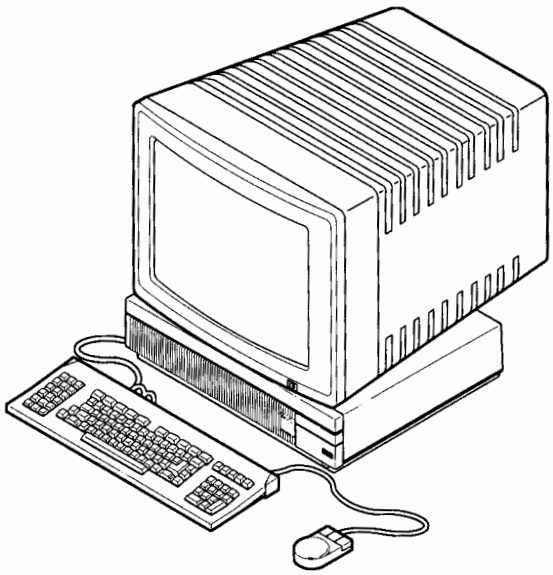
CE Handbook

HP Apollo 9000 Series 700 Workstations/Servers



HEWLETT PACKARD

HP Part No. A1926-90003
Printed in USA June 1991

Edition 2
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Printing History

New editions are complete revisions of the manual. Update packages, which are issued between editions, contain additional and replacement pages to be merged into the manual by the customer. The dates on the title page change only when a new edition or a new update is published. No information is incorporated into a reprinting unless it appears as a prior update; the edition does not change when an update is incorporated.

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Edition 1 . . . . . February 1991
Edition 2 . . . . . June 1991

List of Effective Pages

The List of Effective Pages gives the date of the current edition and of any pages changed in updates to that edition. Within the manual, any page changed since the last edition is indicated by printing the date the changes were made on the bottom of the page. No information is incorporated into a reprinting unless it appears as a prior update.

All pages: Edition 2 . . . . . June 1991

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For your protection this product has been tested to various national and international regulations and standards. The scope of this regulatory testing includes electrical/mechanical safety, radio frequency interference, ergonomics, acoustics, and hazardous materials. Where required, approvals obtained from third-party test agencies are shown on the product label. In addition, various regulatory bodies require some of the information under the following headings.

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Warning

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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取扱説明書に従って正しい取り扱いをして下さい。

Japanese Radio Frequency Notice

Safety Considerations

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation. The following figure shows some of the safety symbols used on the product to indicate various safety considerations.

SAFETY SYMBOLS

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.

Indicates hazardous voltages.

Indicates earth (ground) terminal (sometimes used in manual to indicate circuit common connected to grounded chassis).

Warning

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not done correctly or adhered to, could result in injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

Caution

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not done correctly or adhered to, could damage or destroy part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

Preface

The HP Apollo 9000 Series 700 is a new line of PA-RISC single-user workstation products developed jointly by the Workstation Systems Division and the Systems Technology Division of the Hewlett-Packard company. They are designed to run the HP-UX operating system and eventually the OSF operating system. They will not run the Domain operating system, however.

Presently, there are three Models: the Model 720, Model 730, and Model 750. The Model 720 is targeted for the low-end 2D and 3D LAN-based design automation markets; the Model 730 and 750 are targeted for the mid-range 2D and 3D design automation markets, both LAN-based and stand-alone.

The purpose of this CE Handbook is to provide summarized instructions and information to aid Hewlett-Packard (HP) Customer Engineers and qualified service personnel in servicing HP Apollo 9000 Series 700 Workstations and Servers.

Form Follows Function

Traditionally, the information contained in the CE Handbook was based on summarizing key information provided by other service documents. The intent was to physically reduce the size and weight of the material needed by CEs when making on-site service calls. This feature also allows the user to add Service Notes and other *reduced* service-related information of choice.

Function Follows Form

To eliminate redundancy, the traditional service documents were dropped. As such, this CE Handbook is the only service document for Series 700 workstations and servers. The CE Handbook, along with a workbook and video tape, are used during Level 2 training for HP Apollo 9000 Series 700 Workstations and Servers. Each student is given their own CE Handbook to keep. This way each student can make notes in their handbook during the training and take it with them afterwards.

About this manual

This CE Handbook is a *task-oriented* service manual that provides both need-to-know and nice-to-know information. Need-to-know information is combined for Model 720 and 730 systems, and colored green in chapters 1a, 3a, and 5a for 750 systems.

Individual chapters describe the features of the major card FRUs, supported configurations, product options, installation, and the remove and replace tasks for each Model; other chapters provide instructions to verifiy and troubleshoot all Models. Two additional Tabs are provided as a place for adding future graphics and host adapter interface options.

Nice-to know information for all Models, that supports Level 2 training, is located in a separate chapter. A glossary of terms and an index to quickly locate specific topics are at the end of the document.

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Model 720/730 Workstation/Server Information

The Model 730 is a two board upgrade to the Model 720. The basic difference is a faster system clock and faster cache SRAMs. Note that both the clock speed of the single-ended SCSI port and the EISA port also changes between the two models. Both Model 720 and 730 workstation products provide the same "look and feel" as the Series 400 workstation products (A1421A and A1630A).

A major component for both Model 720 and 730 workstation products is the A1094 System Unit cabinet. The intent of this chapter is to familiarize you with the *internal components* of the HP A1094 System Unit cabinet, referred to as field replaceable units (FRUs). A brief description of each FRU component is provided along with an illustration to assist in identification.

Missing from this chapter is specific product information about the graphics subsystems and the *external* peripheral devices supported by the 700 series of workstations/servers. Refer to the existing service documentation available for these products.

See chapter 8 for specific service information on the supported EISA host adapter card options from the Roseville Networks Division (RND).

See chapter 9 for specific service information on the supported SGC graphics subsystem options from the User Interface Technology Division (UTD), formerly the Graphics Technology Division (GTD) or the Workstation Systems Division (WSY), formerly the Apollo Systems Division (ASY).

System Unit FRUs

The System Unit FRU descriptions in this chapter are organized as follows:

A1094 System Unit Cabinet

Figure 1-1 provides an internal view of the HP A1094 **System Unit cabinet**. The design simplifies upgrading processor, I/O, and SGC graphics cards, adding SIMM memory card pairs, (internal) 3.5 inch SCSI devices, and EISA host adapter cards.

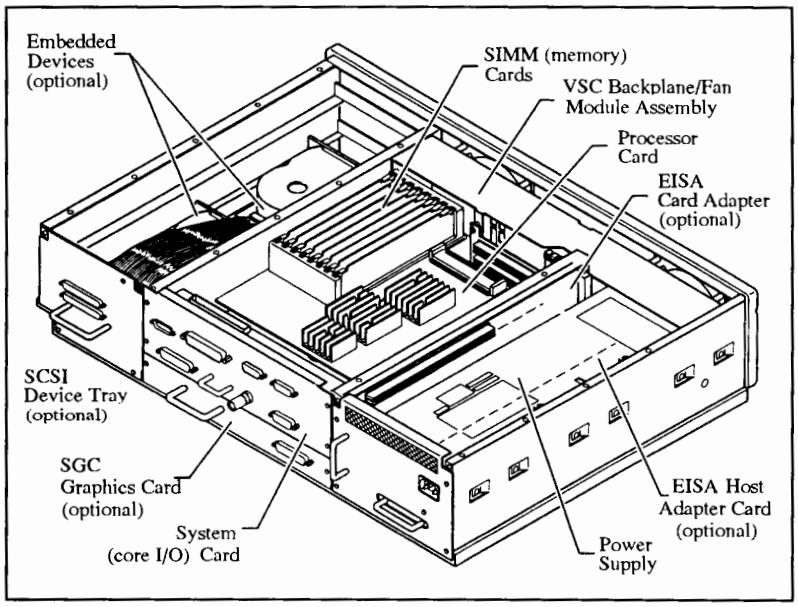


Figure 1-1. Internal View of the A1094 System Unit Cabinet

Features

- Support for one Processor card (with eight connectors for up to four SIMM card pairs), one SGC graphics card, one System (core I/O) card, one EISA host adapter card, and up to two 3.25 inch SCSI devices.
- Standard interfaces supported include: EISA, HP-HIL, HP-SGC, IEEE 802.3 LAN, SCSI-2, Centronics, RS-232, and audio.
- Standard cabinet components include: power supply assembly; VSC backplane/fan module; LED display and switch cards.
- Optional cabinet components include: a SCSI device tray assembly to support two 3.5 inch (internal) SCSI devices and an EISA card adapter assembly to support one EISA host adapter card.

System Unit Specifications

Classification	Standard supported by the A1094 System Unit
Environmental	Without internal SCSI devices: ■ Operating temperature: 0 to 55 degrees C (20 degrees C/hour rate of change maximum) ■ Non-operating temperature: −40 to 70 degrees C (maximum wet bulb temperature) ■ Humidity: 95% R.H. (maximum operating @ 40 degrees C); 90% R.H. (maximum non-operating @ 55 degrees C) ■ Operating altitude: 4,570 meters (15,000 feet) to 47 degrees C, reduce ceiling by 286 meters (938 feet) for each degree C above 47 degrees C ■ Non-operating altitude: 15,240 meters (50,000 feet) to 70 degrees C With internal SCSI devices: ■ Operating temperature: 5 to 45 degrees C (20 degrees C/hour rate of change maximum) ■ Non-operating temperature: −40 to 60 degrees C (maximum wet bulb temperature) ■ Operating (non-condensing) Humidity: 8% to 85% R.H. maximum @ 40 degrees C; maximum wet bulb temperature @ 27 degrees C ■ Non-operating (non-condensing) Humidity: 5% to 95% R.H. maximum @ 55 degrees C; maximum wet bulb temperature @ 46 degrees C ■ Operating altitude: 3,050 meters (10,000 feet) to 40 degrees C, ■ Non-operating altitude: 15,240 meters (50,000 feet) to 60 degrees C
Regulatory	EMI (conducted and radiated): ■ FCC Class A (in USA) ■ FTZ 1046/84 Level B (in Germany) ■ VCCI Class 1 (in Japan) Safety: ■ UL 1950 1st Edition (in USA) ■ CSA 22.2 NO. 220 (in Canada) ■ IEC 950 1st Edition 1986 (in Europe) Datacom: BS6301 Ergonomics: ZH-1/618 Accoustics: less than 50 dbA (sound power level) below 35 degrees C; less than 58 dbA @ 55 degrees C
Physical	Net weight = 19.5 Kilograms (43 pounds) Desktop (horizontal position) = 508 mm (20.0 inches) wide, 114 mm (4.5 inches) high, 470 mm (18.5 inches) deep Deskside (vertical position) = 524 mm (20.6 inches) wide, 114 mm (4.5 inches) high, 470 mm (18.5 inches) deep
Electrical	88 to 250 Volts AC, 47 to 66 Hertz (maximum of 6 Amperes RMS @ 115 Volts or 4 Amperes RMS @ 230 Volts) 310 Watts maximum, 1057 BTU/hour, 267 Kilo-calories/hour 250 Watts typical, 853 BTU/hour, 215 Kilo-calories/hour

Processor and SIMM Cards

Figure 1-2 contains an illustration of a **Processor card** showing three VLS1 chips and eight **SIMM cards**, 2 MB or 8 MB. There are two versions of the Processor card: a 50 MHz. version for Model 720 systems and a 66 MHz. version for Model 730 systems. Both versions plug directly into the VSC backplane assembly to access the VSC (system) Bus signals and DC power from the power supply in the System Unit cabinet.

Each version of Processor card provides Voltage regulators that generate bias DC Voltages for the on-card (ECL) system clock logic.

Note that the 2 MB or 8 MB SIMM cards plug into dedicated connector pairs (called slots) on the Processor card.

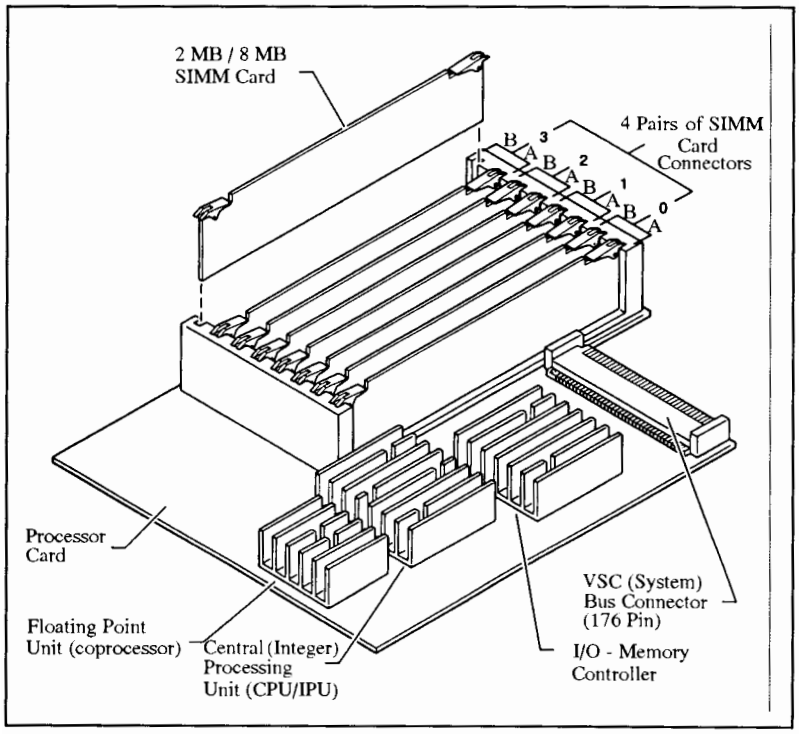


Figure 1-2. Processor Card with Four SIMM Card Pairs

Model 720 Processor Card Features

- A 50 MegaHertz PA-RISC Central (Integer) Processing Unit with internal address translation buffers that processes 57 Drystone MIPS and 55.5 SPECmarks (a benchmark from the Systems Performance Evaluation Cooperative, Inc.)
- A PA-RISC Floating-Point Unit (coprocessor) that processes 17 Mflops.
- A PA-RISC System Controller chip that controls all transactions between CPU (IPU), memory, and the I/O modules.
- An Instruction Cache containing 128 Kilobytes of (parity protected) static RAMs. I-cache parity errors are corrected by the Processor.
- A Data Cache containing 256 Kilobytes of (parity protected) static RAMs. D-cache parity errors are not correctable.
- Minimum of 16 Megabytes of main memory using 2 each 8 Megabyte SIMM cards; customer expandable from 16 to 24 Megabytes using 2 Megabyte SIMM cards or from 16 to 32, 48, and 64 Megabytes using 8 Megabyte SIMM cards.

Model 730 Processor Card Features

- A 66 MegaHertz PA-RISC Central (Integer) Processing Unit with internal address translaton buffers that processes 76 Drystone MIPS and 72.2 SPECmarks (a benchmark from the Systems Performance Evaluation Cooperative, Inc.)
- A PA-RISC Floating-Point Unit (coprocessor) that processes 22 Mflops.
- A PA-RISC System Controller chip that controls all transactions between CPU (IPU), memory, and the I/O modules.
- An Instruction Cache containing 128 Kilobytes of (parity protected) static RAMs. I-cache parity errors are corrected by the Processor.
- A Data Cache containing 256 Kilobytes of (parity protected) static RAMs. D-cache parity errors are not correctable.
- Minimum of 16 Megabytes of main memory using 2 each 8 Megabyte SIMM cards; customer expandable from 16 to 24 Megabytes using 2 Megabyte SIMM cards or from 16 to 32, 48, and 64 Megabytes using 8 Megabyte SIMM cards.

SIMM Card Features

- A pair of 2 MB or 8 MB SIMM cards make up a set of dynamic memory; each set contains two banks; each bank contains 18 (1/4 Megabit) DRAMs. SIMM cards must be added (or deleted) in pairs.
- The error-correcting code (ECC) logic to detect all single and double-bit parity errors and to correct all single-bit errors is in the memory controller/system bus interface chip on the Processor card.
- The SIMM card connector pairs are labeled slot 0, slot 1, slot 2, and slot 3. Memory Addresses ending with X'4, 5, 6, 7, C, D, E, and F are associated with one of the connector pair for each slot; memory addresses ending with X'0, 1, 2, 3, 8, 9, A, and B are associated with the other connector pair for each slot.
- Memory reads require 4 VSC (system) Bus cycles, writes require only 2 cycles.

System (core I/O) Card

Figure 1-3 contains an illustration of the **System (core I/O) card**. This card contains most of the workstation/server's input/output logic controllers. Currently, there is one version of the System (core I/O) card for Model 720 systems and another for Model 730 systems. Both versions plug directly into the VSC backplane assembly to access the VSC (system) Bus signals and DC power from the power supply in the System Unit cabinet.

Note

The Model 730 version of the System (core I/O) card is downward compatible with the Model 720 version of the Processor card when the SCSI frequency jumper is in the Model 720 position.

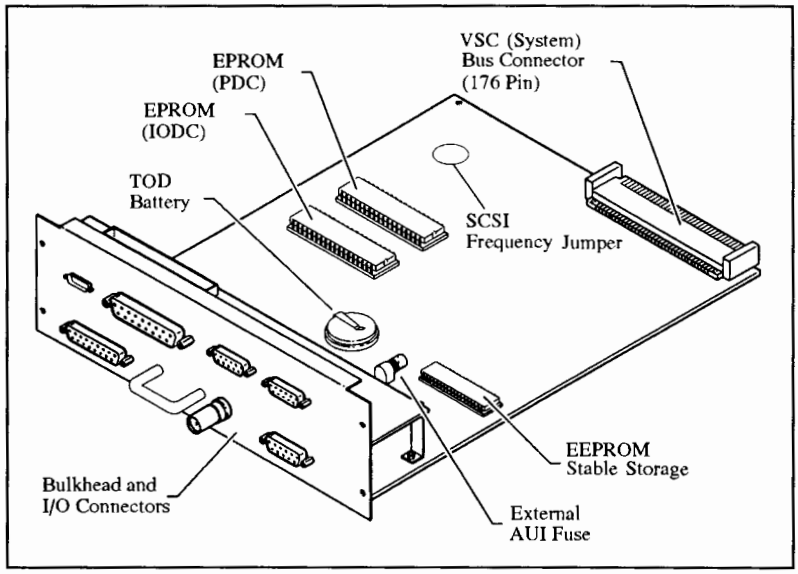


Figure 1-3. Replaceable Parts on the System (core I/O) Card

Replaceable Components

- 3.0 Volt (coin) Battery for the Time-of-Day (TOD) logic
- PDC EPROM for selftests, Boot Administration commands, IPL boot routines, etc.
- IODC EPROM for PDC routines to initialize and test the on-card I/O ports
- EEPROM for storing SPU configuration and boot information (stable storage)
- Fuse for an external AUI

System (core I/O) Card Bulkhead Connectors

Figure 1-4 contains an illustration of the I/O connectors provided on the card's bulkhead. Refer to chapter 2 for a "list of the supported peripheral devices."

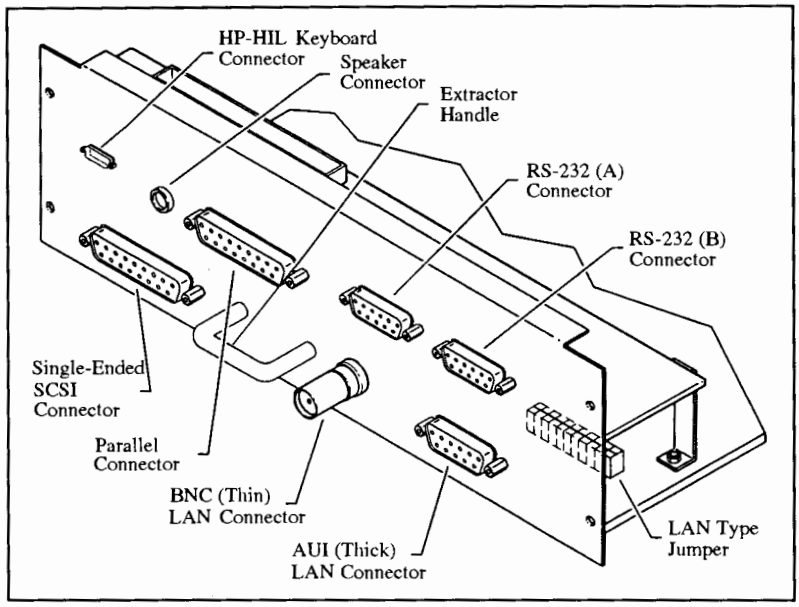


Figure 1-4. Connectors on the System (core I/O) Card's Bulkhead

LAN Port Features

- The IEEE 802.3/ethernet 1.0 LAN port supports (synchronous) data transfers with up to 10 Megabits per second throughput.
- Provides for direct interface to RG-58/u ThinLAN or twisted-pair networks using its built-in 10 BASE2 MAU to BNC connector.
- Onboard LAN type jumpers select either the (ThinLAN) MAU through the BNC connector or an external (ThickLAN) MAU through the 15-pin AUI connector. (See Figure 1-4.)
- A replaceable fuse protects the internal LAN circuits from (internal or external) MAU electrical faults.

Audio Port Features

- Provides 3 independent time generators controllable over 30 DB to produce sounds between 81.46 Hertz to 83.3 Kilo-Hertz. (Capable of approximate chromatic scale over 5 octaves.)
- Provides availability to an external speaker (250 milli-Watts @ 8 ohms) through a phono jack connector on the bulkhead of the System (core I/O) card.

Parallel (Centronics) Port Features

Refer to chapter 2 for a list of supported devices.

- The internal centronics port supports 8-bit data transfers in excess of 300 Kilobytes per second when using standard setup, hold, and strobe pulse width times.
- Support for 25-pin, bi-directional capabilities compatible with PS/2 standards.
- Handshake support for HP Scanjet parallel port.
- Support for NACK and BUSY handshakes.
- No long line support.

RS-232 Serial Port Features

Refer to chapter 2 for a list of supported devices.

- Channels A and B are EIA RS-232C asynchronous type "D" supporting full CCITT V.24/V.28 modem control with support for:
  - 5, 6, 7, or 8 bit characters; odd, even, none, one, zero parity; 1 start bit and 1, 1.5, or 2 stop bits.
  - 1, 4, 8, or 14 byte programmable FIFO interrupt level.
  - CTS (CB0), DSR (CC), RI (CE), and DCD (CF) modem status interrupts.
  - All cardinal BAUD rates: 110, 300, 1200, 2400, 9600, 19.2K, and 38.4K.
  - Additional BAUD rates: 50, 75, 150, 600, 4800,7200, 57.6K, 115.25K, and 230.4K.
- HP-UX version 8.01 supports up to 460.8 Kilobits per second with CTS (outbound) hardware flow control; HP-UX version 8.05 supports up to 460.8 Kilobits per second with CTS (bi-directional) hardware flow control.
- Long cables, (or short cables with BAUD rates above 57.6K), will require an external RS-232 to RS-422 converter box.
- Channel A provides (default) support as an (alternate) console with HP TERM 0, ANSI, or ASCII terminal.

Single-ended SCSI Port Features

Refer to chapter 2 for a list of supported devices.

- Supports the Small Computer Systems Interface (SCSI-2) protocol using 8-bit (synchronous data transfers up to 5 Megabytes per second and asynchronous data transfers up to 1.5 Megabytes per second) over standard length cables.
- Onboard SCSI frequency jumper selects the appropriate SCSI bus frequency for either the Model 720 or Model 730 operation of the System (core I/O) card. (See Figure 1-3.)
- Supports 5 single-ended SCSI devices with HP-UX version 8.01 and 7 single-ended SCSI devices with HP-UX version 8.05.
- Uses "high-density" 50-pin SCSI connector.

