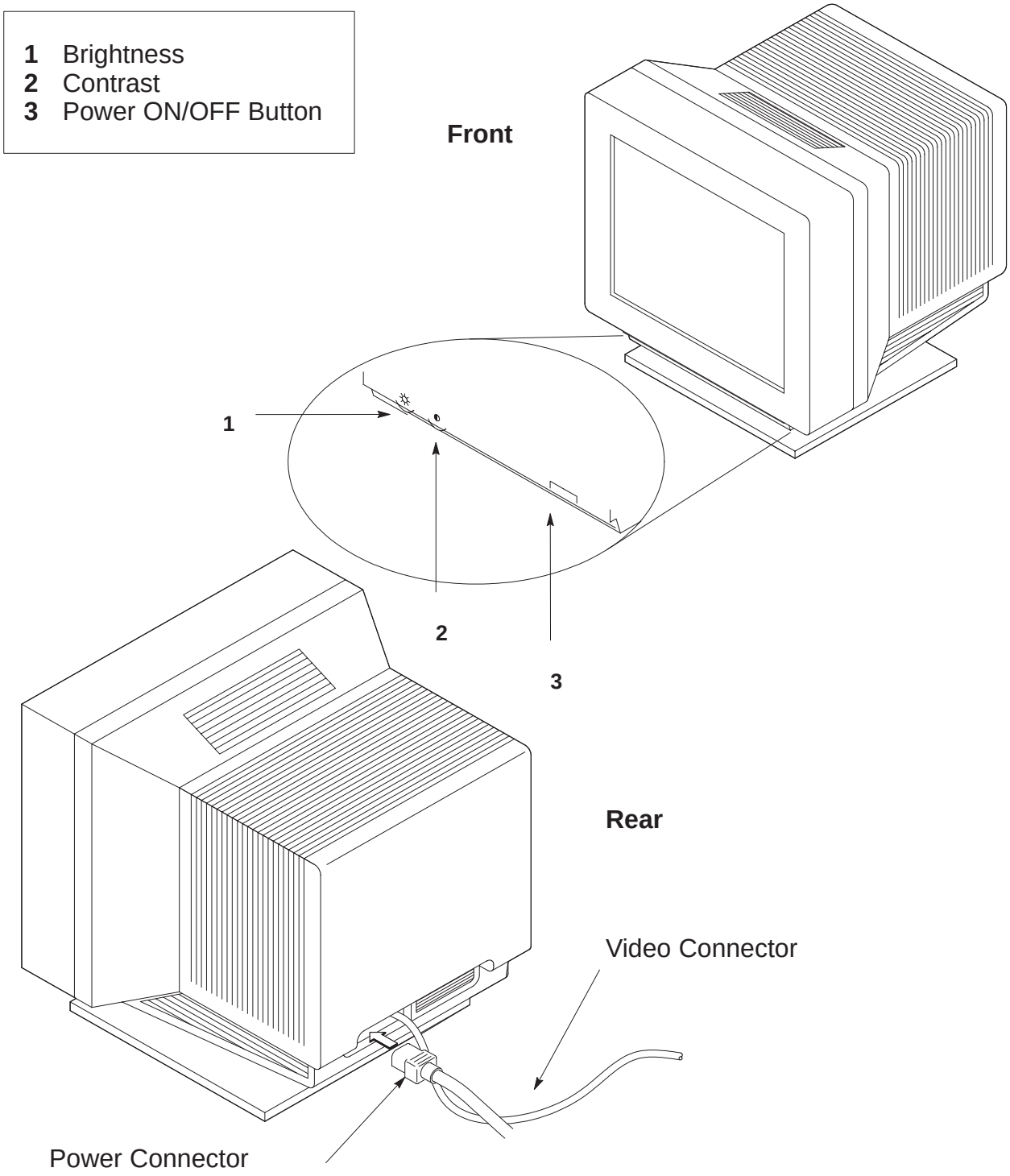
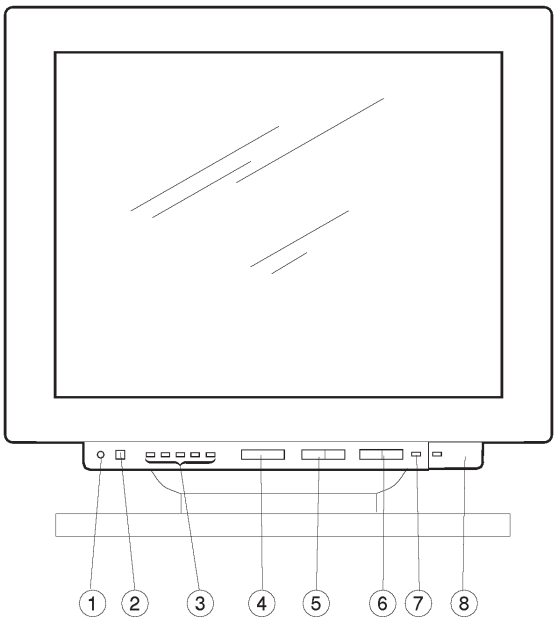