HP-HIL Port Features

Refer to chapter 2 for a list of supported devices.

- The onboard Hewlett-Packard Human Interface Link (HP-HIL) port provides support for 2 standard and 5 optional HP-HIL customer installable devices.
- The (two-dot) HP-HIL connector on the bulkhead is provided for the standard HP-HIL keyboard.
- The keyboard provides an HP-HIL connector for the standard HP-HIL 3-button mouse.

EISA Card Adapter Assembly

Figure 1-5 contains an illustration of the **EISA Card Adapter assembly**. The EISA card adapter assembly is used to adapt one *extended industry standard architecture* (EISA) card to the VSC (system) Bus. The EISA card adapter plugs directly into the VSC backplane assembly to access the VSC (system) Bus signals and DC power from the power supply in the System Unit cabinet.

DC power, from the power supply in the System Unit cabinet and signals on the VSC (system) bus, are routed from a connector on the VSC backplane to the logic on the EISA adapter card assembly and the optional EISA host adapter card.

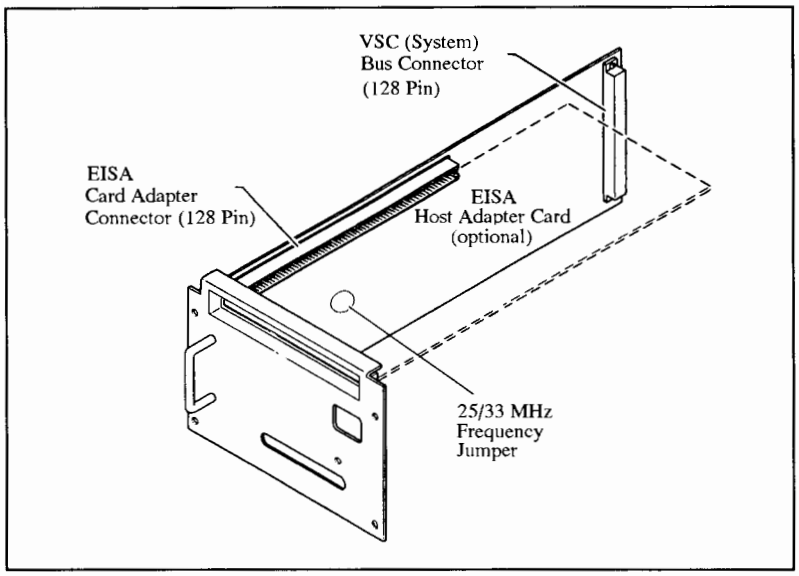


Figure 1-5. EISA Card Adapter Assembly

Features

- Onboard EISA bus frequency jumper selects either 25 MHz. operation for Model 720 systems or 33 MHz. operation for Model 730 and 750 systems.

EISA Host Adapter Card Options

The EISA card adapter is *optional* on Model 720 workstations and servers and is *standard* on Model 730 workstations and servers.

See chapter 2 for a list of EISA host adapter cards supported. Refer to chapter 8 for specific details about individual EISA host adapter cards.

SCSI Device Tray Assembly

Figure 1-6 contains an illustration of the **SCSI Device Tray assembly**. The SCSI device tray assembly is used to install up to two 3.5 inch SCSI devices into the System Unit cabinet.

The SCSI devices on the SCSI device tray assembly receives DC power, from the power supply in the System Unit cabinet, through a connector on the Switch card. Signal and data to/from the SCSI controller on the System (core I/O) card are routed through an external 50-pin (high-density) cable connected between the "IN" (SCSI device) connector on the SCSI device tray and the single-ended SCSI connector on the System (core I/O) card.

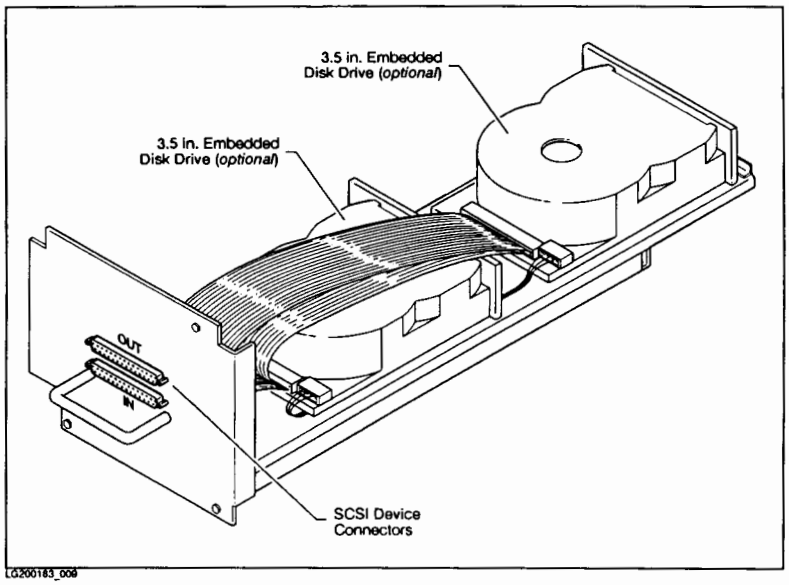


Figure 1-6. SCSI Device Tray Assembly

Embedded Devices

The embedded devices supported are a 210 Megabyte fixed disk from Quantum (PD210S), a 420 Megabyte fixed disk from Quantum (PD420S) or DMD, and a 1.3 Megabyte floppy disk from Teac.

Note: Only 3.5 inch form factor SCSI devices can be mounted on the SCSI Device Tray assembly.

See chapter 8 for detailed information on future embedded device options supported.

Fixed Disk Features

- One 3.5 inch (half-height) 200 Megabyte fixed disk (PD210S) from the Quantum Corporation is supported by HP-UX version 8.01 or higher.
- One 3.5 inch (half-height) 400 Megabyte fixed disk (PD420S) from the Quantum Corporation is supported by HP-UX version 8.01 or higher.
- Drive jumpers for both Quantum models are located on the underside of the device (suggested SCSI address for 1st fixed disk is 6 and 5 for the 2nd fixed disk)
  - SS - enables self seek tests at power-on (not jumpered)
  - EP - enable parity checking of data on SCSI bus (jumpered)
  - WS - enables drive to spin up on command from host (not jumpered)
  - A2 - enables most significant bit of SCSI address
  - A1 - enables next most significant bit of SCSI address
  - A0 - enables least significant bit of SCSI address
- One 3.5 inch (half-height) 400 Megabyte fixed disk from the Disk Memory Division (DMD) of Hewlett Packard is supported by HP-UX version 8.01 or higher.
- Drive jumpers for DMD model are located on the underside/rear of the device (suggested SCSI address for 1st fixed disk is 6 and 5 for the 2nd fixed disk)
  - ?? - (to be supplied)
  - ?? - (to be supplied)
  - ?? - (to be supplied)
  - A2 - enables most significant bit of SCSI address
  - A1 - enables next most significant bit of SCSI address
  - A0 - enables least significant bit of SCSI address

Floppy Disk Features

The HP 1984A 1.3 Megabyte floppy disk requires a different bezel in the A1094 System Unit cabinet that allows insertion/removal of the cartridge. See chapter 5 for part numbers for the standard and optional bezels.

- One 3.5 inch (half-height) 1.3 Megabyte floppy disk from Teac Corporation is supported by HP-UX version 8.01 or higher.
- Drive jumpers for Teac model are located at the rear of the device (suggested SCSI address is 1)
  - 2 - enables most significant bit of SCSI address (no jumper)
  - 1 - enables next most significant bit of SCSI address (no jumper)
  - 0 - enables least significant bit of SCSI address (jumper)
- Suggested SCSI address jumpers/switch settings for embedded floppy disk is 1.

Power Supply Assembly

Figure 1-7 contains an illustration of the **Power Supply assembly**. The power supply assembly is an autoranging unit that automatically adjusts to a nominal 115 Volts (60 Hertz) or 230 Volts (50 Hertz) AC input source. The power supply DC outputs plug directly into the VSC backplane assembly for distribution to the logic cards, embedded devices, and cooling fans in the A1094 System Unit cabinet.

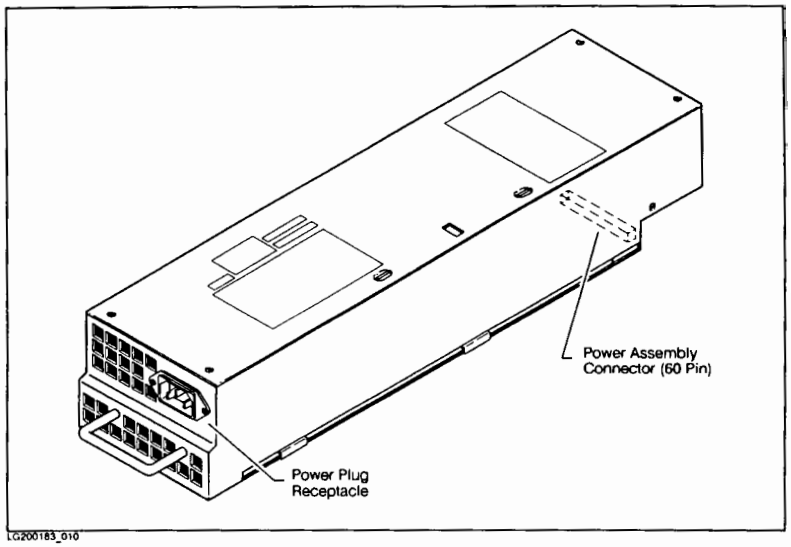


Figure 1-7. Power Supply Assembly

Table 1-1 contains the AC/DC power values of the power supply.

Table 1-1. Power Supply Voltages and Currents (310 Watts maximum)

Input AC Voltage	Input AC Current	Output DC Voltages
115 Volts (60 Hz)	5.4 Amps	5.0 Volts
230 Volts (50 Hz)	3.0 Amps	12 Volts
		−12 Volts
		−5.0 Volts
		10.5 - 13.5 Volts

Caution

The Power Supply becomes operational when the AC power cord is plugged into an AC power source. The Power-on/Standby switch must be in the standby position to turn off all output DC voltages. This position is used to turn the System Unit off prior to removing logic cards, however, the power cord should be removed from the Power Supply before opening the System Unit cabinet.

Features

- Autoranging AC input power (no switches or jumpers).
- The DC outputs of the power supply are turned on/off by the power switch on the Switch card.
- A two-speed fan, housed within the Backplane/Fan module, to increase airflow through the Power Supply when the ambient air temperature exceeds 35 degrees C.
- Supports thermal shutdown when air temperature exceeds 55 degrees C.
- Programmable shut-down is supported.

VSC Backplane Assembly

Figure 1-8 contains an illustration of the **VSC Backplane assembly** mounted within the VSC Backplane/Fan module. DC power is distributed from the Power Supply to the System Unit FRUs and the cooling fans through the VSC Backplane assembly.

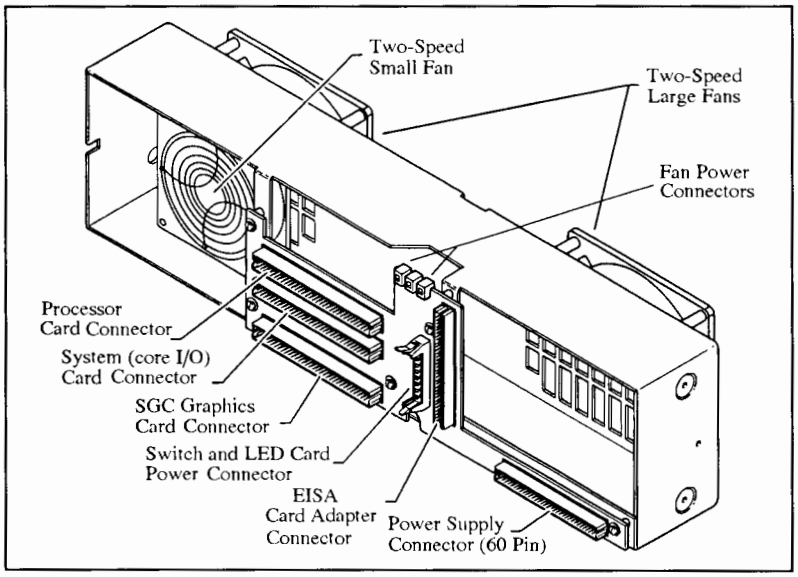


Figure 1-8. VSC Backplane Assembly (on the VSC Backplane/Fan Module)

Front Panel FRUs

The front panel functions are distributed across two logic cards: the Switch card and the LED Display card. See Figure 1-9.

Switch Card

The **Switch card** contains the power supply switch and connects to the VSC backplane assembly through a cable harness for DC power and a ribbon connector for signals.

LED Display Card

The **LED Display card** contains all of the front panel LEDs, the service/normal mode switch, and the TOC switch. DC power and signals are provided through a ribbon cable connected to the Switch card.

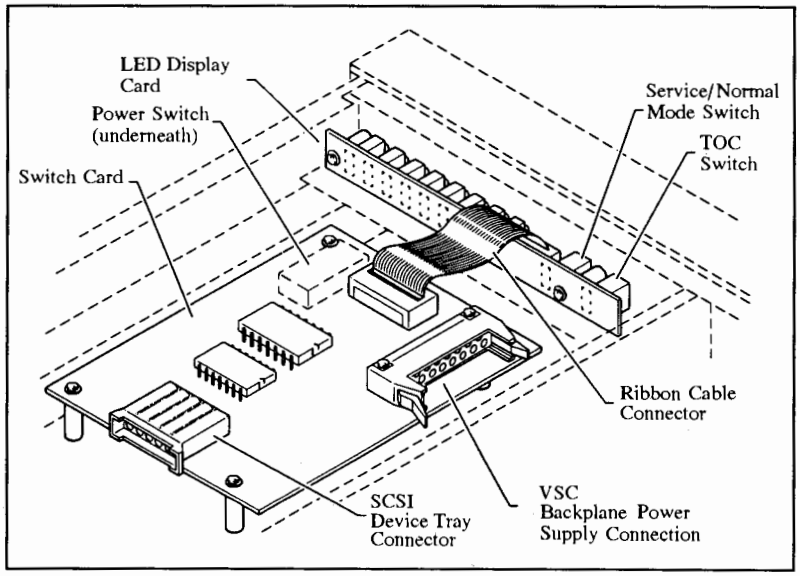


Figure 1-9. Switch and LED Display Cards

DC power for the LED Display card, Switch card, and both embedded devices is provided by a cable assembly from the Backplane assembly.

Switch Functions

See Figure 1-10 for switch locations on the System Unit cabinet.

- Power On/Standby Switch - Control DC power to all the logic cards within the System Unit cabinet; performs a **hard boot** after power on.
- Service/Normal Mode (green-colored) Push-button Switch
  - The "service mode" is intended for "manufacturing personnel ONLY." This mode will run selftests and initialization routines *without halting after errors* in order to launch the ISL environment. Six-digit error/status codes are directed to RS-232 (port A).
  - The "normal mode" is used to launch the HP-UX environment with full error checking.
- TOC Push-button Switch
  - Store processor state and some PIM information into **stable storage**.
  - Flush the instruction and data caches.
  - During the Boot Admin. environment, reset the System Unit and initialize memory without destroying the contents, (called a **soft boot**).
  - During the O/S environment, the O/S will print a panic message on the console device; dump contents of main memory to swap area on the system disk; soft boot the operating system.

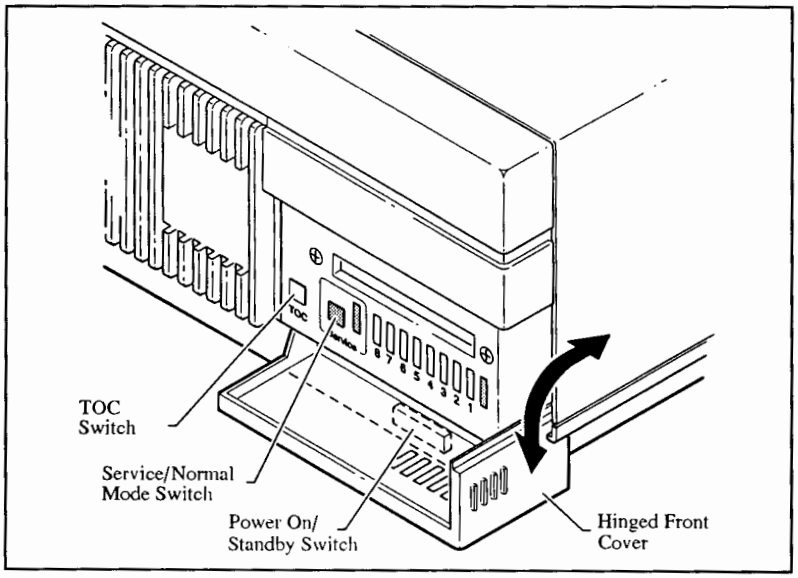


Figure 1-10. Front Panel Switch Locations

LED Functions

See Figure 1-11 for LED locations on the System Unit cabinet.

- Power On LED - the On state of this green-colored LED indicates that the power supply is functioning.
- The On/Off state of the 4 *visible with the cover closed* amber-colored LEDs 1, 2, 3, and 4 indicate one of the following:
  - the selftest error/status codes prior to booting the ISL program (LED 4 will toggle on/off during the memory test to indicate CPU activity)
  - the **IPL** boot status codes prior to loading the ISL program
  - the operating system "heartbeat," disk activity, and communicating over the network
- The On/Off state of the 4 *hidden with the cover closed* amber-colored LEDs 5, 6, 7, and 8 indicate selftest error and IPL boot status prior to loading the ISL program.
- The On/Off state of the green-colored "service" LED indicates either service mode or normal mode respectively. Service mode is used during manufacturing.

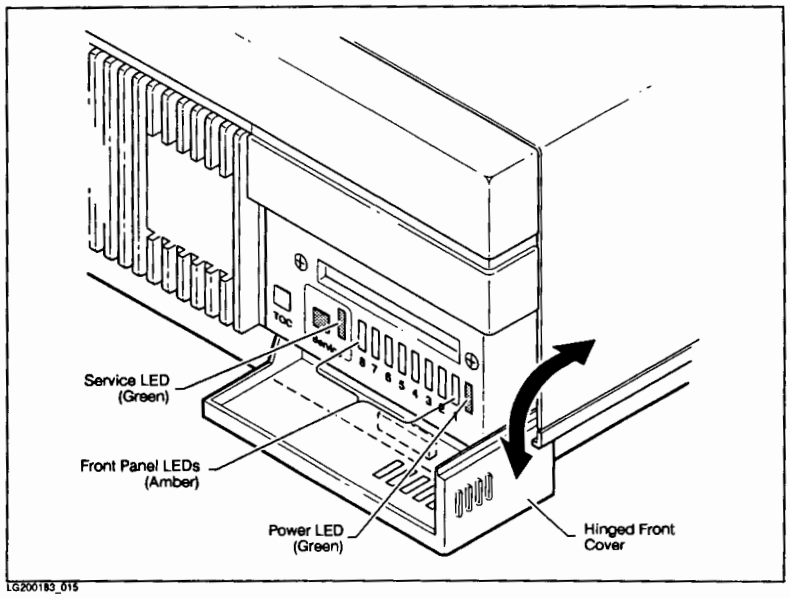


Figure 1-11. Front Panel LED Locations

1a

Model 750 Workstation/Server Information

The Model 750 is a re-packaged version of the Model 730 that supports up to 192 Megabytes of memory, two graphics subsystems, and four EISA cards; both models provide the same performance, however. The Model 750 workstation products share the same System Unit cabinet as the Series 400S products ... with only a few differences.

The intent of this chapter is to familiarize you with the *internal components* of the HP A1095 System Unit cabinet, referred to as field replaceable units (FRUs). A brief description of each FRU component is provided along with an illustration to assist in identification.

Missing from this chapter is specific product information about the graphics subsystems and the *external* peripheral devices supported by the 700 series of workstations/servers. Refer to the existing service documentation available for these products.

See chapter 8 for specific service information on the supported EISA host adapter card options from the Roseville Networks Division (RND).

See chapter 9 for specific service information on the supported SGC graphics subsystem options from the User Interface Technology Division (UTD), formerly the Graphics Technology Division (GTD) or the Workstation Systems Division (WSY), formerly the Apollo Systems Division (ASY).

System Unit FRUs

The System Unit FRU descriptions in this chapter are organized as follows:

A1095 System Unit Cabinet

Figure 1a-1 provides a front view of the HP A1095 **System Unit cabinet.** The design simplifies adding memory, graphics cards, EISA host adapter cards, and embedded 5.25 inch (full-height and half-height) SCSI devices.

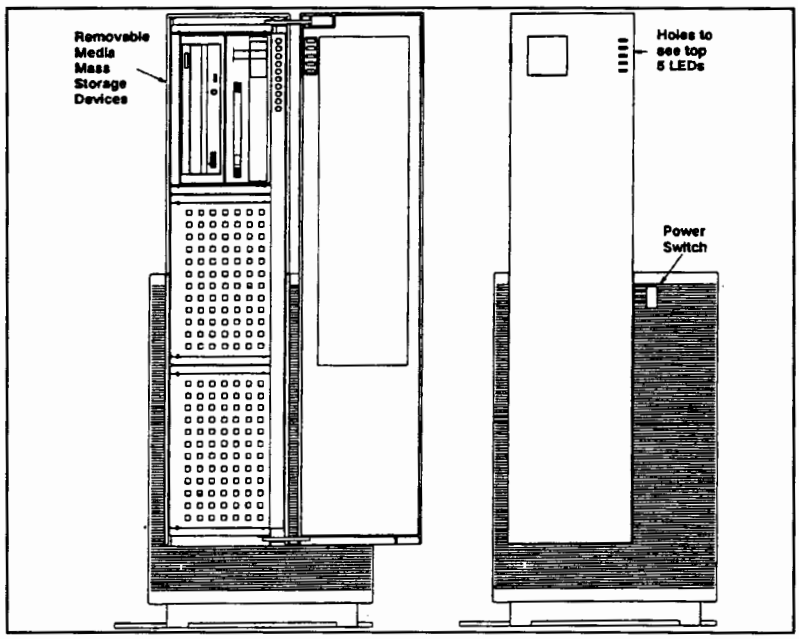


Figure 1a-1. Front View of the A1095 System Unit Cabinet

Features

- Support for one System card (combined CPU, FPU, MEM, and I/O logic with connectors for up to six SIMM card pairs), two SGC graphics cards, four 5.25 inch SCSI devices, and four EISA host adapter cards.
- Standard interfaces supported include: EISA, HP-HIL, HP-SGC, 802.3 LAN, SCSI-2, Centronics, RS-232, and audio.
- Standard cabinet components include: three compartments for up to four 5.25 inch (internal) SCSI devices, power supply assembly, VSC backplane, EISA card cage assembly, fan tray, and LED display card.
- Optional cabinet components include: up to four 5.25 inch SCSI devices (2 full-height and 2 half-height) and up to four EISA host adapter cards.

A1095 System Unit Specifications

Classification	Standard supported by the A1095 System Unit
Environmental	Without internal SCSI devices: ■ Operating temperature: 0 to 55 degrees C (20 degrees C/hour rate of change maximum) ■ Non-operating temperature: −40 to 70 degrees C (maximum wet bulb temperature) ■ Humidity: 95% R.H. (maximum operating @ 40 degrees C); 90% R.H. (maximum non-operating @ 55 degrees C) ■ Operating altitude: 4,570 meters (15,000 feet) to 47 degrees C, reduce ceiling by 286 meters (938 feet) for each degree C above 47 degrees C ■ Non-operating altitude: 15,240 meters (50,000 feet) to 70 degrees C With internal SCSI devices: ■ Operating temperature: 5 to 45 degrees C (20 degrees C/hour rate of change maximum) ■ Non-operating temperature: −40 to 60 degrees C (maximum wet bulb temperature) ■ Operating (non-condensing) Humidity: 8% to 85% R.H. maximum @ 40 degrees C; maximum wet bulb temperature @ 27 degrees C ■ Non-operating (non-condensing) Humidity: 5% to 95% R.H. maximum @ 55 degrees C; maximum wet bulb temperature @ 46 degrees C ■ Operating altitude: 3,050 meters (10,000 feet) to 40 degrees C, ■ Non-operating altitude: 15,240 meters (50,000 feet) to 60 degrees C
Regulatory	EMI (conducted and radiated): ■ FCC Class A ■ FTZ 1046/84 Level B ■ VCCI Class 1 Safety: ■ UL 1950 1st Edition ■ CSA 22.2 NO. 220 ■ IEC 950 1st Edition 1986 Datacom: BS6301 Ergonomics: ZH-1/618
Physical	Net weight = 47.6 Kilograms (105 pounds max.) Deskside (vertical position) = 220 mm (8.7 inches) wide, 610 mm (24.0 inches) high, 595 mm (23.4 inches) deep
Electrical	120/208 or 220/380 Nominal Volts AC, 47 to 66 Hertz 470 Watts maximum, 1603 BTU/hour, 410 Kilo-calories/hour 366 Watts typical, 1248 BTU/hour, 315 Kilo-calories/hour

System and SIMM Cards

Figure 1a-2 contains an illustration of the **System card** showing the twelve **SIMM cards**, 8 MB or 16 MB. The System card plugs directly into the VSC backplane assembly to access the VSC (system) Bus signals and DC power from the power supply in the System Unit cabinet.

The System card provides Voltage regulators that generate bias DC Voltages for the (ECL) system clock logic.

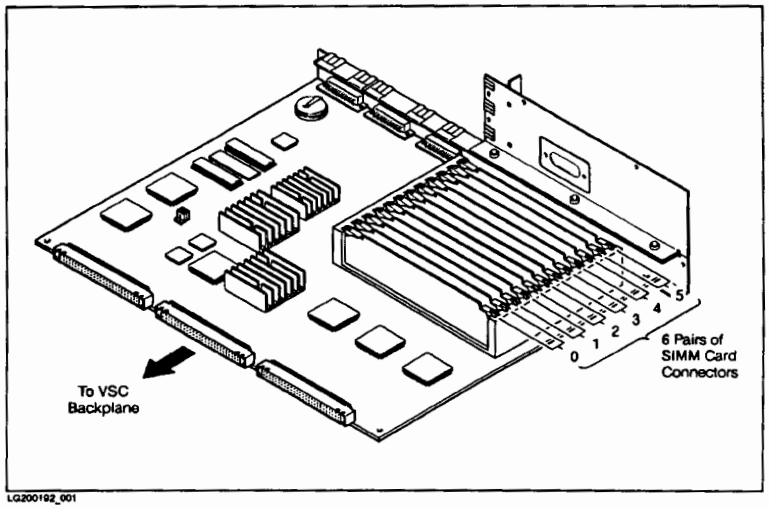


Figure 1a-2. System Card with Two SIMM Card Pairs

Model 750 Processor Features

- A 66 MegaHertz PA-RISC Central (Integer) Processing Unit with internal address translaton buffers that processes 76 Drystone MIPS and 72.2 SPECmarks (a benchmark from the Systems Performance Evaluation Cooperative, Inc.)
- A PA-RISC Floating-Point Math Coprocessor that processes 22 Mflops.
- A PA-RISC System Controller chip that controls all transactions between CPU, memory, and the I/O modules.
- An Instruction Cache containing 256 Kilobytes of (parity protected) static RAMs. I-cache parity errors are corrected by the Processor.
- A Data Cache containing 256 Kilobytes of (parity protected) static RAMs. D-cache parity errors are not correctable.
- Minimum of 32 Megabytes of main memory using 2 each 16 Megabyte SIMM cards; customer expandable to 32, 48, 64, 128, and 192 Megabytes, using 8/16 Megabyte SIMM cards.

SIMM Card

Figure 1a-3 contains an illustration of the 16 MB **SIMM card**. SIMM cards plug into dedicated connector pairs (called slots) on the System card.

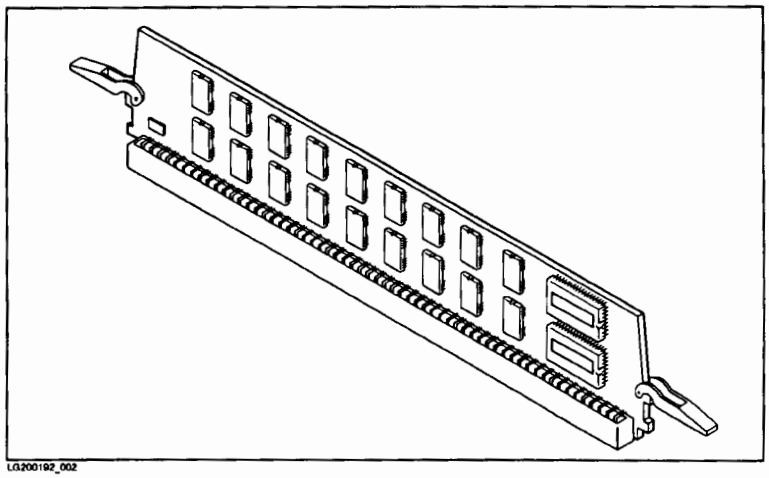


Figure 1a-3. 16 Megabyte SIMM Card

SIMM Card Features

- A pair of 8 MB or 16 MB SIMM cards make up a set of dynamic memory; each set contains two banks; an 8 MB bank contains 18 (4 Megabit) DRAMs; a 16 MB bank contains 36 (4 Megabit) DRAMs. SIMM cards must be added (or deleted) in pairs.
- The error-correcting code (ECC) logic to detect all single and double-bit parity errors and to correct all single-bit errors is in the memory controller/system bus interface chip on the Processor card.
- The SIMM card connector pairs on the System card are labeled slot 0, slot 1, slot 2, slot 3, slot 4, and slot 5. Memory Addresses ending with X'4, 5, 6, 7, C, D, E, and F are associated with one of the connector pair for each slot; memory addresses ending with X'0, 1, 2, 3, 8, 9, A, and B are associated with the other connector pair for each slot.
- Memory reads require 4 VSC (system) Bus cycles, writes require only 2 cycles.

System Card Bulkhead Connectors

The System card contains most of the workstation/server's input/output logic controllers. Figure 1a-4 contains an illustration of the I/O connectors provided on the card's bulkhead. Refer to chapter 2 for a "list of the supported peripheral devices."

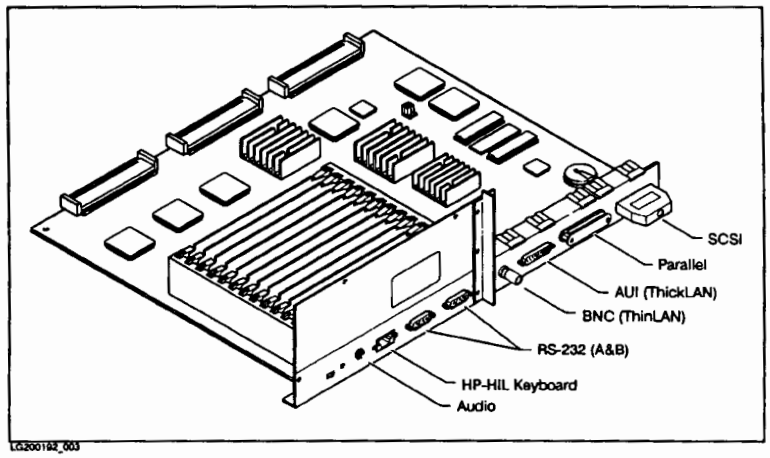


Figure 1a-4. Connectors on the System Card's Bulkhead

LAN Port Features

- The 802.3/ethernet 1.0 LAN port supports (synchronous) data transfers with up to 10 Megabits per second throughput.
- Provides for direct interface to RG-58/u ThinLAN or twisted-pair networks using its built-in 10 BASE2 MAU to BNC connector.
- Onboard LAN type jumpers select either the (ThinLAN) MAU through the BNC connector or an external (ThickLAN) MAU through the 15-pin AUI connector.
- A replaceable fuse protects the internal LAN circuits from (internal or external) MAU electrical faults.

Audio Port Features

- Provides 3 independent time generators controllable over 30 DB to produce sounds between 81.46 Hertz to 83.3 Kilo-Hertz. (Capable of approximate chromatic scale over 5 octaves.)
- Provides availability to an external speaker (250 milli-Watts @ 8 ohms) through a phono jack connector on the bulkhead of the System card.

Parallel (Centronics) Port Features

Refer to chapter 2 for a list of supported devices.

- The internal centronics port supports 8-bit data transfers in excess of 300 Kilobytes per second when using standard setup, hold, and strobe pulse width times.
- Support for 25-pin, bi-directional capabilities compatible with PS/2 standards.
- Handshake support for HP Scanjet parallel port.
- Support for NACK and BUSY handshakes.
- No long line support.

RS-232 Serial Port Features

Refer to chapter 2 for a list of supported devices.

- Channels A and B are EIA RS-232C asynchronous type "D" supporting full CCITT V.24/V.28 modem control with support for:
  - 5, 6, 7, or 8 bit characters; odd, even, none, one, zero parity; 1 start bit and 1, 1.5, or 2 stop bits.
  - 1, 4, 8, or 14 byte programmable FIFO interrupt level.
  - CTS (CB0), DSR (CC), RI (CE), and DCD (CF) modem status interrupts.
  - All cardinal BAUD rates: 110, 300, 1200, 2400, 9600, 19.2K, and 38.4K.
  - Additional BAUD rates: 50, 75, 150, 600, 4800,7200, 57.6K, 115.25K, and 230.4K.
- HP-UX version 8.01 supports up to 460.8 Kilobits per second with CTS (outbound) hardware flow control; HP-UX version 8.05 supports up to 460.8 Kilobits per second with CTS (bi-directional) hardware flow control.
- Long cables, (or short cables with BAUD rates above 57.6K), will require an external RS-232 to RS-422 converter box.
- Channel A provides (default) support as an (alternate) console with HP TERM 0, ANSI, or ASCII terminal.

SCSI Port Features

Refer to chapter 2 for a list of supported devices.

- Supports the Small Computer Systems Interface (SCSI-2) protocol using 8-bit (synchronous data transfers up to 6 Megabytes per second and asynchronous data transfers up to 1.5 Megabytes per second) over standard length cables.
- Onboard SCSI frequency jumpers select either 50 MHz. or 66 MHz. operation through the SCSI single ended connector.
- Supports 7 single-ended SCSI devices with HP-UX version 8.05.
- Uses SCSI "high-density" 50-pin connectors.

HP-HIL Port Features

Refer to chapter 2 for a list of supported devices.

- The onboard Hewlett-Packard Human Interface Link (HP-HIL) port provides support for 2 standard and 5 optional HP-HIL customer installable devices.
- The (two-dot) HP-HIL connector on the bulkhead is provided for the standard HP-HIL keyboard.
- The keyboard provides an HP-HIL connector for the standard HP-HIL 3-button mouse.

Replaceable Components

Figure 1a-5 contains an illustration of the replaceable components on the System card.

- 3.0 Volt (coin) Battery for the Time-of-Day (TOD) logic
- PDC EPROM for selftests, Boot Administration commands, IPL boot routines, etc.
- IODC EPROM for PDC routines to initialize and test the on-card I/O ports
- EEPROM for storing SPU configuration and boot information (stable storage)
- Fuse for an external AUI

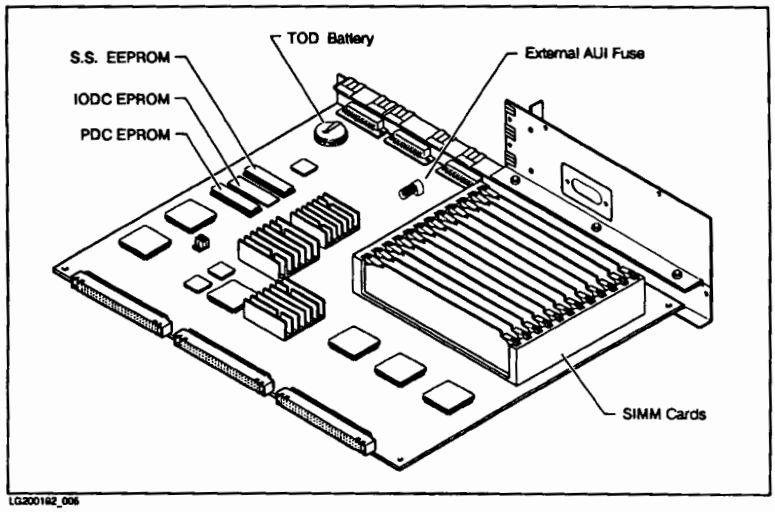


Figure 1a-5. Replaceable Parts on the System Card

Switch Functions

The Power-On/Standby Switch, positioned at the front of the A1095 System Unit cabinet, switches DC power to all the logic cards within the System Unit cabinet. Powering on performs a **hard boot** of the SPU.

See Figure 1a-6 for the following switches located on the bulkhead of the System card:

- Service/Normal Mode (green-colored) Push-button Switch
  - The "service mode" is intended for "manufacturing personnel ONLY." This mode will run selftests and initialization routines *without halting after errors* in order to launch the ISL environment. Six-digit error/status codes are directed to RS-232 (port A).
  - The "normal mode" is used to launch the HP-UX environment with full error checking.
- Reset (TOC) Push-button Switch
  - Store processor state and some PIM information into **stable storage.**
  - Flush the instruction and data caches.
  - During the Boot Admin. environment, reset the System Unit and initialize memory without destroying the contents, (called a **soft boot**).
  - During the O/S environment, the O/S will print a panic message on the console device; dump contents of main memory to swap area on the system disk; soft boot the operating system.

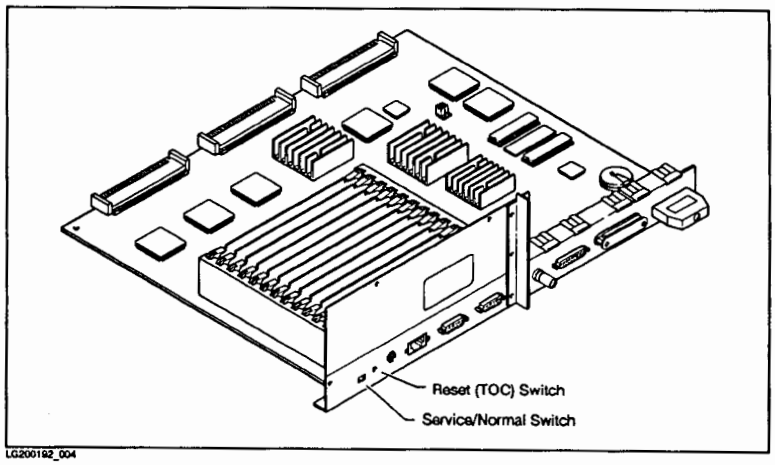


Figure 1a-6. System Card Switch Locations

SCSI Device Compartments

Figure 1a-7 contains an illustration of the **SCSI Device Slots**. There are three embedded SCSI device compartments behind the front door of the A1095 System Unit cabinet. These slots allow up to three 5.25 inch single-ended SCSI devices or two 5.25 inch single-ended SCSI devices and two 3.5 inch (half-height single-ended SCSI devices in the System Unit cabinet.

All embedded SCSI devices receive VSC (system) Bus signals and DC power from a pair of cable harnesses connected to the VSC backplane.

VSC (system) Bus signals from the SCSI controller on the System card are routed through an external 50-pin (high-density) cable connected between the "IN" (SCSI device) connector on the SCSI device tray and the single-ended SCSI connector on the System card.

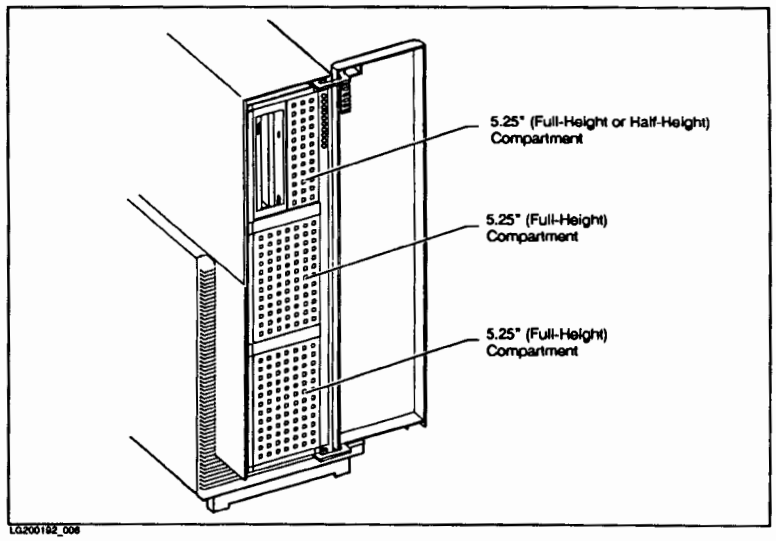


Figure 1a-7. SCSI Device Compartments

Embedded Devices

Floppy Disk Features

- One 3.5 inch (half-height) 1.3 Megabyte floppy disk from the Teac Corporation is supported by HP-UX version 8.05 or higher.
- Drive jumpers are located at the rear of the device (suggested SCSI address is 1)
  - 2 - enables most significant bit of SCSI address (no jumper)
  - 1 - enables next most significant bit of SCSI address (no jumper)
  - 0 - enables least significant bit of SCSI address (jumper)

Fixed Disk Features

- Two 5.25 inch (full-height) mechanisms are supported: a 660 Megabyte model from Micropolis and a 1.4 Gigabyte version from either Micropolis or DMD are supported by HP-UX version 8.05 and higher.
- Drive jumpers for both Micropolis models are located at the rear of the device (suggested SCSI address is 6 for the 1st fixed disk and 5 for the 2nd fixed disk)
  - ?? - (no jumper)
  - ?? - (no jumper)
  - ?? - (no jumper)
  - ?? - (no jumper)
  - ?? - (no jumper)
  - ?? - (no jumper)
  - ?? - (no jumper)
  - ?? - (no jumper)
  - ?? - (no jumper)
  - A2 - enables most significant bit of SCSI address
  - A1 - enables next most significant bit of SCSI address
  - A0 - enables least significant bit of SCSI address
- Drive jumpers for both DMD models are located at the rear of the device (suggested SCSI address is 6 for the 1st fixed disk and 5 for the 2nd fixed disk)
  - ?? - (to be supplied)
  - ?? - (to be supplied)
  - ?? - (to be supplied)
  - A2 - enables most significant bit of SCSI address
  - A1 - enables next most significant bit of SCSI address
  - A0 - enables least significant bit of SCSI address

CD ROM Features

- One 5.25 inch (half-height) 600 Megabyte Compact Disc from Toshiba is supported by HP-UX version 8.05 or higher.
- Drive jumpers are located at the rear of the device (suggested SCSI address is 3)
  - 1 - enables least significant bit of SCSI address (jumper)
  - 2 - enables next most significant bit of SCSI address (jumper)
  - 4 - enables most significant bit of SCSI address (no jumper)
  - PRTY - enables data parity (enabled)
  - ARBT - enables arbitrtion (not enabled)
  - TEST - enables internal test at power up (not enabled)

DDS (DAT) Features

- One 3.5 inch (full-height) 1.4 Gigabyte 4 mm DAT from the Disk Memory Division of Hewlett Packard is supported by HP-UX version 8.05 or higher.
- Drive jumpers are located at the top rear of the device (suggested SCSI address is 4)
  - P - enable parity checking of data on SCSI bus (jumper)
  - T - enable termination power (jumper)
  - 2 - enables most significant bit of SCSI address (jumper)
  - 1 - enables next most significant bit of SCSI address (no jumper)
  - 0 - enables least significant bit of SCSI address (no jumper)

EISA Card Cage Assembly

Figure 1a-8 contains an illustration of the **EISA Card Cage assembly**. The EISA card cage assembly supports up to four *extended industry standard architecture* (EISA) host adapter cards to the VSC (system) Bus.

The EISA backplane plugs into a connector on the Regulator card which plugs directly into the VSC backplane assembly to access the VSC (system) Bus signals.

DC power for the EISA host adapter cards is derived from the VSC backplane through a cable harness to the EISA backplane.

Refer to chapter 8 for specific details about the supported EISA host adapter card options.

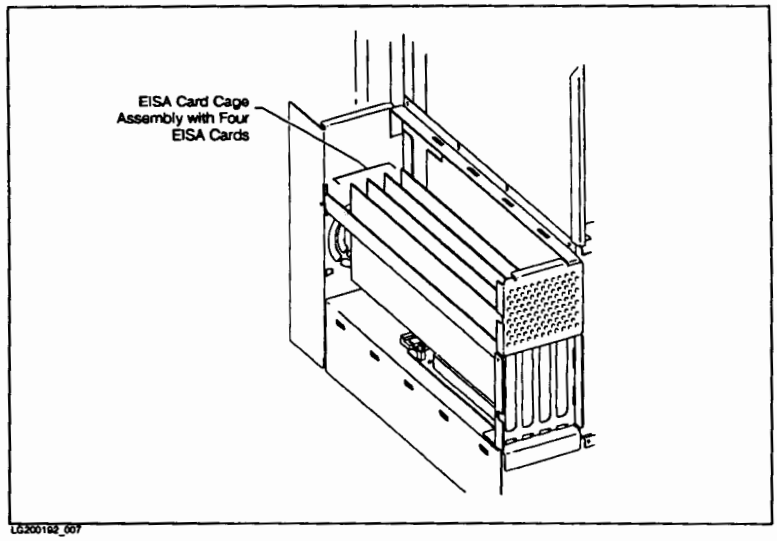


Figure 1a-8. EISA Card Cage Assembly

Features

- Provides support for four EISA host adapter cards.
- Has a separate cooling fan.
- Refer to chapter 2 for a list of supported EISA host adapter card options; refer to chapter 8 for detailed information on EISA host adapter cards.

Replaceable Components

- EISA backplane assembly
- Power cable harness (between the VSC backplane and the EISA backplane)
- Fan with cable assembly
- Regulator card (connects the EISA backplane to the VSC backplane)

Regulator Card

Figure 1a-9 contains an illustration of the **Regulator card**. This assembly plugs directly into the VSC backplane and contains voltage regulator components for the EISA host adapter card logic and has no replaceable components.