Figure 8−3. HP A2287A/B 17−in. Color Monitor Controls

Table 8−3. HP A2287A/B 17−in. Color Monitor Dimensions

Height	43.8 cm (17.2 in)
Width	40,8 cm (16.0 in)
Depth	44.2 cm (17.4 in)
Weight	21.0 Kg (46.2 lb)

1. RESET
2. CTRL (control)
3. Indicator Lights
   C TEMP
   CONV
   GEOM
   SIZE
   CENT
4. SELECT
5. Brightness
6. Contrast
7. POWER SAVING
   Light
8. Power Switch/Ind.



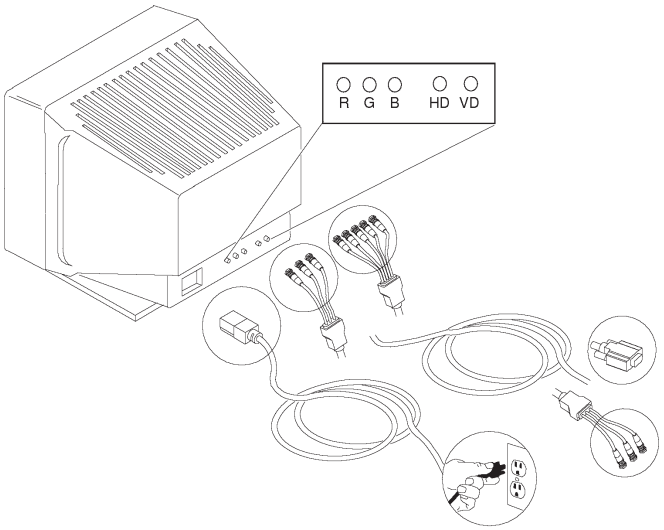


Figure 8−4. HP A4032A/B 17−in. Multi−Mode Color Monitor Controls

Table 8−4. HP A4032A/B 17−in. Multi−Mode Color Monitor Dimensions

Height	41.4 cm (16.3 in)
Width	40.6 cm (16 in)
Depth	45.0 cm (17.7 in)
Weight	22 Kg (48.4 lb)