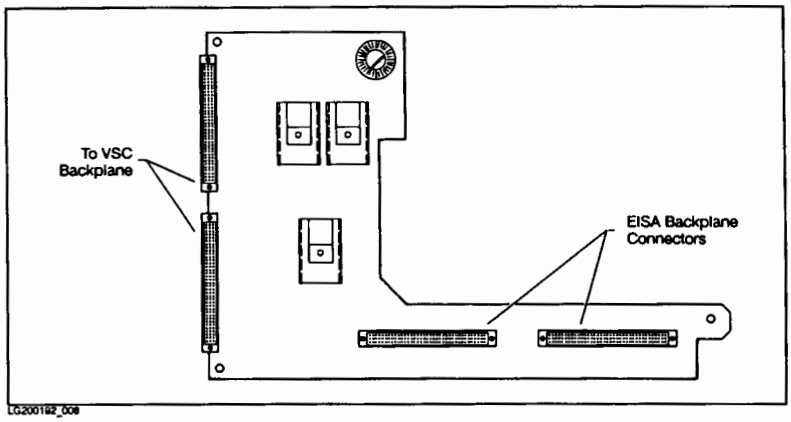


Figure 1a-9. Regulator Card

Power Supply Assembly

Figure 1a-10 contains an illustration of the **Power Supply assembly**. The power supply assembly is an autoranging unit that automatically adjusts to a nominal 115 Volts (60 Hertz) or 230 Volts (50 Hertz) AC input source. The power supply DC outputs provides DC power directly to the VSC backplane assembly through a cable harness.

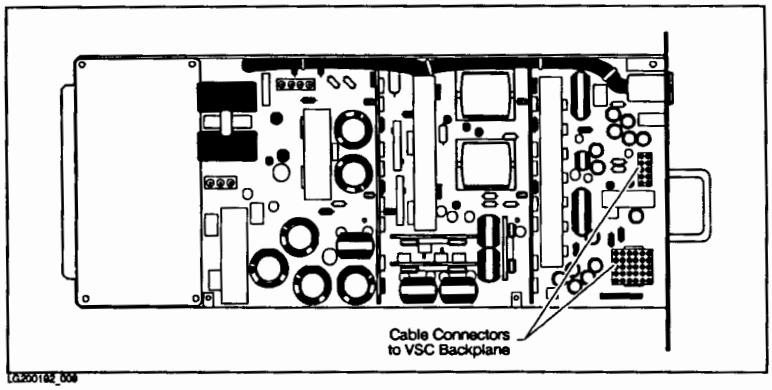


Figure 1a-10. Power Supply Assembly

Table 1a-1 contains the DC output power values of the power supply.

Table 1a-1. Power Supply Voltages (470 Watts maximum)

Input AC Voltage	Input AC Current	Output DC Voltages
115 Volts (60 Hz)	9.0 Amps	+5.0 Volts
230 Volts (50 Hz)	5.0 Amps	+12 Volts
		−12 Volts
		−5 Volts
		+10.5 - 13.5 Volts

Replaceable Components

- Power On/Standby switch (located on the front of the System Unit cabinet)
- Power cable harness (between the VSC backplane and the Power Supply)
- Fuse (Buss), 250 Volts 12 Amperes

Caution

The Power Supply becomes operational when the AC power cord is plugged into an AC power source. The Power-on/Standby switch must be in the standby position to turn off all output DC voltages. This position is used to turn the System Unit off prior to removing logic cards, however, the power cord should be removed from the Power Supply before opening the System Unit cabinet.

Features

- Autoranging AC input power (no switches or jumpers).
- The DC outputs of the power supply are turned on/off by the power-on/standby switch on the front of the System Unit cabinet.
- A pair of two-speed fans, housed within the Fan assembly, to increase airflow through the A1095 System Unit when the ambient air temperature exceeds 35 degrees C.
- Supports thermal shutdown when air temperature exceeds 55 degrees C.
- Programmable shut-down is supported.

Cooling Fan Tray Assembly

Figure 1a-11 contains an illustration of the **cooling fan tray assembly**. This assembly is located directly above the Power Supply assembly and below the EISA card cage assembly.

Airflow, within the A1095 System Unit cabinet, is from top to bottom. Both fans and their cables are removable.

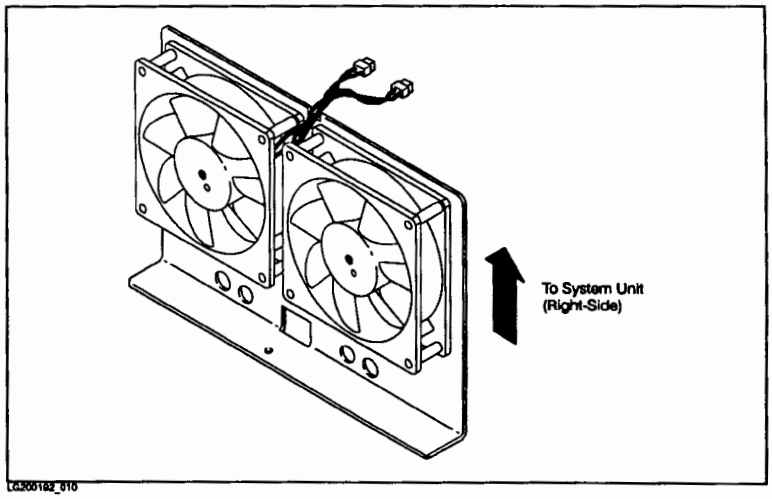


Figure 1a-11. Cooling Fan Tray Assembly

VSC Backplane Assembly

Figure 1a-12 contains an illustration of the **VSC Backplane assembly** mounted within the A1095 System Unit cabinet. DC power is distributed from the Power Supply to the System Unit FRUs and the cooling fans through a cable harness between the VSC Backplane assembly and the Power Supply.

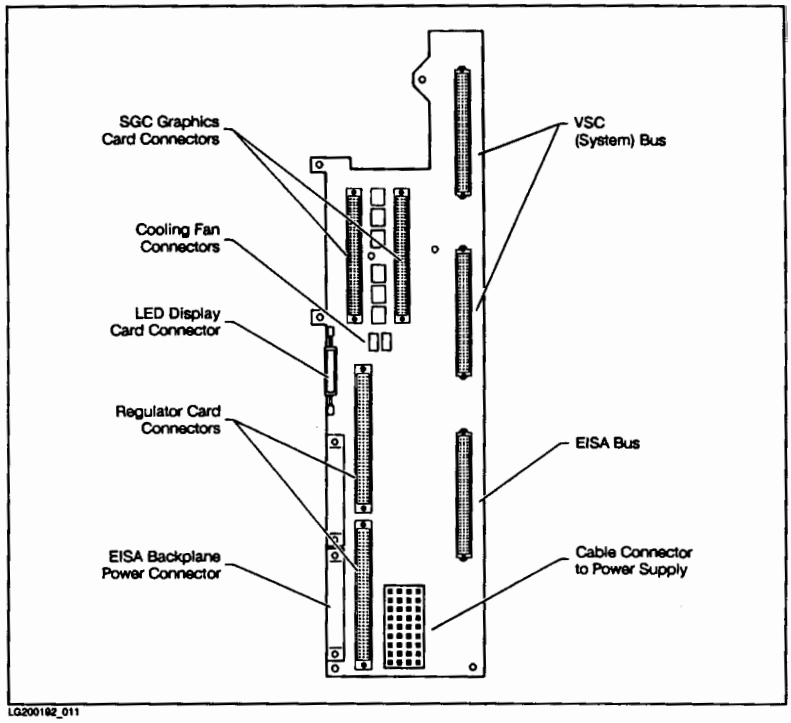


Figure 1a-12. VSC Backplane Assembly Mounted in the A1095 System Unit

Front Panel LED Display

Figure 1a-13 contains an illustration of the **Front Panel LED Display**. This PCA is mounted to the System Unit cabinet and uses a flat ribbon cable to connect to the VSC backplane for DC power and logic signals.

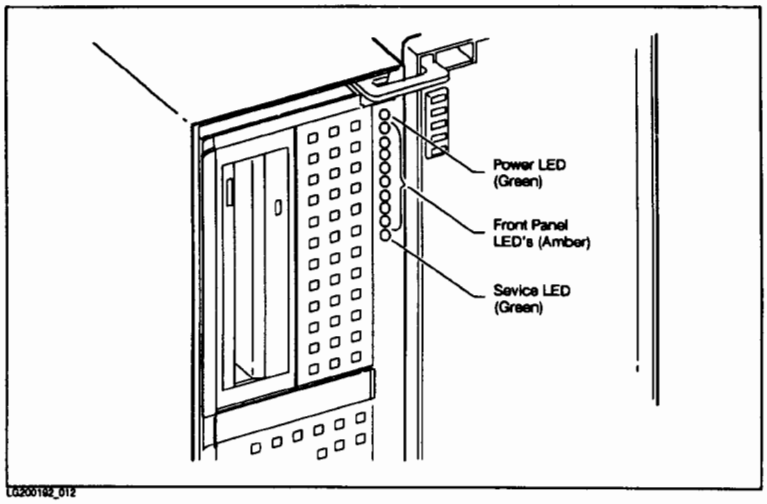


Figure 1a-13. Front Panel LEDs

Front Panel LED Functions

- Power On LED - the On state of this green-colored LED indicates that the power supply is functioning.
- The On/Off state of the 4 *visible with the cover closed* amber-colored LEDs 1, 2, 3, and 4 indicate one of the following:
  - the selftest error/status codes prior to booting the ISL program
  - the IPL boot status codes prior to loading the ISL program
  - the operating system "heartbeat," disk activity, and communicating over the network
- The On/Off state of the 4 *hidden with the cover closed* amber-colored LEDs 5, 6, 7, and 8 indicate selftest error and IPL boot status prior to loading the ISL program.
- The On/Off state of the green-colored "service" LED indicates either service mode or normal mode respectively.

2

Series 700 Supported Configurations and Interfaces

Supported Series 700 Configurations

This chapter contains the supported configurations and interfaces for all Series 700 workstations and servers.

The minimum hardware configurations required for a Model 720/730/750 workstations and servers are listed below. Product numbers (PN) are enclosed in parenthesis.

Model 720 - PA-RISC Workstation/Server

Server version (HP A1944A) requires an HP 700/94 terminal with keyboard as a system console and includes one embedded 420 MB fixed disk; there are no graphics options.

- 50 MHz. Processor/co-processor card with 16 MB of Memory (configurable to 64 MB)
- 50 MHz. System (core I/O) card provides 1 (single-ended) SCSI-2 port, 1 802.3 Ethernet LAN port, 1 Centronics parallel port, 2 RS-232C serial ports, and jack for audio port
- Internal provisions for two (3.5 inch single-ended) SCSI devices
- Optional 25 MHz. EISA port (HP A1986A) for one EISA host adapter card
- Stand and labels for deskside use
- 2-User Runtime license-to-use HP-UX version 8.01 or higher
- GRXGrayscale versions of Workstation (with/without internal fixed disks) include:
  - Grayscale Graphics Card (HP A1924A)
  - 19 inch (1280 x 1024) Monochrome Monitor, 72 Hz. (HP 98774A)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)
- CRXColor Plus versions of Workstation (with/without internal fixed disks) include:
  - 2D vector 3D wireframe pseudo-color Graphics Card (HP A1659A)
  - 19 inch (1280 x 1024) Color Monitor, 72 Hz. (HP A1097A/B)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)
- PersonalVRX 3D versions of Workstation (with/without internal fixed disks) include:
  - 3D solids Color Graphics Unit (HP 98705B) with SGC Graphics (interface) Card (HP A1471A)
  - 19 inch (1280 x 1024) Color Monitor, 60 Hz. (HP 98754A)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)
- TurboVRX 3D versions of Workstation (with/without internal fixed disks) include:
  - 3D solids Color Graphics Unit (T2 is HP 98765A; T4 is HP 98766A) with VSC Graphics (interface) Card (HP A1472A)
  - 19 inch (1280 x 1024) Color Monitor, 72 Hz. (HP A1097A/B)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)

Model 730 - Workstation/Server

Server version (HP A1956A) requires an HP 700/94 terminal with keyboard as a system console and includes two embedded 420 MB fixed disks; there are no graphics options.

- 66 MHz. Processor/co-processor card with 16 MB of Memory (configurable to 64 MB)
- 33 MHz. System (core I/O) card provides 1 (single-ended) SCSI-2 port, 1 802.3 Ethernet LAN port, 1 Centronics parallel port, 2 RS-232C serial ports, and jack for audio port
- Internal provisions for two (3.5 inch single-ended) SCSI devices
- Provides one 33 MHz. EISA port (HP A1986A) for one EISA host adapter card
- Stand and labels for deskside use
- 2-User Runtime license-to-use HP-UX version 8.01 or higher of internal disk storage
- GRXGrayscale versions of Workstation (with/without internal fixed disks) include:
  - Grayscale Graphics Card (HP A1924A)
  - 19 inch (1280 x 1024) Monochrome Monitor, 72 Hz. (HP 98774A)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)
- CRXColor Plus versions of Workstation (with/without internal fixed disks) include:
  - 2D vector 3D wireframe pseudo-color Graphics Card (HP A1659A)
  - 19 inch (1280 x 1024) Color Monitor, 72 Hz. (HP A1097A/B)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)
- PersonalVRX 3D versions of Workstation (with/without internal fixed disks) include:
  - 3D solids Color Graphics Unit (HP 98705B) with SGC Graphics (interface) Card (HP A1471A)
  - 19 inch (1280 x 1024) Color Monitor, 60 Hz. (HP 98754A)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)
- TurboVRX 3D versions of Workstation (with/without internal fixed disks) include:
  - 3D solids Color Graphics Unit (T2 is HP 98765A; T4 is HP 98766A) with VSC Graphics (interface) Card (HP A1472A)
  - 19 inch (1280 x 1024) Color Monitor, 72 Hz. (HP A1097A/B)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)

Model 720/730 Memory Options (up to 64 MB)

- 8 Megabyte RAM add-on (HP A1978A); 4 each 2 MB SIMMs
- 16 Megabyte RAM add-on (HP A1979A); 2 each 8 MB SIMMs

Model 720/730 Embedded Device Options (up to 840 MB; 2 devices)

- Single-ended 3.5 inch 210 Megabyte fixed disk unit (1st is HP A1980A; 2nd is A1981A)
- Single-ended 3.5 inch 420 Megabyte fixed disk unit (1st is HP A1982A; 2nd is A1983A)
- Single-ended 3.5 inch 1.3 MB floppy disk unit (HP A1984A) for systems with less than 2 embedded disks (includes bezel)

Model 750 - Deskside Workstation/Server

Server versions require an HP 700/94 terminal with keyboard as a system console and (HP A1971A) includes one embedded 660 MB fixed disk; (HP A1977A) includes two embedded 660 MB fixed disks;; there are no graphics options.

- System card provides a 66 MHz. Processor and co-processor, 16 MB of Memory (configurable to 192 MB), 1 (single-ended) SCSI-2 port, 1 802.3 Ethernet LAN port, 1 Centronics parallel port, 2 RS-232C serial ports, and jack for audio port
- Internal provisions for three (3.5 or 5.25 inch single-ended) SCSI devices
- Provides one 33 MHz. EISA port for up to four EISA host adapter cards
- Provides four EISA card slots
- 2-User Runtime license-to-use HP-UX version 8.05 or higher
- CRXColor Plus versions of Workstation (with/without internal fixed disks) include:
  - 2D vector 3D wireframe pseudo-color Graphics Card (HP A1659A)
  - 19 inch (1280 x 1024) Color Monitor, 72 Hz. (HP A1097A/B)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)
- PersonalVRX 3D versions of Workstation (with/without internal fixed disks) include:
  - 3D solids Color Graphics Unit (HP 98705B) with SGC Graphics (interface) Card (HP AI471A)
  - 19 inch (1280 x 1024) Color Monitor, 60 Hz. (HP 98754A)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)
- TurboVRX 3D versions of Workstation (with/without internal fixed disks) include:
  - 3D solids Color Graphics Unit (T2 is HP 98765A; T4 is HP 98766A) with SGC Graphics (interface) Card (HP A1472A)
  - 19 inch (1280 x 1024) Color Monitor, 72 Hz. (HP A1097A/B)
  - HP-HIL Keyboard (HP 46021A) and 3-Button Mouse (HP 46060B)

Model 750 Memory Options (up to 192 MB)

- 16 Megabyte RAM add-on (HP A1979A); 2 each 8 MB SIMMs
- 32 Megabyte RAM add-on (HP A1987A); 2 each 16 MB SIMMs

Model 750 Embedded SCSI Device Options (up to 2.6 GB; 3 devices)

- Single-ended 5.25 inch 660 Megabyte fixed disk unit (HP A1988A)
- Single-ended 5.25 inch 1.4 Gigabyte fixed disk unit (HP A1989A)
- Single-ended 5.25 inch 600 Megabyte CD-ROM unit (HP A1985A)
- Single-ended 3.5 inch 1.4 Gigabyte 4 mm DAT unit (HP A1990A)
- Single-ended 3.5 inch 1.3 MB floppy disk unit (HP A1984A)

Series 700 Device Options

The Model 720/730 support up to 10 GB of SCSI disk storage; the Model 750 supports up to 40 GB of SCSI disk storage using both single-ended and differential devices.

Single-Ended SCSI Devices

- Model 660s (single-ended) Mass Storage System with one 660 MB fixed disk unit (HP C2213A)
  - Add one 664 MB fixed disk unit (option 002; two units is option 022)
  - Add one 1.4 GB 4 mm DAT unit (option 003; standalone is HP C1512A)
  - Add one 600 MB CD-ROM (option 004; standalone is HP A1999A)
  - Add one 640 MB Magneto Optical unit (option 005; standalone is HP 1701A)
- Standalone (single-ended) *horizontal* expansion box with one 1.4 GB fixed disk (HP C2214A)
  - Add one 1.4 GB fixed disk unit (option xxx; two units is option xxx)
  - Add one 1.4 GB 4 mm DAT unit (option 003; standalone is HP C1512A)
  - Add one 600 MB CD-ROM (option 004; standalone is HP A1999A)
  - Add one 640 MB Magneto Optical unit (option 005; standalone is HP 1701A)
- SCSI single-ended Cables and Terminators
  - 1.5-meter cable, low-density male (screw) to low-density male (bail) (HP K2283; 1-meter is HP K2284)
  - 1.5-meter cable, high-density male (spring) to low-density male (bail) (HP K2285; 1-meter is HP K2286)
  - 1.5-meter cable, high-density male (spring) to low-density male (screw) (HP K2287; 1-meter is HP K2288)
  - high-density male (screw) SCSI terminator (HP K2289; low-density male is HP K2290)
  - low-density male (bail) SCSI terminator (HP K2291)

Differential SCSI Devices

- Standalone (vertical) expansion box with one (differential) 660 MB fixed disk (HP C2481A)
  - Add one 660 MB fixed disk unit (HP C2291A)
- Standalone (minitower) expansion box with one (differential) 1.4 GB fixed disk (HP C2482A)
  - Add one 1.4 GB fixed disk unit (HP C2292A)
- SCSI differential Cables and Terminators
  - 1-meter cable, high-density male (screw) to low-density male (bail) (HP K2296; 1.5-meter is HP K2297)
  - 0.5-meter cable, low-density male (bail) to low-density male (bail) (HP 92222A; 1-meter is HP 92222B; 2-meter is HP 92222C)
  - 1-meter cable, low-density female (bail) to low-density female (bail) (HP 92222D; 3-meter is HP C2900A; 5-meter is HP C2901A; 10-meter is HP C2902A; 20-meter is HP C2903A)
  - low-density male (bail) SCSI terminator (HP 12016-80003)

Series 700 Device Options, continued

- Parallel (Centronics) Devices/Cables:
  - LaserJet III printer (HP, model 33450A)
  - PaintJet XL printer (HP, model C1602A)
  - Impact printer (HP, model 256xC)
  - E-size plotter (HP, model C1620A)
  - 2-meter cable for printers/scanners, 25-pin male to 36-pin male (HP 24542D)
- Serial RS-232 Devices/Cables:
  - serial terminal (HP, model 700/94 with HP 24542G "printer" cable)
  - LaserJet III printer (HP, model 33450A)
  - MODEM (Telebit, model Trailblazer) for remote support
  - B-size plotter (HP, model 7550A)
  - A through E-size plotter (HP, model 7576A)
  - 3-meter cable for DTE devices (terminals/printers/plotters), 9-pin female to 25-pin male (HP 24542G)
  - 3-meter cable for DTE devices (DEC terminals), 9-pin female to 25-pin male (HP 24542H)
  - 3-meter cable for DCE devices (Modems), 9-pin female to 25-pin male (HP 24542N)
  - 5-meter cable for DTE to DCE converter, 25-pin male to 25-pin male (HP 40242G)
- HP-HIL Devices:
  - Mouse (HP K1410)
  - 3-button Track Ball (HP M1309A)
  - 11"x 11" Tablet (HP 45911A/C)
  - Keyboard-all languages (HP 46021A)
  - 3-button Mouse (HP 46060B)
  - 2.4-meter Extensions (HP 46080/81A)
  - 15/30-meter RGB Extensions (HP 46082A/B)
  - Security Module (HP 46084A)
  - 9-dial Box (HP 46085A)
  - 32-button Box (HP 46086A)
  - A-size Tablet (HP 46087/90C)
  - B-size Tablet (HP 46088/91C)
  - Cursor (HP 46089A/B)
- HP-IB Devices:
  - 0.25 inch 67 MB Cartridge Tape unit (HP 9144A)
  - 0.25 inch 133 MB Cartridge Tape unit (HP 9145A)
  - 0.5 meter cable (HP 10833D; 1-meter is HP 10833A; 2-meter is HP 10833B; 4-meter is HP 10833C; 6-meter is HP 8120-3448; 8-meter is HP 8120-3449)
  - 0.3 meter right-angle connector cable (HP 92220R)
  - 2.3 meter connector-extension cable (HP 10834A)
- EISA Card options: (needs HP-UX version 8.05 or higher)
  - HP 25560A HP-IB Host Adapter - an interface card that provides a connection to HP-IB peripheral devices.
  - (HP) 802.3 LAN Host Adapter - an interface card that provides a connection to systems/devices connected to the same local area network.
  - HP 25525A EISA SCSI-2 (differential) Host Adapter - a high-performance interface card that provides a connection to *differential* SCSI peripheral devices.

Supported Interfaces

The Model 720/730 workstation provides several interface standards to support high-speed graphics and disk devices along with low-speed devices.

The **VSC (system) Bus** supports the following interfaces through host adapters:

- Hewlett-Packard Standard Graphics Connect **(HP-SGC):** used to connect various HP supplied graphics subsystems.
- Extended Industry Standard Architecture **(EISA):** used to connect various HP and other EISA cards.
- Small Computer Systems Interface **(SCSI):** used to connect various HP and other high-speed (single-ended and differential) devices.
- **802.3 LAN:** used to connect to a local network of HP and other system nodes.
- **Centronics (Parallel) Interface:** used to connect HP and other medium-speed printers and plotters.
- **RS-232 (Serial) Interface:** used to connect HP and other low-speed printers, modems, and plotters.
- Hewlett-Packard Human Interface Link **(HP-HIL):** used to connect low-cost HP only devices (keyboard, mouse, tablets, etc.).

Extended Industry Standard Architecture (EISA)

An extension to the popular ISA bus used in "AT compatible" personal computers, EISA is a "superset" of ISA and is backwards compatible with existing 8/16-bit ISA cards.

Originally designed in 1989 for Intel's 386/486 CPU chips, EISA was adopted by the "Gang of Nine" computer system manufacturers as an alternative to IBM's Micro Channel Architecture (MCA) designed in 1987.