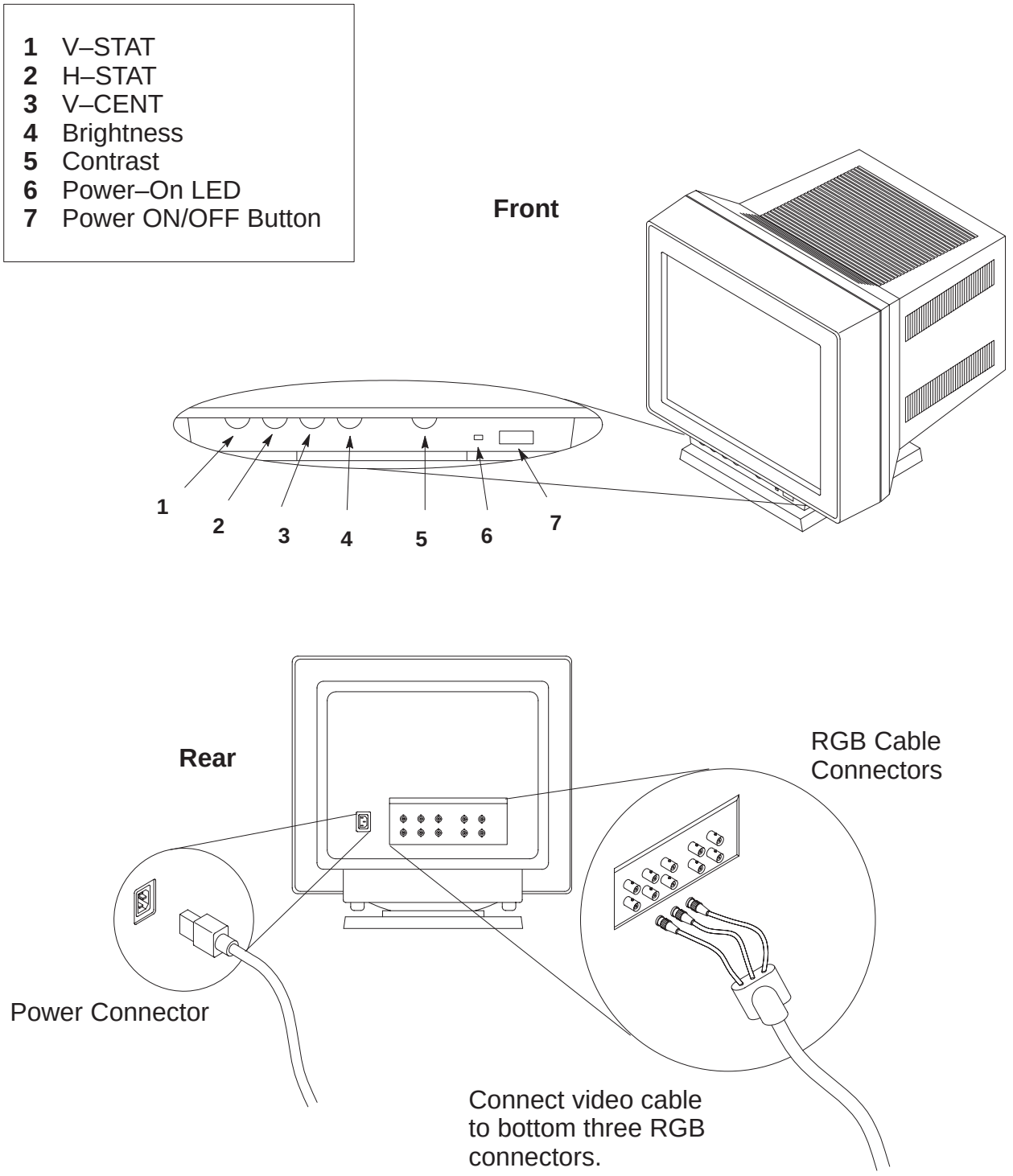


Figure 8−5. HP A2094A/B 19−in. Color Monitor Controls

Table 8−5. HP A2094A/B 19−in. Color Monitor Dimensions

Height	47.4 cm (18.7 in)
Width	48.0 cm (18.9 in)
Depth	50.5 cm (19.9 in)
Weight	32.5 Kg (71 lb)

9

Keyboard Layouts

Dimensions

The Model 712 workstation supports 13 different language keyboards. Each keyboard comes with a 7.5 foot mini–DIN style cable. The physical characteristics are as follows:

Length:	467 mm (18.4 in)
Width:	184 mm (7.25 in)
Height:	48 mm (1.9 in)
Weight:	1.09 kg (2.4 lb)

Japanese version:

Length:	455.7 mm (17.95 in)
Width:	164.51 mm (6.48 in)
Height:	38.07 mm (1.50 in)

Keyboard Layout

Tables 9−1 through 9−13 located on pages 9−2 through 9−14 show the 13 keyboard key layouts available for the model 712 Workstations.