EISA Features

- Provides 32-bit address and data paths to support faster throughput.
- Provides higher burst performance (sequential writes to memory up to 33 MB per second on Model 730 and 750 systems; 25 MB per second on Model 720 systems).
- Provides higher burst performance (sequential reads from memory up to 28 MB per second on Model 730 and 750 systems; 21 MB per second on Model 720 systems).
- Provides Bus Mastering capabilities that support multiple CPUs.
- EISA cards have fewer or no switches/jumpers to configure the card.
- EISA cards have an architected id register (address and format).

Small Computer Systems Interface (SCSI)

SCSI or SCSI-1 is the best known and most widely used American National Standards Institute (ANSI) standard interface for high-speed devices. Standards (X3.131) for SCSI were published in 1986; SCSI-2 standards (X3T9.2) were completed in 1990.

SCSI-2 Features

The definitions of SCSI-2 include the following features:

- Wide SCSI: SCSI may now transfer data at bus widths of 16 and 32 bits. Commands, status, and messages are still transferred as 8-bit data. A second 68-pin cable has been defined to contain the extra data bits.
- Fast SCSI: On 8-bit transfers it is possible to transfer at 10 Megabytes per second if superior cables and components are used. If combined with Wide SCSI, a total transfer rate of 40 Megabytes per second is possible.
- New Termination: To improve noise resistance of single-ended SCSI, a new termination scheme has been added (using active vs passive components).
- Bus Arbitration: SCSI-2 *initiators* are required to arbitrate prior to selection of a *target*.
- Parity: An option in SCSI-1, parity is now required.
- Connectors: A microconnector has been chosen and is available from several sources.
- Rotational Position Locking: This feature defines synchronized spindles, so that an *initiator* can manage disk targets that have their spindles locked in a known position to each other. By arraying banks of synchronized fixed disks, higher transfer rates can be achieved.
- Target Identify: SCSI-1 allows the *initiator* to select the *target* physically but not to logically address commands to it. SCSI-2 extends the Identify message to allow definition of up to 8 processes.
- Contingent Allegiance: This existed in SCSI-1, even though it was not defined, and is required to prevent corruption of error sense data. *Targets* in the Contingent Allegiance state reject all commands from other *initiators* until the error is cleared by the *initiator* that got the error. (Deferred Error Handling), if anything goes wrong in writing to the media, the deferred error can be handled.
- Extended Contingent Allegiance (ECA): This extends the utility of the Contingent Allegiance state for an indefinite period during which the *initiator* that received the error can perform advanced recovery algorithms.
- Asynchronous Event notification (AEN): A *target* peripheral can advise the *initiator* of asynchronous events, such as a cartridge being loaded into a tape drive.
- Mandatory Messages: The list of mandated messages for targets and initiators has been extended.

SCSI-2 Features, continued

- Optional Messages: These are used to negotiate wide transfers and Tags to support command queuing.
- Command Queuing: Up to 256 commands can be outstanding to one logical unit number (LUN), compared with one command per LUN in SCSI-1. The *target* is allowed to resequence the order of command execution to optimize seek motions.
- Disk Caching: Two control bits are used in the Command Descriptor Block (CDB) to control whether the cache is accessed on a Read or Write command, and some commands have been added to control prefetching and locking of data into the cache.

  Users do not have to change their software to take advantage of caching, because parameters may be used to optimize the *target* algorithms to maximize cache performance.
- Common Command Set: Many old commands (Mode Select & Mode Sense) have been reworked and several new commands have been added.

  SCSI-2 also includes a number of common commands, including Change Definition, Mode Select, Mode Sense, Inquiry, Log Select, Log Sense, Write Buffer, Read Buffer, Send Diagnostics, and Receive Diagnostics.

  - *Change Definition* allows a SCSI-2 initiator to instruct a SCSI-2 target to stop executing according to the SCSI-1 standard.
  - *Inquiry* now provides additional data about the target and its LUNs.
  - *Sense Keys and Sense Codes* have been formalized and extended to provide additional information about error causes.
  - *Log Select and Log Sense* were added so that if the target gathers historical and statistical data, the initiator can recover it.
  - *Diagnostic Capabilities* have been extended on the Read/Write Buffer and Read/Write Long commands.
- Pages: Some method has to be found to pass parameters between host and target, and the technique used is known as pages.

SCSI Device Configuration

Figure 2-1 illustrates the SCSI device cabling scheme. A built-in SCSI terminator, shown as (T) on the System (core I/O) card of Model 720/730 systems, provides termination for the single-ended SCSI connector on the bulkhead.

Note that the embedded devices have a single SCSI connector while the external devices have two SCSI connectors, one marked "in" and one marked "out."

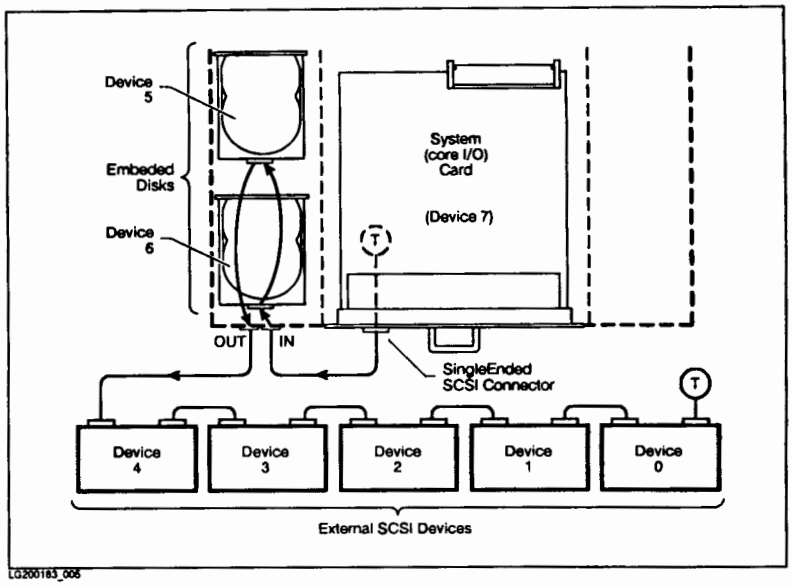


Figure 2-1. SCSI Device Configuration Scheme

Precautions

Consider the following to avoid *data corruption* caused by powering on/off SCSI devices while data is being transferred:

- Power on all external SCSI devices and allow time for their selftests to complete before powering on the System Unit cabinet.
- Keep all external devices powered on during and after system boot. Do not add or remove SCSI devices while the System Unit or any SCSI device is powered on.
- Ensure that each SCSI device has a unique number (address) between 0 and 6. The host is always address 7. The C1700A, Magneto Optical Disk Autochanger, requires three (3) addresses: one for the autochanger, and one for each of its two drives.
- Do NOT connect single-ended devices with the EISA SCSI-2 host adapter card or differential devices to the core SCSI-2 port.
- Ensure that the total cable length (both internal and external cables) does not exceed 6 meters for single-ended devices; 25 meters for differential devices.
- Ensure that the last device in the chain of devices is terminated with the proper (single-ended vs differential) SCSI terminator, shown in Figure 2-1 as (T) on SCSI device 0.

HP-IB Device Configuration

In Figure 2-2 below, note that each HP-IB device has one connector. HP-IB cables connect from the HP-IB card in the EISA card adapter to each device in a daisy-chained fashion; star configurations (multiple devices connected at a single connection point) may not be reliable.

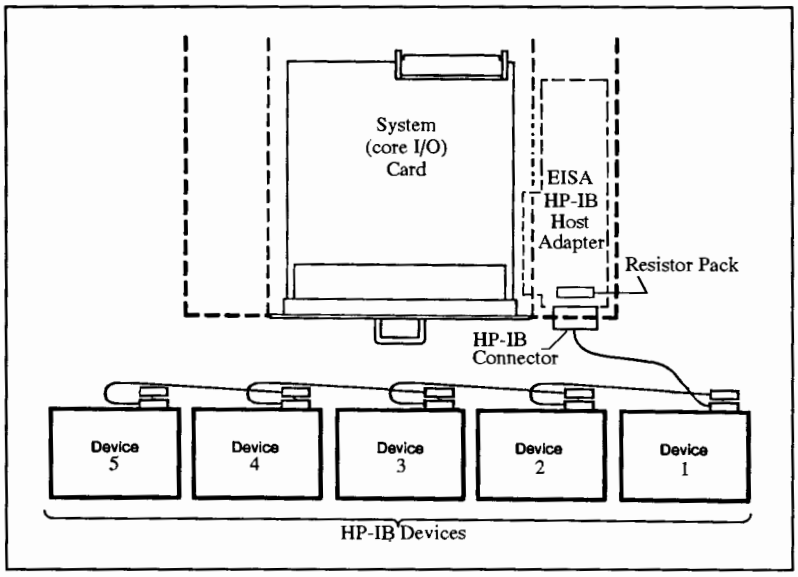


Figure 2-2. HP-IB Device Configuration Scheme

HP-IB Cable Lengths

Cable length requirements depend on the HP-IB operating speed (either high or slow/medium-speed).

For high-speed operation and best performance:

- Maximum HP-IB cable length for each EISA HP-IB host adapter card = 15 meters.
- There must be AT LEAST one load (device or resistive equivalent) for each meter of HP-IB cable.
- Maximum number of HP-IB devices for each EISA HP-IB host adapter card = 7.

For slow/medium-speed operation and best performance:

- Maximum HP-IB cable length for each EISA HP-IB host adapter card = 20 meters.
- There can be two meters of HP-IB cable for each load (device or resistive equivalent).
- Maximum number of HP-IB devices for each EISA HP-IB host adapter card = 15.

HP-IB Device Loads

HP-IB device loads consist of the attached peripheral devices (one load per device), the EISA HP-IB host adapter card (one load per card), and the equivalent device loads supplied by the following resistor packs:

- Resistor Pack (HP 1810-0408) provides 1 device-equivalent load
- Resistor Pack (HP 1810-0410) provides 2 device-equivalent loads
- Resistor Pack (HP 1810-0409) provides 4 device-equivalent loads
- Resistor Pack (HP 1810-0081) provides 7 device-equivalent loads

Note that each EISA HP-IB host adapter is shipped with an HP 1810-0081 resistor pack installed directly behind the HP-IB connector providing 8 device loads.

High-Speed Device Cabling Examples

The following examples assume one EISA HP-IB card (1 load) with an HP 1810-0081 resistor pack (7 loads). The *total cable length* when connected to:

- one high-speed device (1 load) cannot exceed 9 meters.
- two high-speed devices (2 loads) cannot exceed 10 meters.
- three high-speed devices (3 loads) cannot exceed 11 meters.
- four high-speed devices (4 loads) cannot exceed 12 meters.
- five high-speed devices (5 loads) cannot exceed 13 meters.
- six high-speed devices (6 loads) cannot exceed 14 meters.
- seven high-speed devices (7 loads) cannot exceed 15 meters.

Connecting eight or more high-speed devices will degrade performance.

Slow/Medium-Speed Device Cabling Examples

The following examples assume one EISA HP-IB card (1 load) with no resistor pack (0 loads). The *total cable length* when connected to:

- one slow/medium-speed device (1 load) cannot exceed 4 meters.
- two slow/medium-speed devices (2 loads) cannot exceed 6 meters.
- three slow/medium-speed devices (3 loads) cannot exceed 8 meters.
- four slow/medium-speed devices (4 loads) cannot exceed 10 meters.
- five slow/medium-speed devices (5 loads) cannot exceed 12 meters.
- six slow/medium-speed devices (6 loads) cannot exceed 14 meters.
- seven slow/medium-speed devices (7 loads) cannot exceed 16 meters.
- eight slow/medium-speed devices (8 loads) cannot exceed 18 meters.
- nine slow/medium-speed devices (9 loads) cannot exceed 20 meters.

To connect ten or more slow/medium-speed devices requires using short (1-meter) interconnect cables between devices so as not to exceed the 20 meter total cable length restriction.

HP-HIL Device Configuration

In Figure 2-3 below, note that each HP-HIL device has two connectors: one connector is marked with 2 black dots, the second is marked with one (black dot). HIL cables use similar markings on each end to simplify the daisy-chained connections by matching the dots on the cables with those on the devices.

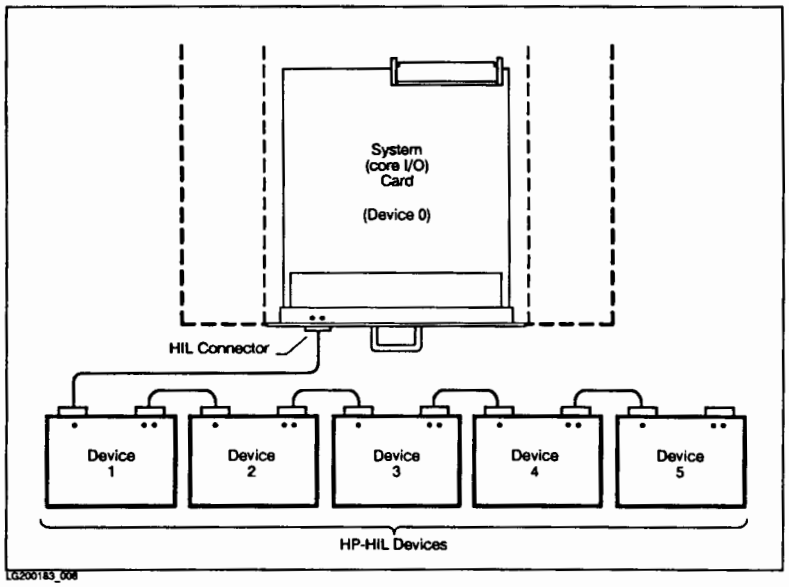


Figure 2-3. HP-HIL Device Configuration Scheme

3

Installing Model 720/730 Workstations and Servers

Chapter 3 contains installation procedures from the *Installation Guide for HP Apollo 9000 Model 720/730 Workstations and Servers* (part number A1926-90000; manufacturing number A1926-90604).

The objective of the Installation Guide is to provide step-by-step instructions for *end-user customers* to inventory, connect, and verify the operation of their workstation or server.

Missing from this chapter (document) are the procedures to install peripherals. External peripheral devices are shipped with an Installation/Service manual.

Installation Tasks

The first half of the *Installation Guide for HP Apollo 9000 Model 720/730 Workstations and Servers*; covers installing workstations; the second half covers installing servers.

Note

The following page is the *third* page of the *Installation Guide for HP Apollo 9000 Model 720/730 Workstations and Servers*; the first (cover) page and the second (legal info and EMC signoff and verification) page are not included.

Summary of Tasks (page three)

Considerations when choosing a site for your workstation/server:

- All of the workstation/server's components operate on either 115 Volts (60 Hertz) or 230 Volts (50 Hertz) input power. Both the U.S. and Canada provide 115 Volts (60 Hertz) input power.
- None of the workstation/server's components require special air conditioning for cooling. However, avoid operating your workstation/server in direct sunlight or in a confined area where heat build-up, chemicals, or dirt can shorten the working life of the components.
- Avoid operating the workstation/server in close proximity to radio, TV, or radar antennae to minimize erratic operation from strong electro-magnetic radiation.

Installation Tasks

Some workstation models have their graphics components in a separate cabinet other models have them in on a card in the System Unit cabinet. Servers do not have any graphics components.

1. Desktop installation or Deskside installation (see note below)
2. System Unit connections for workstations/servers
3. Graphics Unit connections for workstations
4. Graphics Monitor connections for workstations; System console connections for servers
5. Power on and booting the HP-UX operating system

Note: The components of the workstation/server are ready for deskside installations; some minor assembly of the floor stand to the System Unit is required for deskside installations.

Tools Required

- razor or small knife to open shipping cartons
- small flatblade screwdriver
- small (#1) Pozidrive or Phillips-head screwdriver

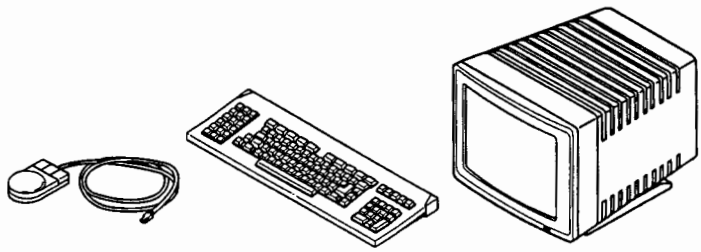
Where to Start

The tasks for *installing workstations* begins on the following page and continues to the middle of this document.

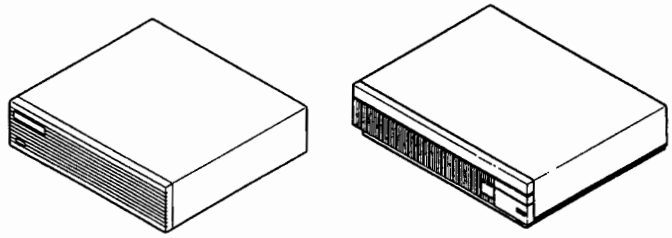
The tasks for *installing servers* begins after the workstation installation tasks on the page titled **Server Installation Tasks** and continues to the end of this document.

Unpacking and Checking the Workstation Components (page four)

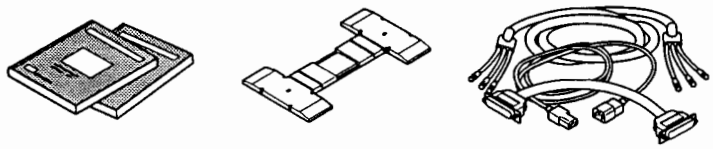
Use the checklist below to identify the **workstation's** components.
Unpack and inspect each item for visible damage. Contact the shipping company if any items on the packing list are missing or damaged.



☐ Mouse ☐ Keyboard ☐ Graphics Monitor *(color optional)*



☐ External Graphics Unit *(optional)* ☐ System Unit



☐ Documentation ☐ System Unit Stand *(optional)* ☐ Cables

LG200183_016

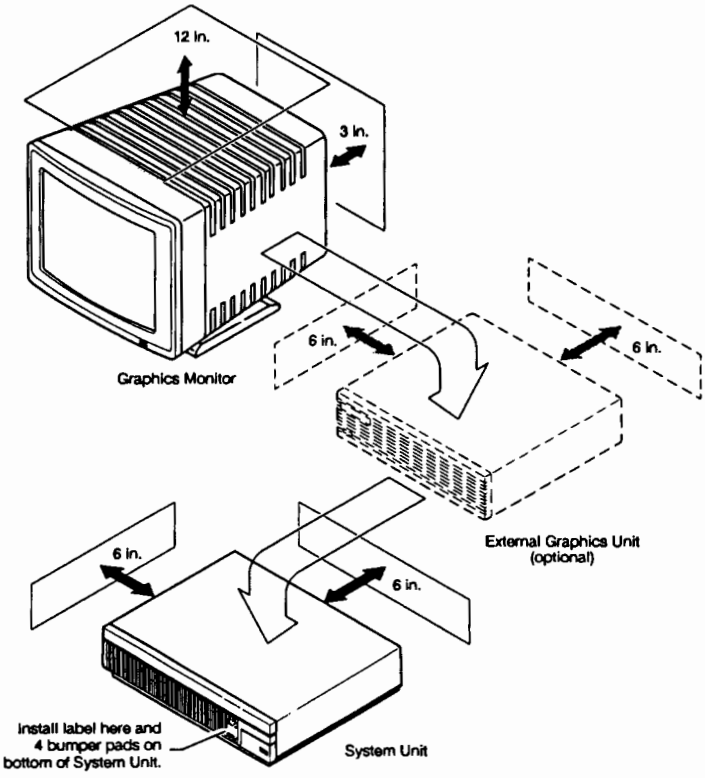
Figure 3-1. Unpacking and Checking Workstation Components

Workstation Arrangement for Desktop Installation (page five)

1 – Desktop Installation

Skip this task if you are intending to do a Deskside installation. Place the components as shown for Desktop installation to allow for proper air flow. The (optional) External Graphics Unit should be placed on top of the System Unit.

Skip Deskside installation.



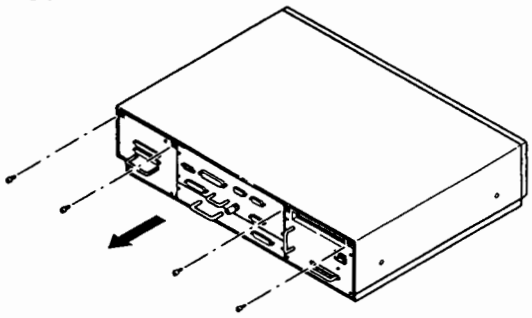
LG200183_019

Figure 3-2. Workstation Component Arrangement for Desktop Installation

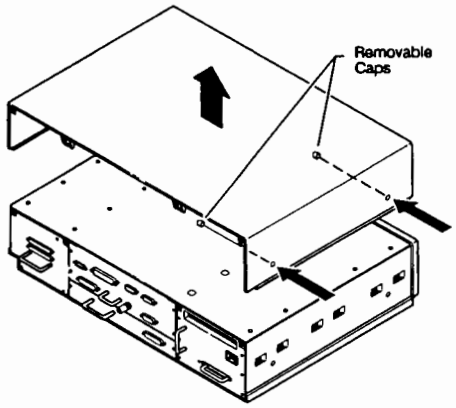
Plastic Top Removal for Deskside Installation (page six)

1 – Deskside Installation

Use a Pozidrive or Phillips-head screwdriver to remove the 4 screws holding the plastic top panel to the System Unit.



Lift and remove the top cover to gain access to the 2 plastic caps. Remove and discard both plastic caps.

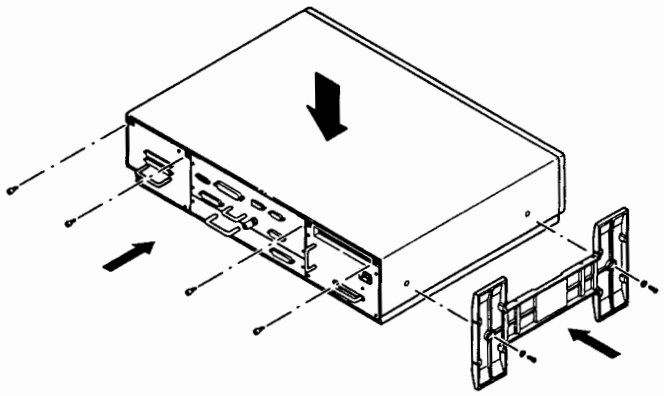


LO200183_020

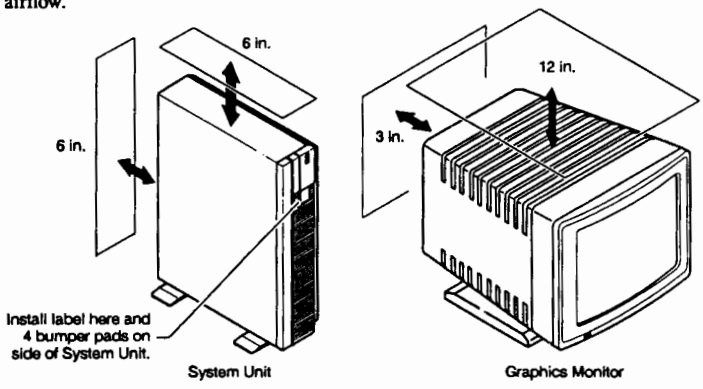
Figure 3-3. Plastic Top Removal

Workstation Arrangement for Deskside Installation (page seven)

Reattach the plastic top cover to the System Unit. Use a Pozidrive or Phillips-head screwdriver to attach the floor stand to the top cover and System Unit.