Figure 9−1. Danish Keyboard

Figure 9−2. French Keyboard

Figure 9−3. German Keyboard

Figure 9−4. Italian Keyboard

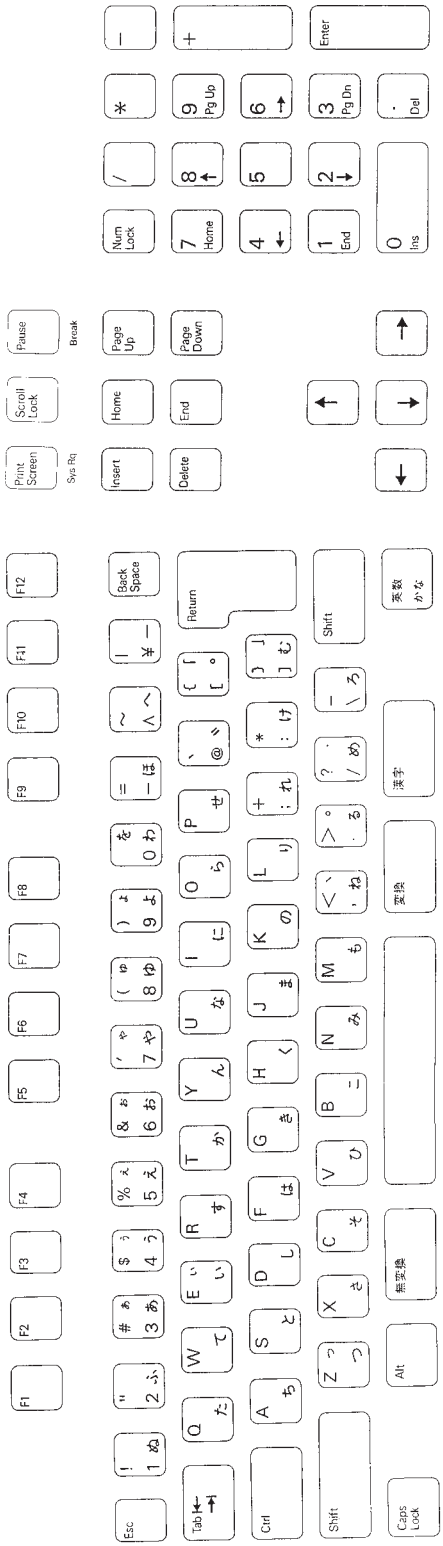


Figure 9−5. Japanese Keyboard

Figure 9−6. Korean Keyboard

Figure 9−7. Norwegian