Position the components as shown below for Deskside installation to allow for proper airflow.

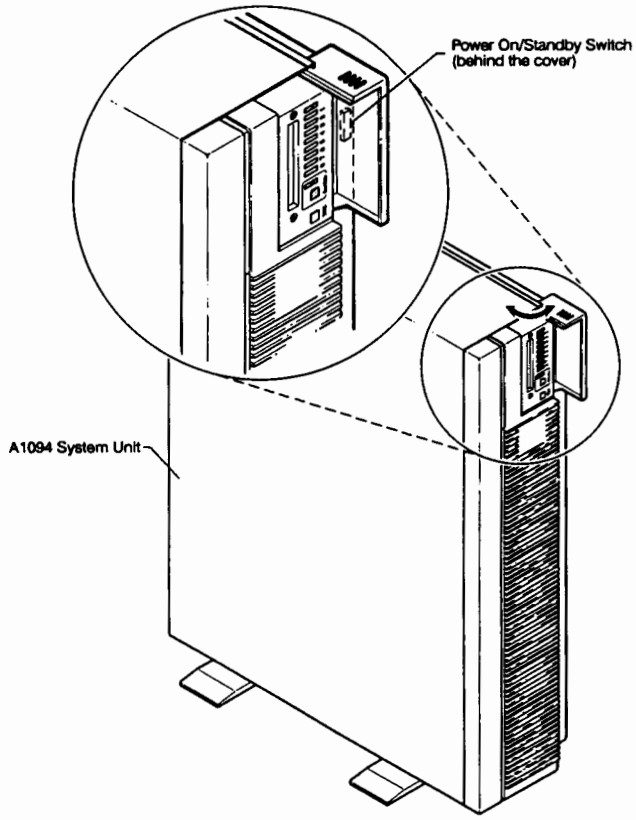


LG200183_021

Figure 3-4. Workstation Component Arrangement for Deskside Installation

System Unit, front view (page eight)

Familiarize yourself with the location of the front panel switches and LED indicators on the A1094 System Unit (front view, vertical position).



LG200183_017

Figure 3-5. System Unit, Front View

System Unit, rear view (page nine)

Familiarize yourself with the labels and locations of the connectors on the A1094 System Unit (rear view, horizontal position).

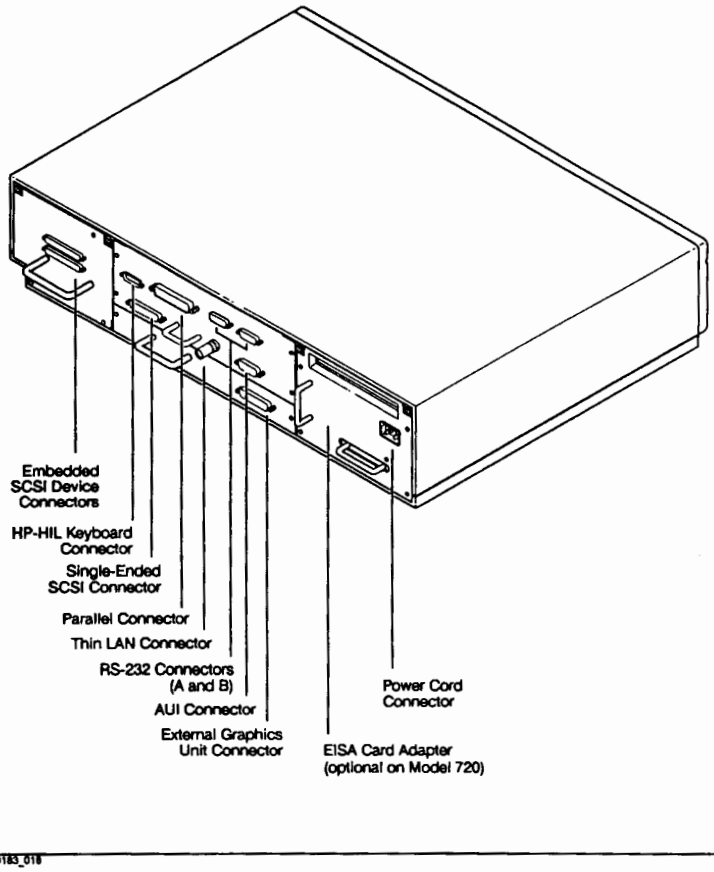
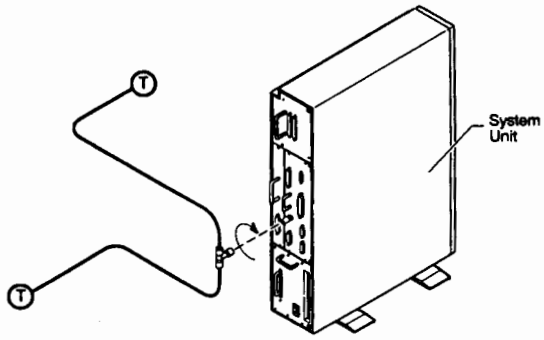


Figure 3-6. System Unit, Rear View

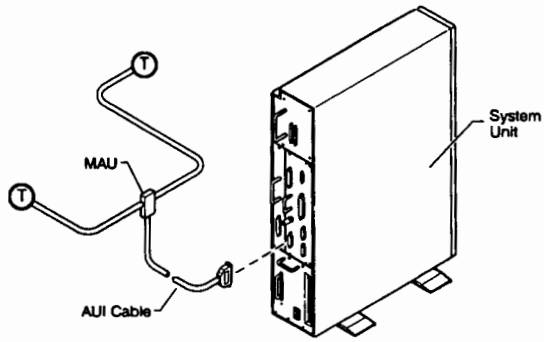
Workstation LAN Connections (page ten)

2a – System Unit Connections: Network

ThinLAN networks connect to the ThinLAN connector on the System Unit.
Note: *LAN cables are not supplied with the workstation but must be provided.*



Thick LAN networks connect to the AUI connector on the System Unit.



L0200183_022

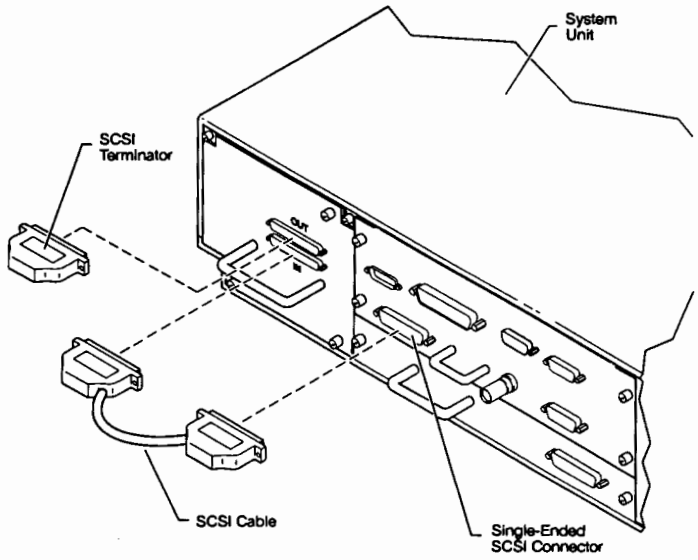
Figure 3-7. Workstation LAN Network Connections

Workstation SCSI Device Connections (page eleven)

2b – System Unit Connections: SCSI Devices

Skip this task if the SCSI cable and terminator are installed.

Connect the small SCSI cable and terminator as shown below for the embedded devices.



Additional external SCSI devices are connected to the SCSI "OUT" connector — however, the last SCSI device must be terminated.

Refer to accompanying device installation manuals.

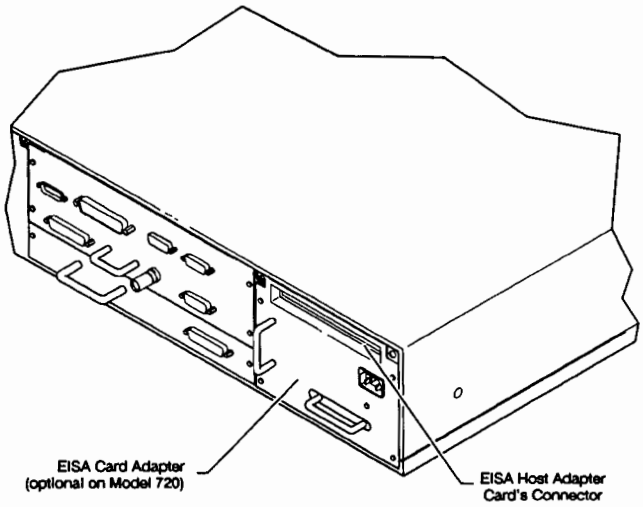
LG200183_038

Figure 3-8. Workstation SCSI Device Connections

Workstation EISA Host Adapter Connections (page twelve)

2c – System Unit Connections: EISA Host Adapter Cards

Skip this task if there is no EISA card adapter in the A1094 System Unit Cabinet.



Refer to accompanying EISA host adapter card installation manual.

ESD Precautions:

- ☐ Wear a grounded static strap to discharge any accumulated electrostatic charge from your body when installing or removing the EISA card adapter.
- ☐ Handle EISA cards by their edges, once you have removed them from their protective anti-static bags.

LG200183_048

Figure 3-9. Workstation EISA Host Adapter Connections

Workstation Keyboard and Mouse Connections (page thirteen)

2d – System Unit Connections: Keyboard and Mouse

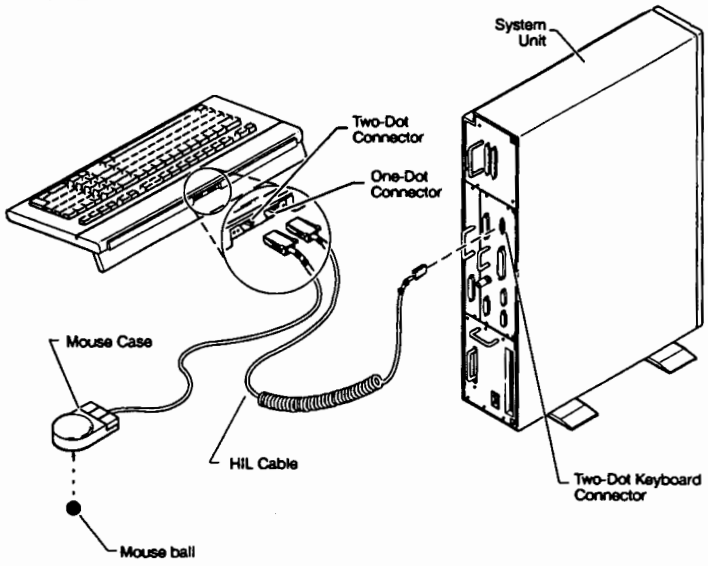
Connect the end of the HP-HIL cable that is marked with one dot (•) to the connector on the back of the keyboard that is also marked with one dot (•).

Connect the other end of that same HP-HIL cable that is marked with two dots (••) to the HP-HIL connector on the System Unit that is also marked with two dots (••) (or to the two-dot connector of the last HP-HIL device you plan to install.

Connect the end of the mouse cable to the two–dot (••) connector on the keyboard (or to the last HP-HIL device you plan to install).

If you have any other HP–HIL Devices, install them at this time. Refer to the instructions supplied with the optional device for installation instructions.

Note: *Install the mouse ball into the mouse case.*



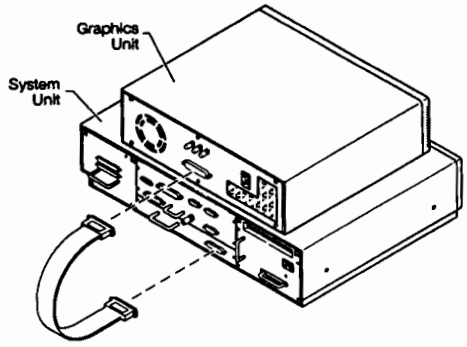
LG200183_023

Figure 3-10. Workstation Keyboard and Mouse Connections

Workstation Graphics Connections (page fourteen)

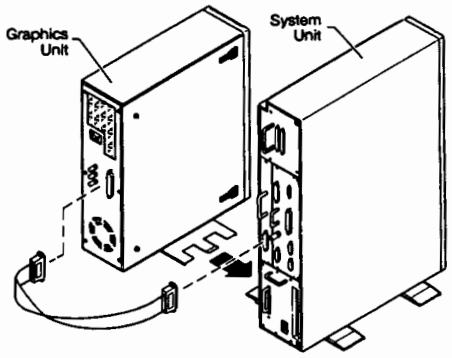
3 – External Graphics Unit Connections

Connect as shown below for Desktop installation.



Connect as shown below for Deskside installation.

NOTE: *Refer to the HP 98705A attachment kit (PN 98705-87904) for Deskside instructions for the Graphics Unit.*



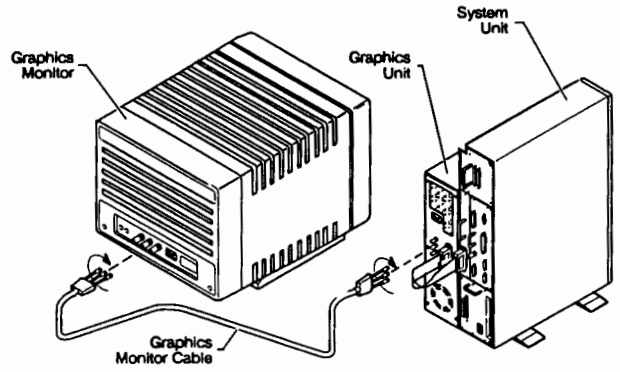
LG200183_044

Figure 3-11. Workstation Graphics Connections

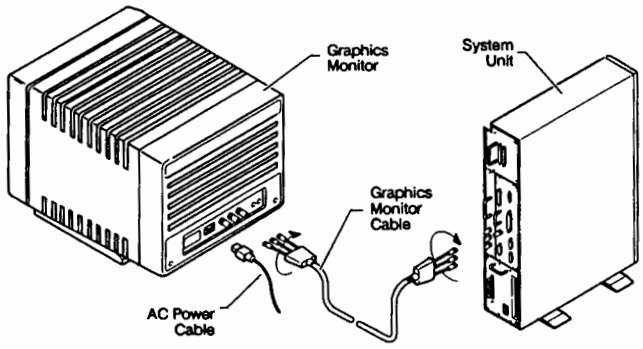
Graphics Monitor Connections (page fifteen)

4 – Graphics Monitor Connections

Connect as shown below for Graphics Monitor connection with a Graphics Unit.



Connect as shown below for Graphics Monitor connection to an internal Graphics Card.



LG200183_024

Figure 3-12. Graphics Monitor Connections

Workstation Power-on (page sixteen)

5 - WORKSTATION POWER-ON and BOOTING HP-UX

1). Connect the power cords from the System Unit, Graphics Unit, Monitor, and any external devices to the nearest AC power outlet. DO NOT CONNECT POWER CORDS TO A POWER STRIP ... as this may cause electrical shock.

Note: The correct power-on sequence is to power on any external devices, Graphics Unit, and the System Monitor first, and the System Unit last. **If any of the components appear dead:**

- Check all of the power cord connections and AC voltage settings.
- Check the operation of the "Power" switches on the System Unit, System Monitor, external devices, and external Graphics Unit.

If any of the workstation's components do NOT power up contact your HP Service Representative to inform him/her of the problem and to establish a plan of action.

2). This is the end of the "Workstation Installation Tasks." Refer to "Starting Up Your Workstation" in chapter 2 of the document titled *HP Apollo 9000 Model 720/730 Owner's Guide for HP-UX Users.* (PN A1926-90001)

The remaining pages contain the tasks for SERVER installations.

Note

The seventeenth page was intentionally left blank; the following page is the *eighteenth* page of the *Installation Guide for HP Apollo 9000 Model 720/730 Workstations and Servers*.

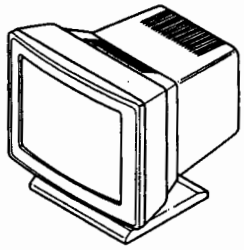
Unpacking and Checking the Server Components (page eighteen)

Server Installation Tasks

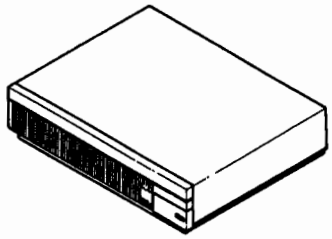
Use the checklist below to identify the server's components.

Unpack and inspect each item for visible damage. Contact the shipping company if any items on the packing list are missing or damaged.

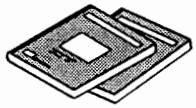
☐ Keyboard



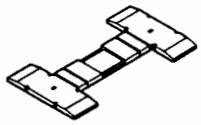
☐ System Console
(color optional)



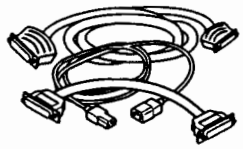
☐ System Unit



☐ Documentation



☐ System Unit Stand
(optional)



☐ Cables

LG200163_018a

Figure 3-13. Unpacking and Checking Server Components

Server Arrangement for Desktop Installation (page nineteen)

1 – Desktop Installation

Skip this task if you are intending to do a Deskside installation. Place the components as shown for Desktop installation to allow for proper air flow. The System Console should be placed on top of the System Unit.

Skip Deskside installation.

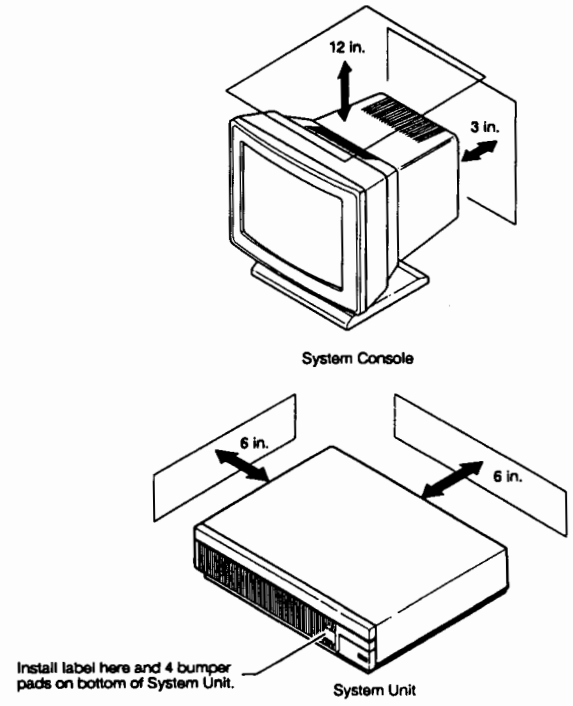
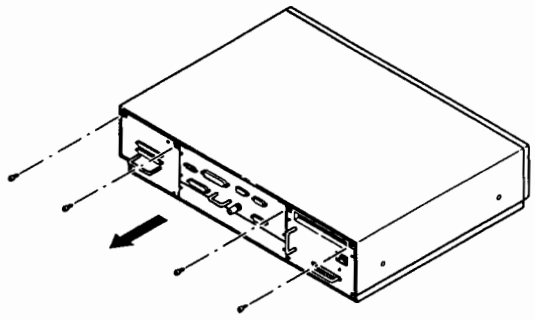


Figure 3-14. Server Component Arrangement for Desktop Installation

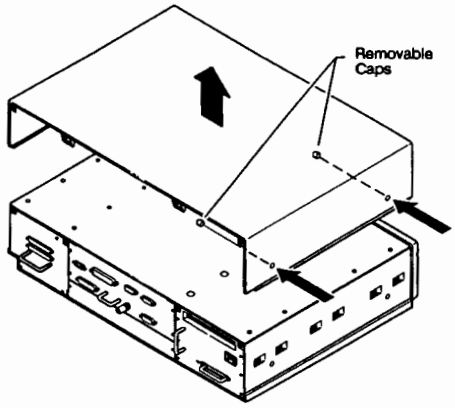
Plastic Top Removal for Deskside Installation (page twenty)

1 – Deskside Installation

Use a Pozidrive or Phillips-head screwdriver to remove the 4 screws holding the plastic top panel to the System Unit.



Lift and remove the top cover to gain access to the 2 plastic caps. Remove and discard both plastic caps.

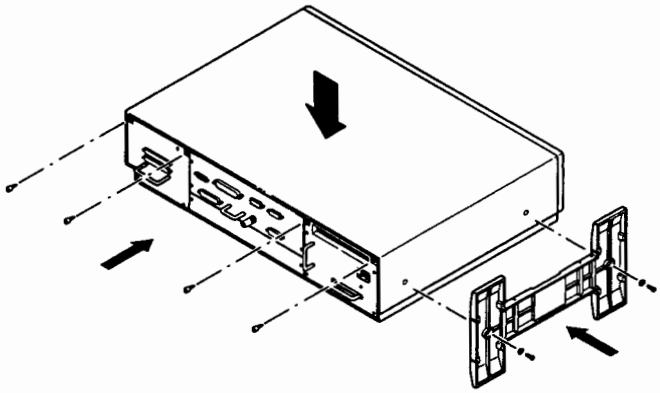


LG200183_020a

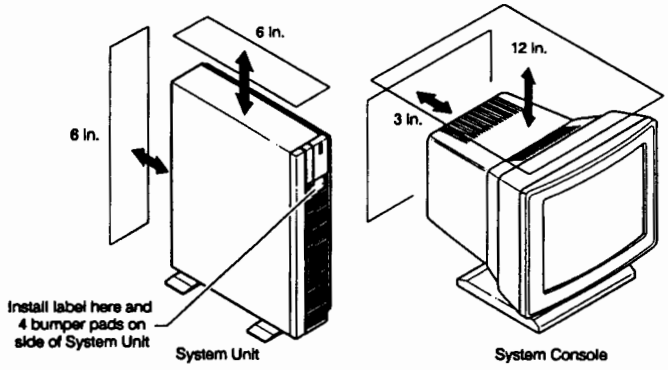
Figure 3-15. Plastic Top Removal

Server Arrangement for Deskside Installation (page twenty-one)

Reattach the plastic top cover to the System Unit. Use a Pozidrive or Phillips-head screwdriver to attach the floor stand to the top cover and System Unit.



Position the components as shown below for Deskside installation to allow for proper airflow.

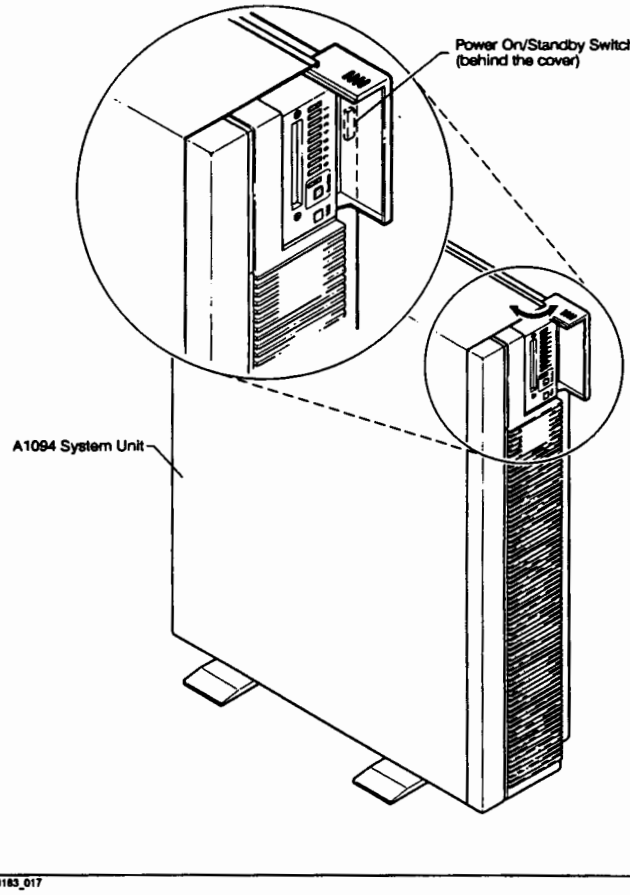


G200183_021a

Figure 3-16. Server Component Arrangement for Deskside Installation

System Unit, front view (page twenty-two)

Familiarize yourself with the location of the front panel switches and LED indicators on the A1094 System Unit (front view, vertical position).