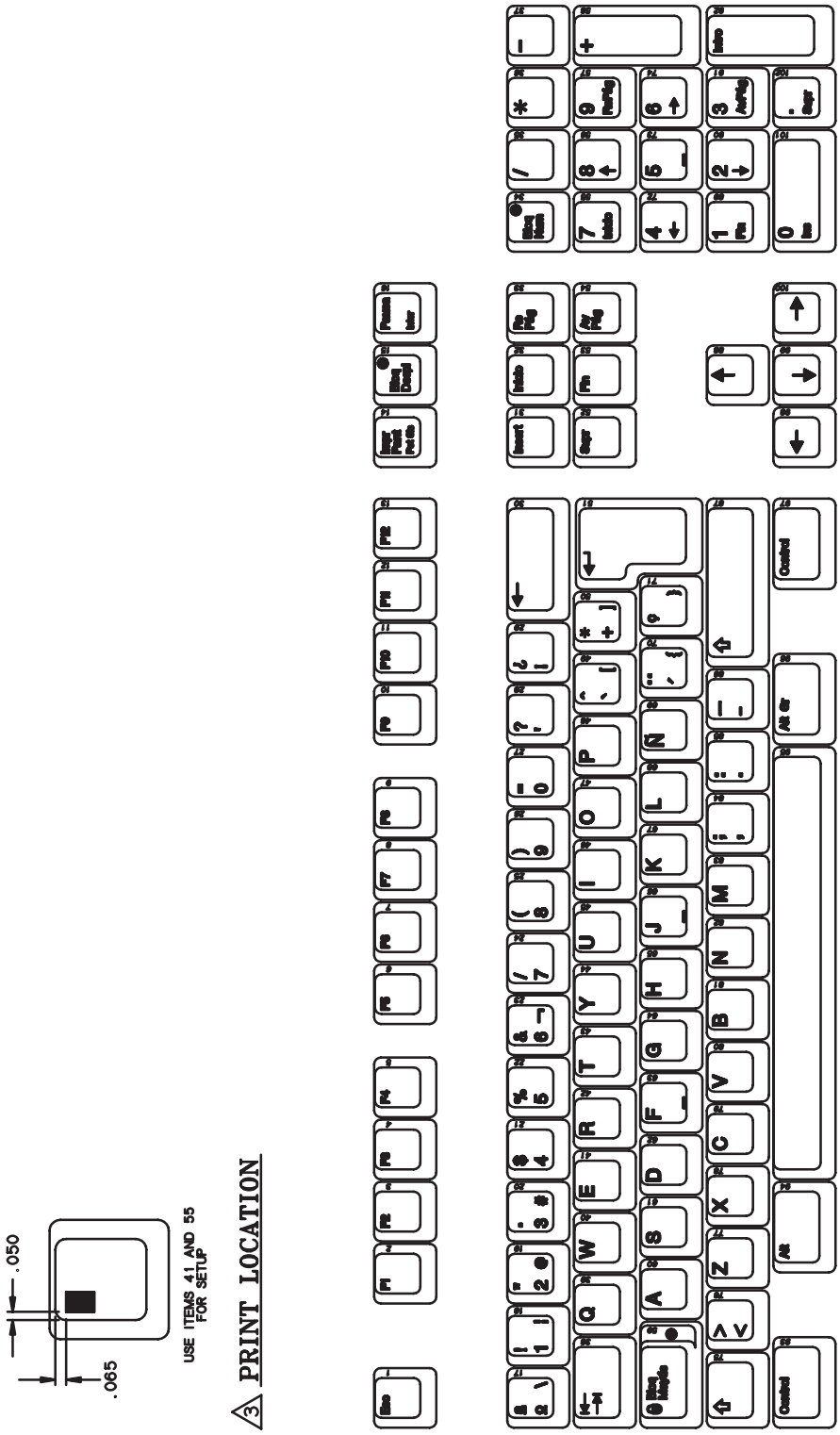


Figure 9−8. Spanish Keyboard

Figure 9−9. Swedish Keyboard

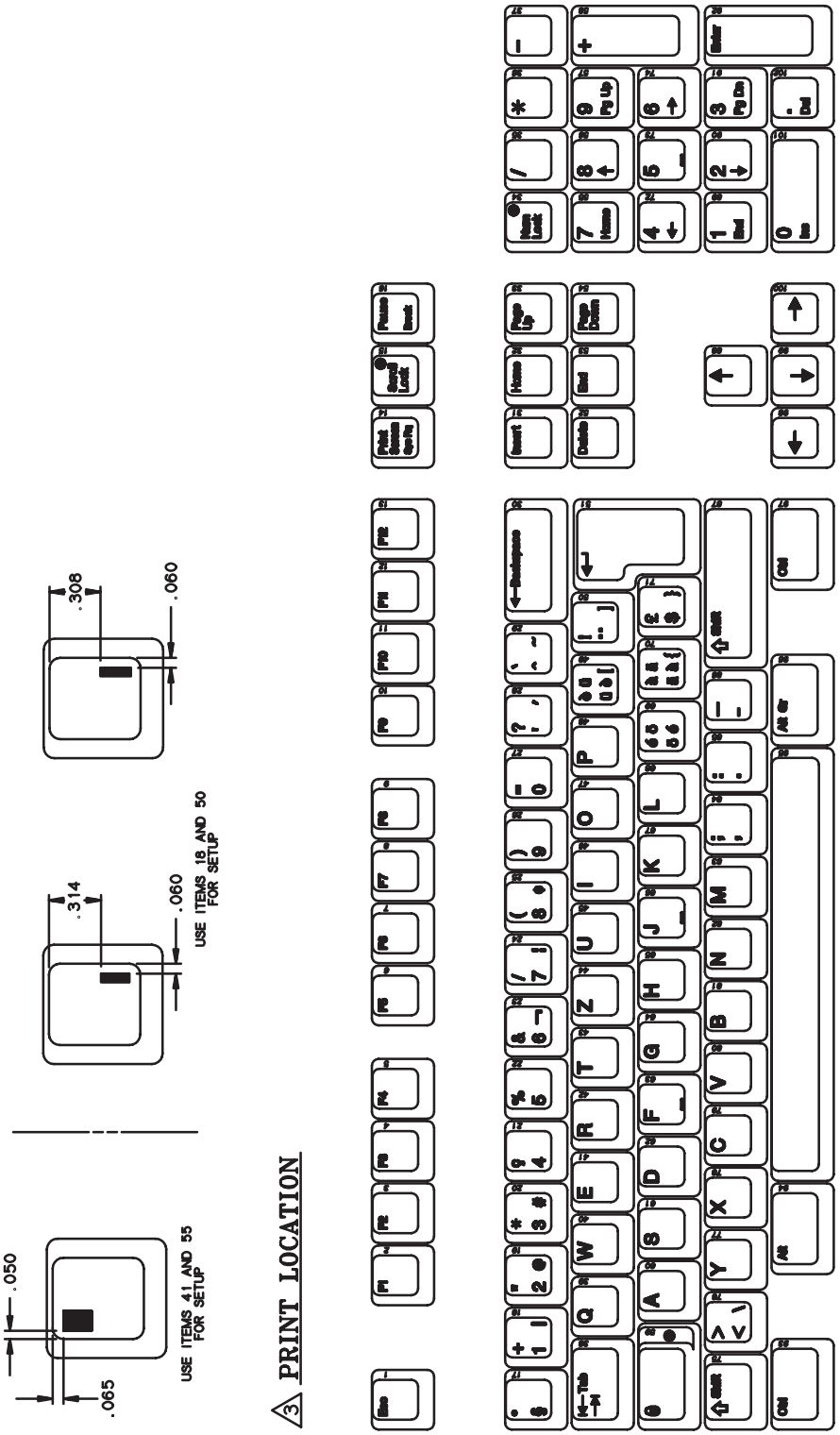


Figure 9−10. Swiss Keyboard

Figure 9−11. Taiwanese Keyboard

Figure 9−12. United Kingdom Keyboard

Figure 9−13. United States Keyboard