LG200183_017

Figure 3-17. System Unit, Front View

System Unit, rear view (page twenty-three)

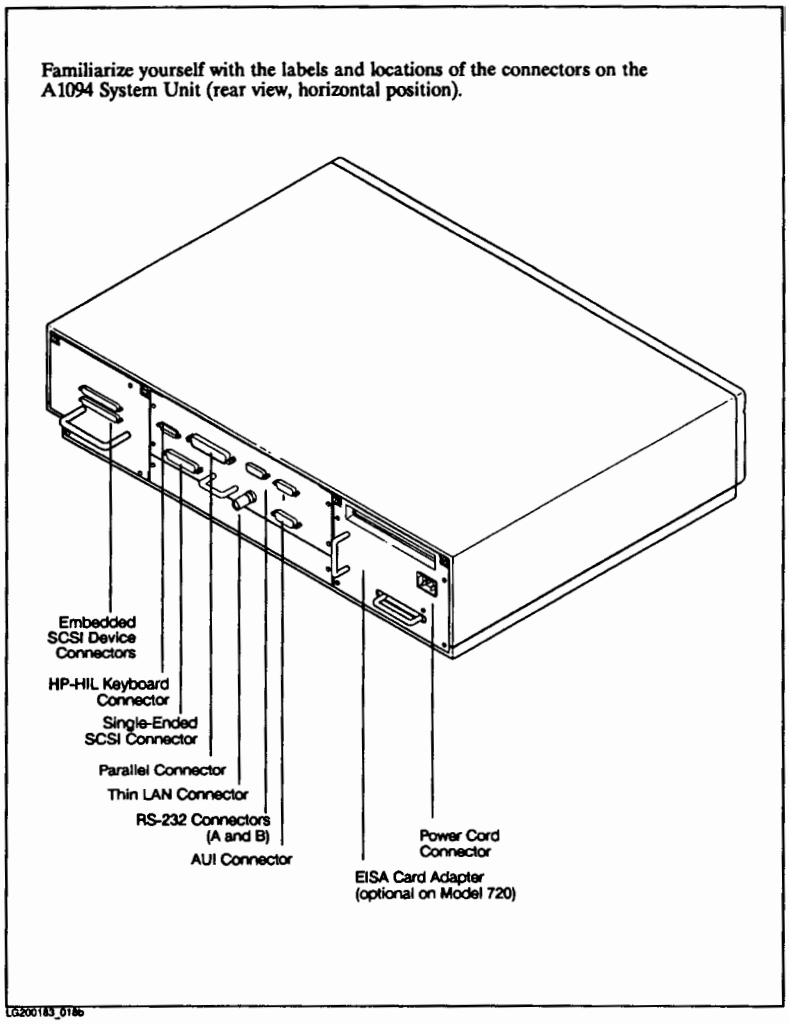
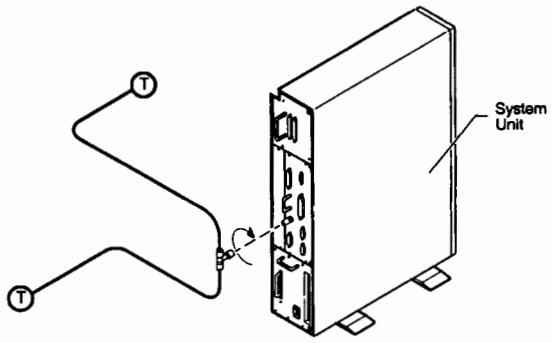


Figure 3-18. System Unit, Rear View

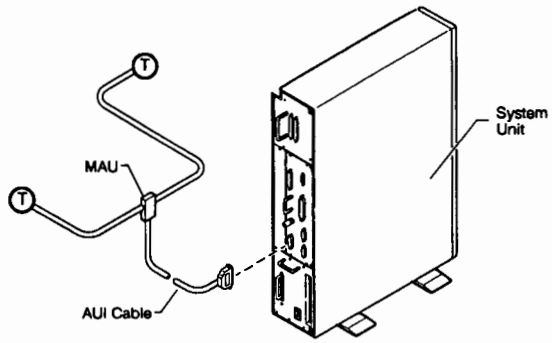
Server LAN Connections (page twenty-four)

2a – System Unit Connections: Network

ThinLAN networks connect to the ThinLAN connector on the System Unit.
Note: *LAN cables are not supplied with the workstation but must be provided.*



Thick LAN networks connect to the AUI connector on the System Unit.



LG200183_022a

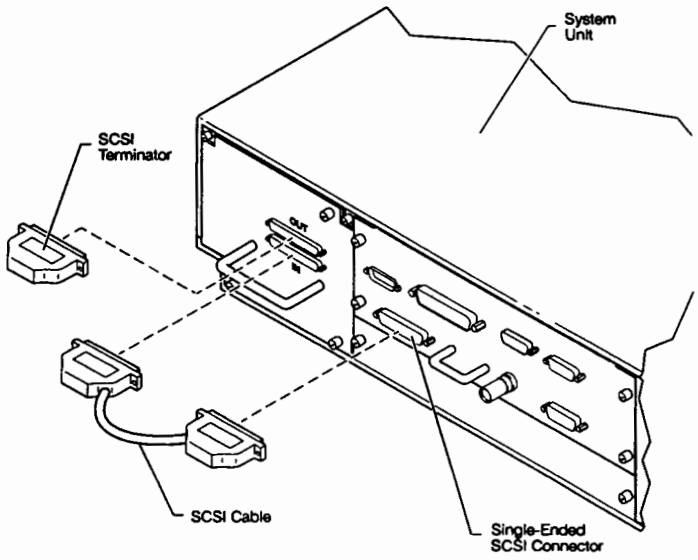
Figure 3-19. Server LAN Network Connections

Server SCSI Device Connections (page twenty-five)

2b – System Unit Connections: SCSI Devices

Skip this task if the SCSI cable and terminator are installed.

Connect the small SCSI cable and terminator as shown below for the embedded devices.



Additional external SCSI devices are connected to the SCSI "OUT" connector — however, the last SCSI device must be terminated.

Refer to accompanying device installation manuals.

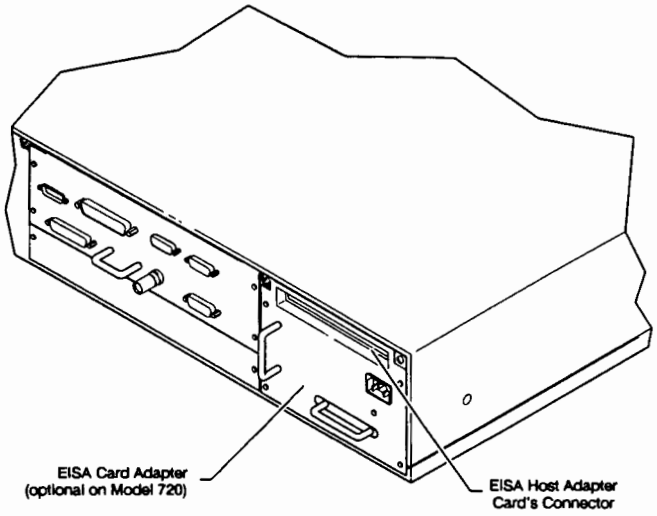
LG200183_036a

Figure 3-20. Server SCSI Device Connections

Server EISA Host Adapter Connections (page twenty-six)

2c – System Unit Connections: EISA Host Adapter Cards

Skip this task if there is no EISA card adapter in the A1094 System Unit Cabinet.



Refer to accompanying EISA host adapter card installation manual.

LG200183_048a

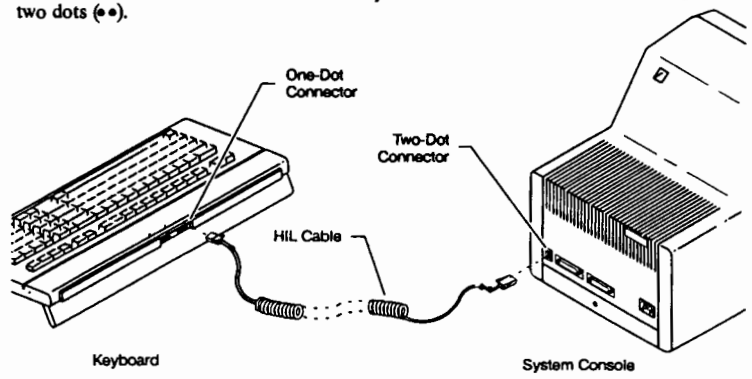
Figure 3-21. Server EISA Host Adapter Connections

Server System Console Connections (page twenty-seven)

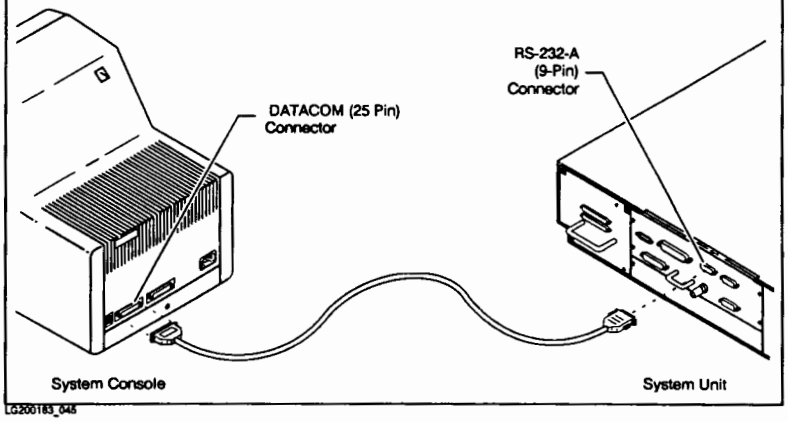
3 – System Console Connections

Connect the end of the HP-HIL cable that is marked with one dot (•) to the connector on the back of the keyboard that is also marked with one dot (•).

Connect the other end of the same HP-HIL cable that is marked with two dots (••) to the HP-HIL connector on the back of the System Console that is also marked with two dots (••).



Connect the System Console to the System Unit as shown.



LG200183_048

Figure 3-22. Server System Console Connections

Server Power-on (page twenty-eight)

4 - SERVER POWER-ON and BOOTING HP-UX

1). Connect the power cords from the System Unit, System Console, and any external devices to the nearest AC power outlet. DO NOT CONNECT POWER CORDS TO A POWER STRIP ... as this may cause electrical shock.

Note: The correct power-on sequence is to power on any external devices and the System Console first, and the System Unit last. **If any of the components appear dead:**

- Check all of the power cord connections and AC voltage settings.
- Check the operation of the "Power" switches on the System Unit, System Console, and external devices.

If any of the server's components do NOT power up contact your HP Service Representative to inform him/her of the problem and to establish a plan of action.

2). This is the end of the "Server Installation Tasks." Refer to "Starting Up Your Workstation" in chapter 2 of the document titled *HP Apollo 9000 Model 720/730 Owner's Guide for HP-UX Users.* (PN A1926-90001)

3a

Installing Model 750 Workstations and Servers

This chapter contains installation procedures from the *Installation Guide for HP Apollo 9000 Model 750 Workstations and Servers* (part number A1961-90001; manufacturing number A1961-90601).

The objective of the Installation Guide is to provide step-by-step instructions for *end-user customers* to inventory, connect, and verify the operation of their workstation or server.

Missing from this chapter (document) is the procedures to install peripherals. External peripheral devices are shipped with an Installation/Service manual.

Installation Tasks

The first half of the *Installation Guide for HP Apollo 9000 Model 750 Workstations and Servers*; covers installing workstations; the second half covers installing servers.

Note

The following page is the *third* page of the *Installation Guide for HP Apollo 9000 Model 750 Workstations and Servers*; the first (cover) page and the second (legal info and EMC signoff and verification) page are not included.

Summary of Tasks (page three)

Considerations when choosing a site for your workstation/server:

- All of the workstation/server's components operate on either 115 Volts (60 Hertz) or 230 Volts (50 Hertz) input power. Both the U.S. and Canada provide 115 Volts (60 Hertz) input power.
- None of the workstation/server's components require special air conditioning for cooling. However, avoid operating your workstation/server in direct sunlight or in a confined area where heat build-up, chemicals, or dirt can shorten the working life of the components.
- Avoid operating the workstation/server in close proximity to radio, TV, or radar antennae to minimize erratic operation from strong electro-magnetic radiation.

Installation Tasks

Some workstation models have their graphics components in a separate cabinet other models have them in on a card in the System Unit cabinet. Servers do not have any graphics components.

1. Deskside installation (see note below)
2. System Unit connections for workstations/servers
3. Graphics Unit connections for workstations
4. Graphics Monitor connections for workstations; System console connections for servers
5. Power on and booting the HP-UX operating system

Note: The internal SCSI components of the workstation/server come installed in the System Unit cabinet.

Tools Required

- razor or small knife to open shipping cartons
- small flatblade screwdriver
- small (#1) Pozidrive or Phillips-head screwdriver

Where to Start

The tasks for *installing workstations* begins on the following page and continues to the middle of this document.

The tasks for *installing servers* begins after the workstation installation tasks on the page titled **Server Installation Tasks** and continues to the end of this document.

Unpacking and Checking the Workstation Components (page four)

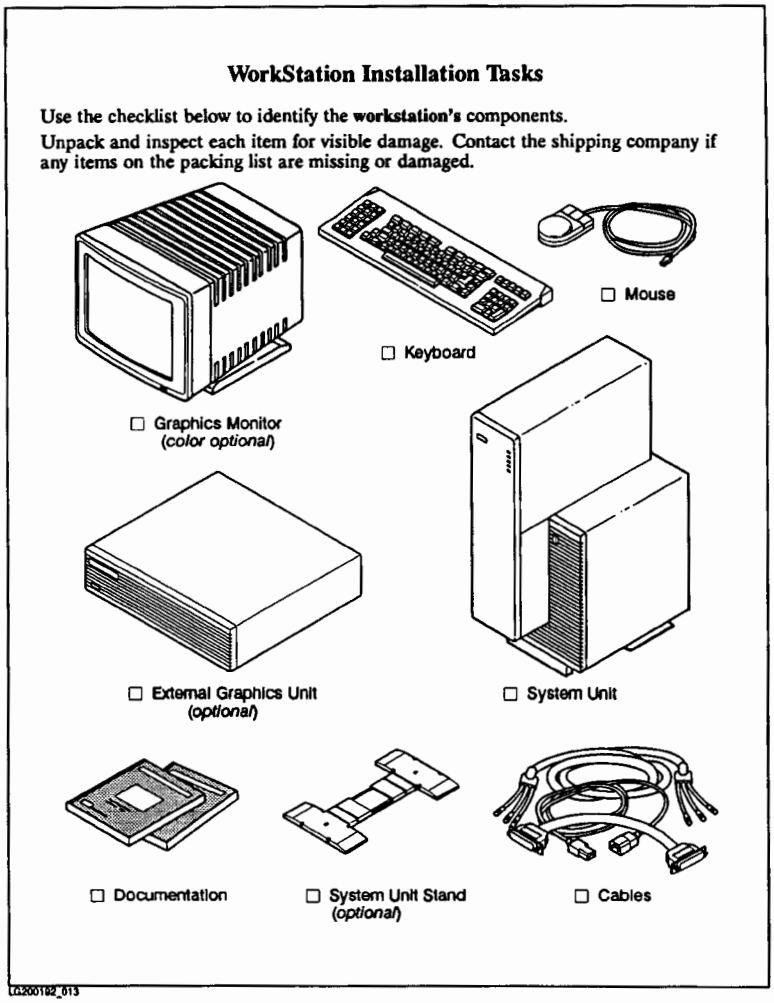


Figure 3a-1. Unpacking and Checking Workstation Components

Workstation Arrangement for Deskside Installation (page five)

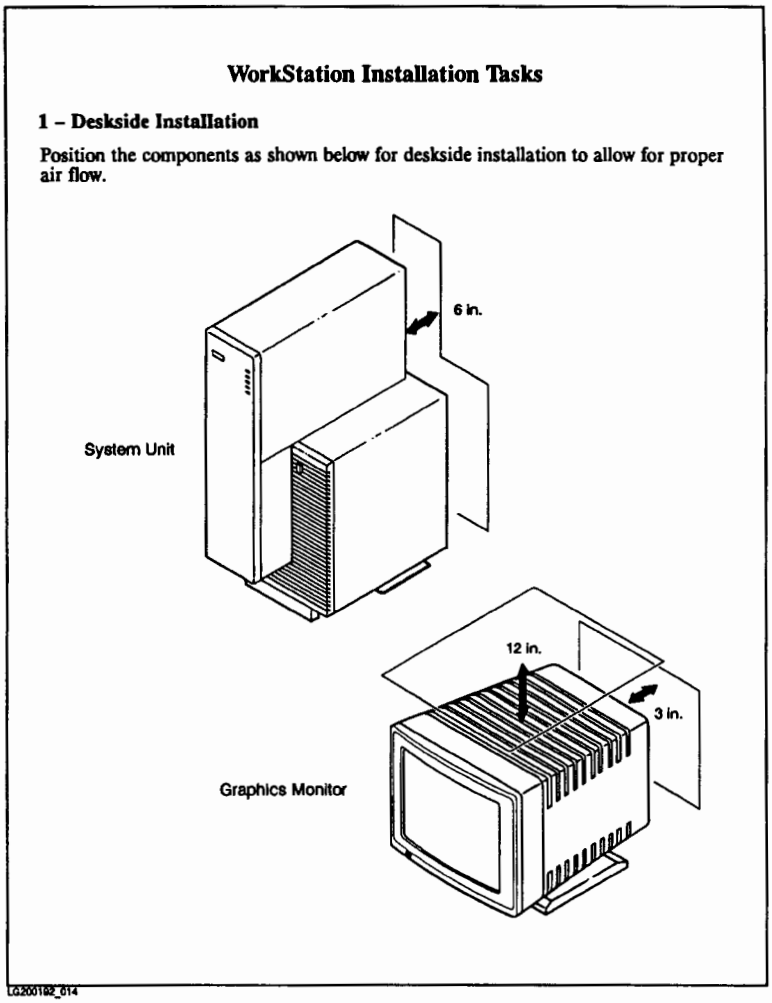


Figure 3a-2. Workstation Component Arrangement for Deskside Installation

System Unit, front view (page six)

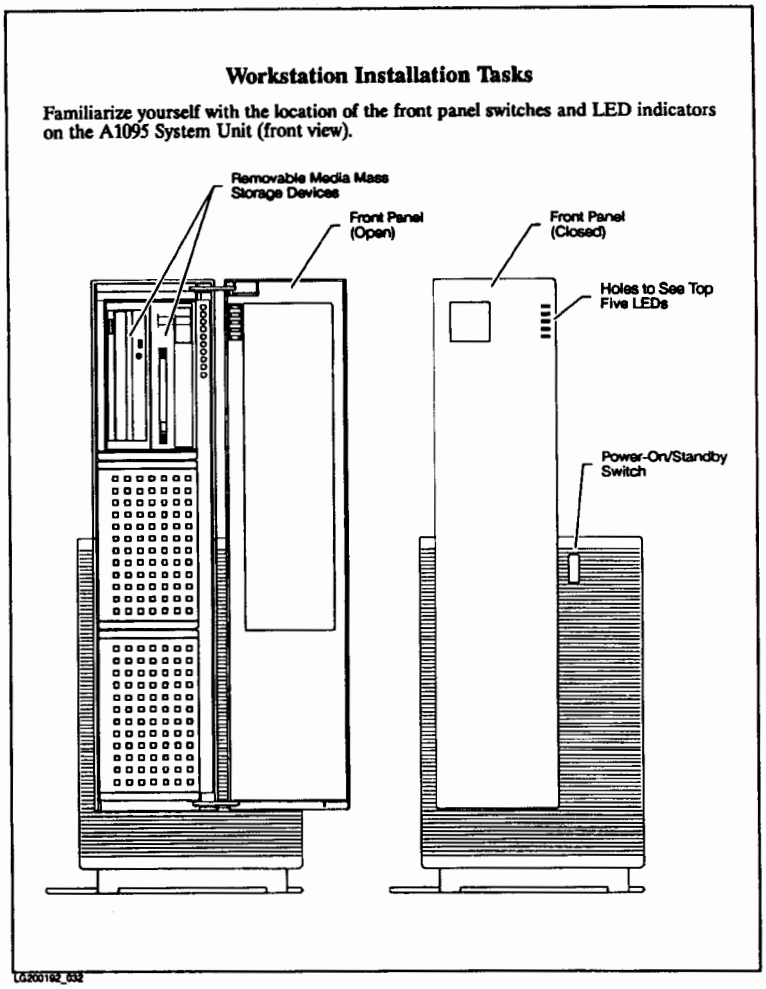


Figure 3a-3. System Unit, Front View

System Unit, rear view (page seven)

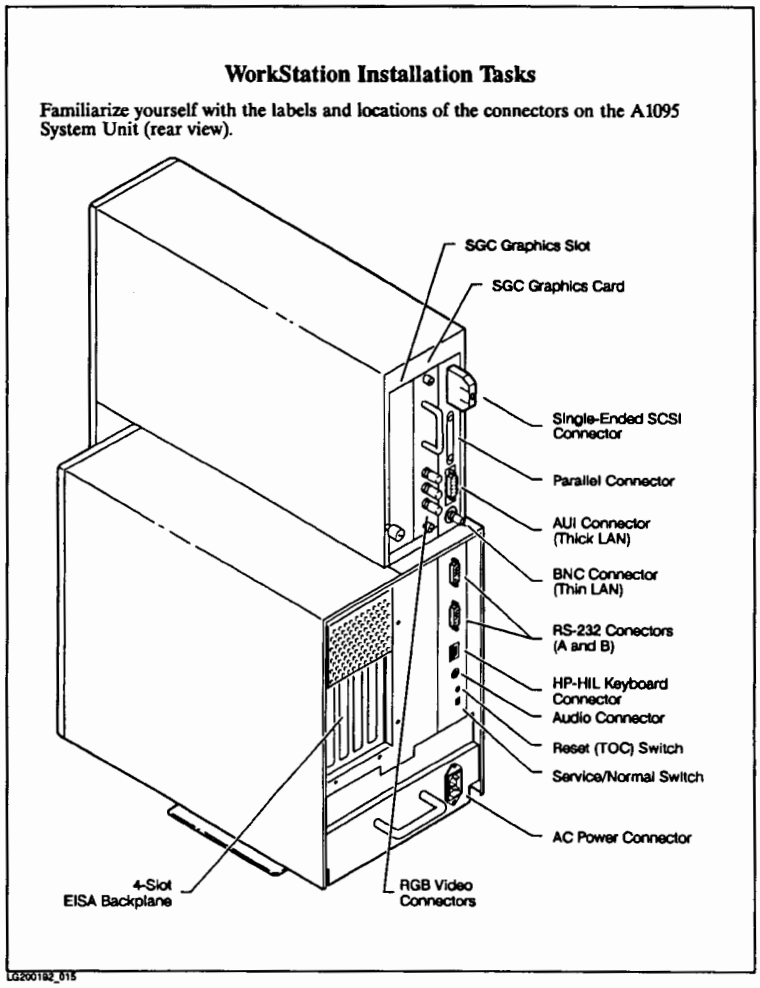


Figure 3a-4. System Unit, Rear View

Workstation LAN Connections (page eight)

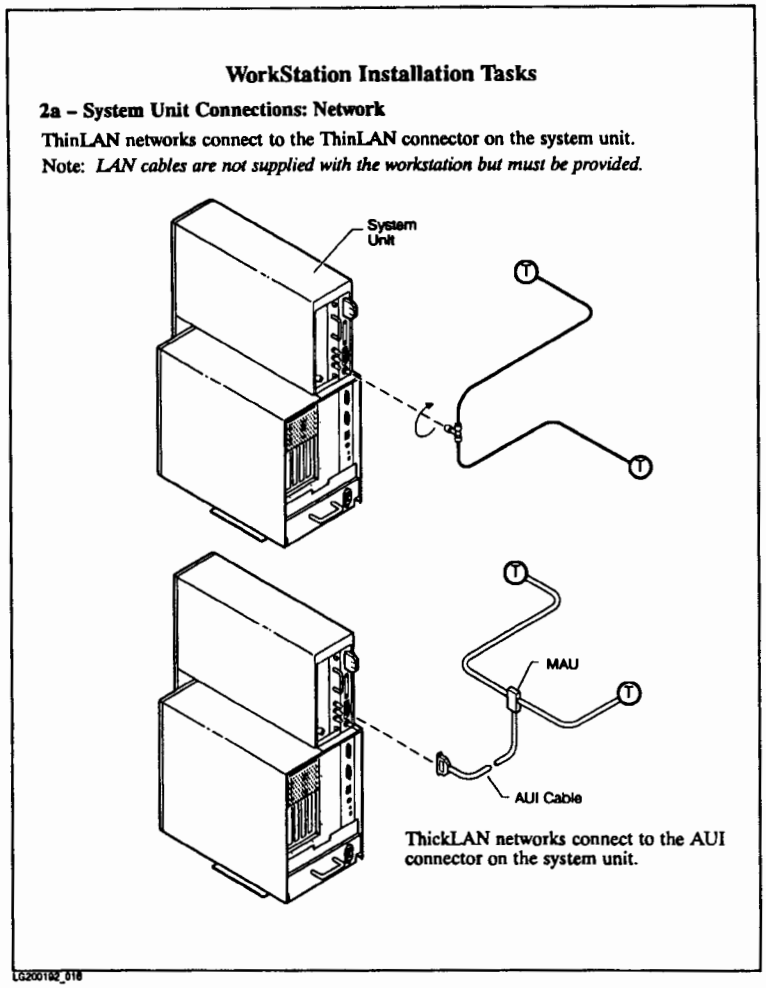


Figure 3a-5. Workstation LAN Network Connections

Workstation SCSI Device Connections (page nine)

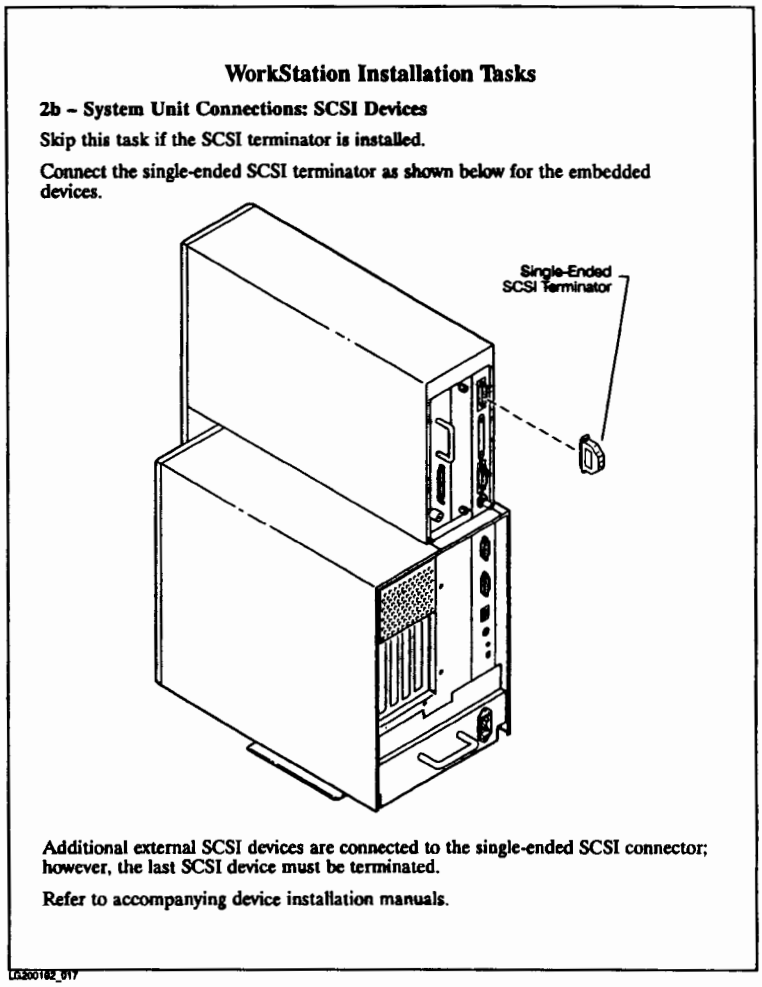


Figure 3a-6. Workstation SCSI Device Connections

Workstation EISA Host Adapter Connections (page ten)

2c - System Unit Connections: EISA Cards

NOTE: *Skip this task if no EISA cards are included and go to step 2d.*

1). If there are EISA cards included with your system, proceed to the end of the "Server Installation Tasks" for instructions to install EISA cards.

2). After installing the EISA cards, go to step 2d to continue the workstation installation tasks.

Workstation Keyboard and Mouse Connections (page eleven)

WorkStation Installation Tasks

2d – System Unit Connections: Keyboard and Mouse

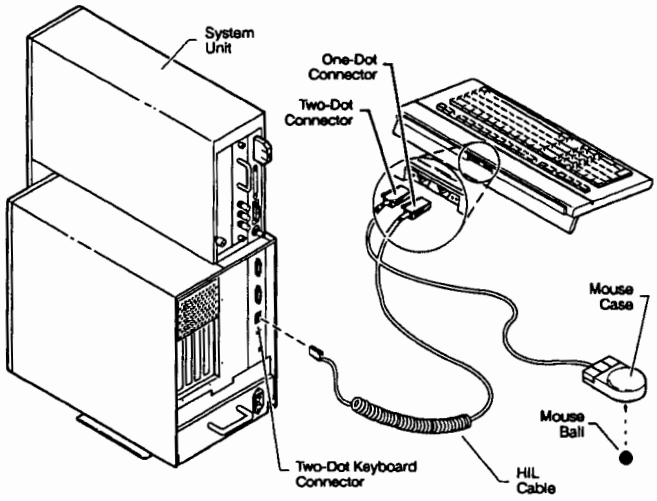
Connect the end of the HP-HIL cable that is marked with one dot (•) to the connector on the back of the keyboard that is also marked with one dot (•).

Connect the other end of that same HP-HIL cable that is marked with two dots (••) to the HP-HIL connector on the system unit that is also marked with two dots (••) (or to the two-dot connector of the last HP-HIL device you plan to install.

Connect the end of the mouse cable to the two–dot (••) connector on the keyboard (or to the last HP-HIL device you plan to install).

If you have any other HP–HIL devices, install them at this time. Refer to the instructions supplied with the optional device for installation instructions.

Note: *Install the mouse ball into the mouse case.*



LG200192_022

Figure 3a-7. Workstation Keyboard and Mouse Connections

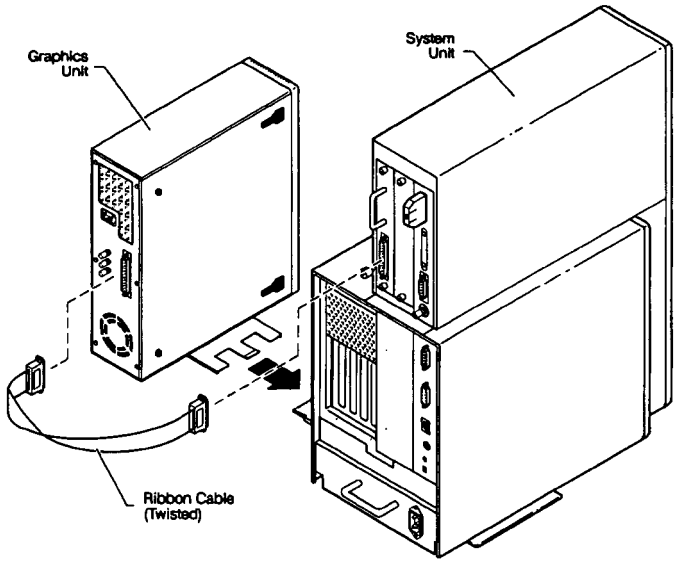
Workstation Graphics Connections (page twelve)

WorkStation Installation Tasks

3 – External Graphics Unit Connections

Connect as shown below for deskside installation.

NOTE: *Refer to the HP 98705A attachment kit (PN 98705-87905) for deskside instructions for the graphics unit.*



LG200192_023

Figure 3a-8. Workstation Graphics Connections

Graphics Monitor Connections (page thirteen)

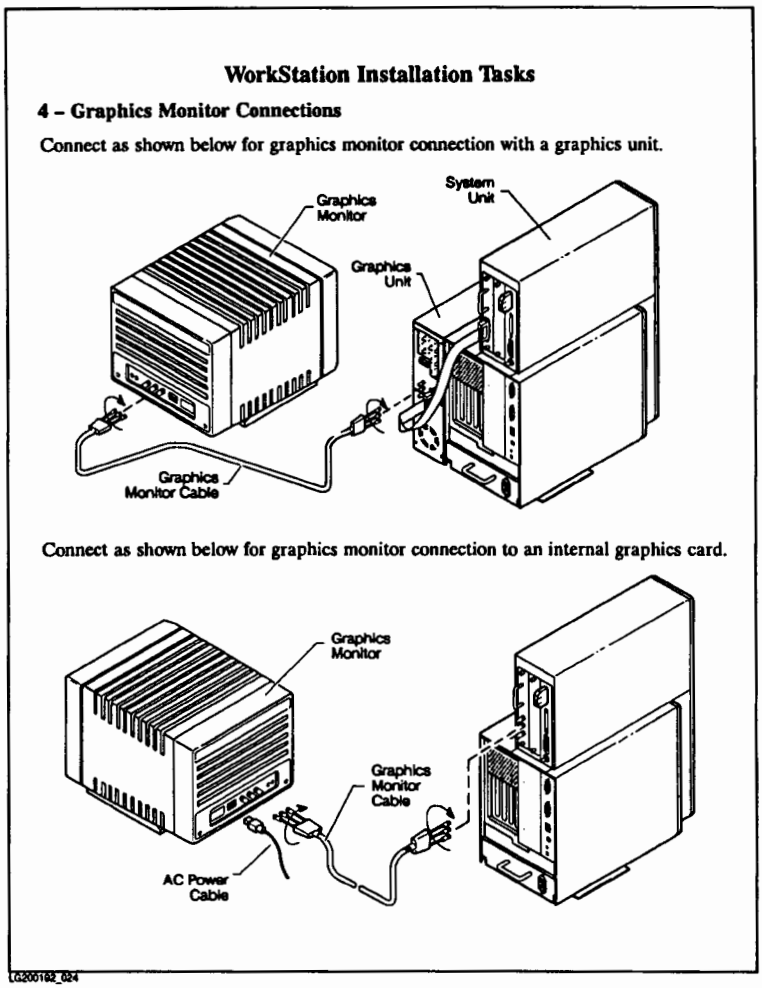


Figure 3a-9. Graphics Monitor Connections

Workstation Power-on and Booting HP-UX (page fourteen)

5 - WORKSTATION POWER-ON and BOOTING HP-UX

1). Connect the power cords from the System Unit, Graphics Unit, Monitor, and any external devices to the nearest AC power outlet. DO NOT CONNECT POWER CORDS TO A POWER STRIP ... as this may cause electrical shock.

Note: The correct power-on sequence is to power on any external devices, Graphics Unit, and the System Monitor first, and the System Unit last. **If any of the components appear dead:**

- Check all of the power cord connections and AC voltage settings.
- Check the operation of the "Power" switches on the System Unit, System Monitor, external devices, and external Graphics Unit.

If any of the workstation's components do NOT power up contact your HP Service Representative to inform him/her of the problem and to establish a plan of action.

2). This is the end of the "Workstation Installation Tasks." Refer to "Starting Up Your Workstation" in chapter 2 of the document titled *HP Apollo 9000 Model 750 Owner's Guide for HP-UX Users.* (PN A1961-90000)

Server Installation Tasks (page fifteen)

Server Installation Tasks

The following pages contain the tasks for *installing servers* and ends on the page titled **Installing EISA Cards**.

Unpacking and Checking the Server Components (page sixteen)

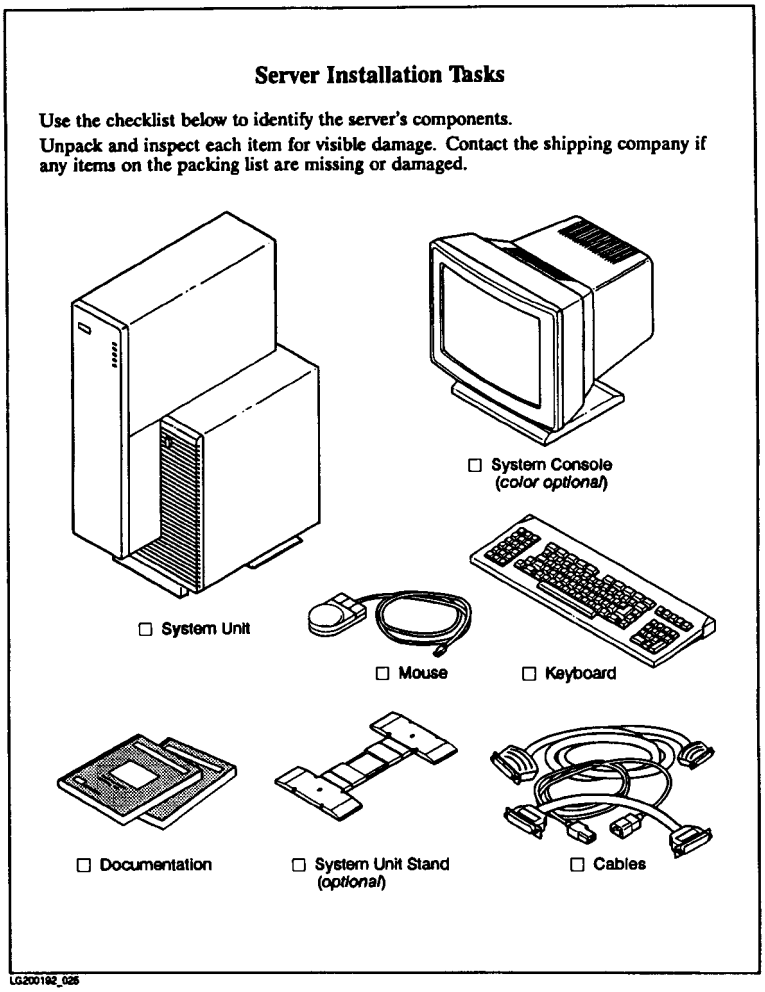


Figure 3a-10. Unpacking and Checking Server Components

Server Arrangement for Deskside Installation (page seventeen)

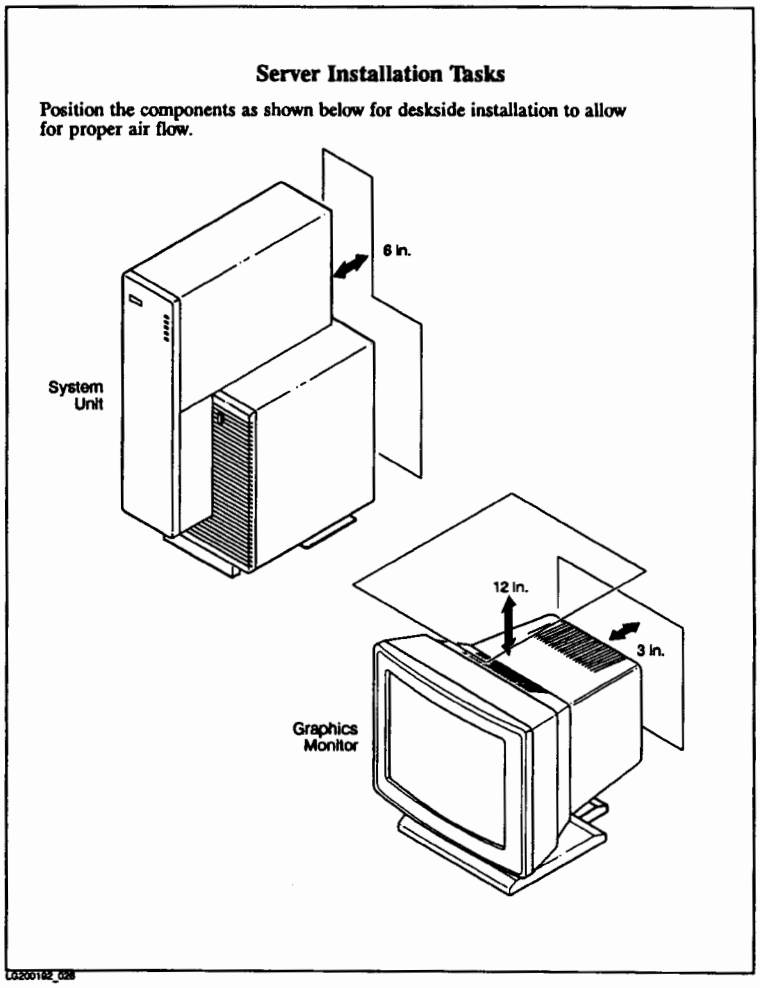


Figure 3a-11. Server Component Arrangement for Deskside Installation

System Unit, front view (page eighteen)

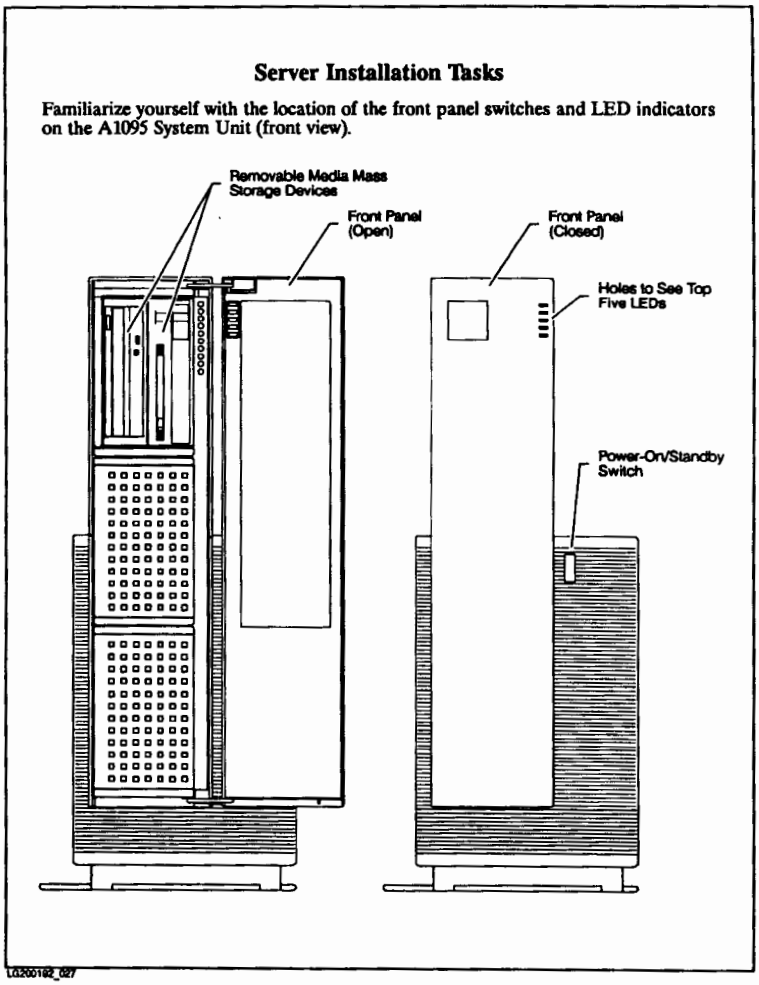


Figure 3a-12. System Unit, Front View

System Unit, rear view (page nineteen)

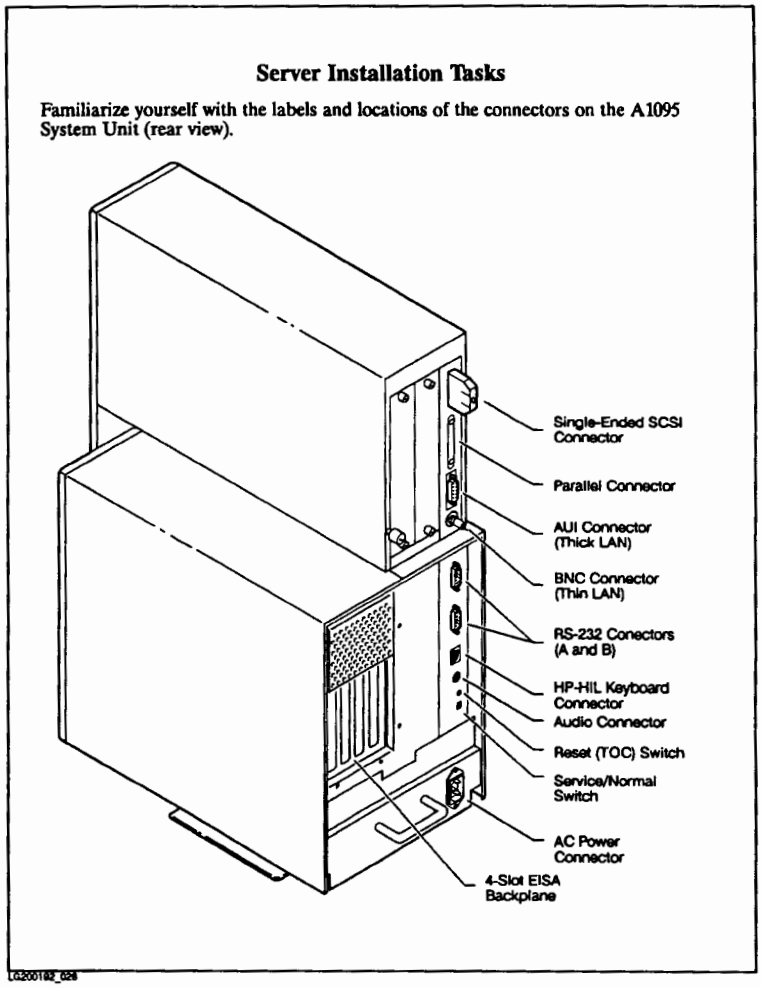


Figure 3a-13. System Unit, Rear View

Server LAN Connections (page twenty)

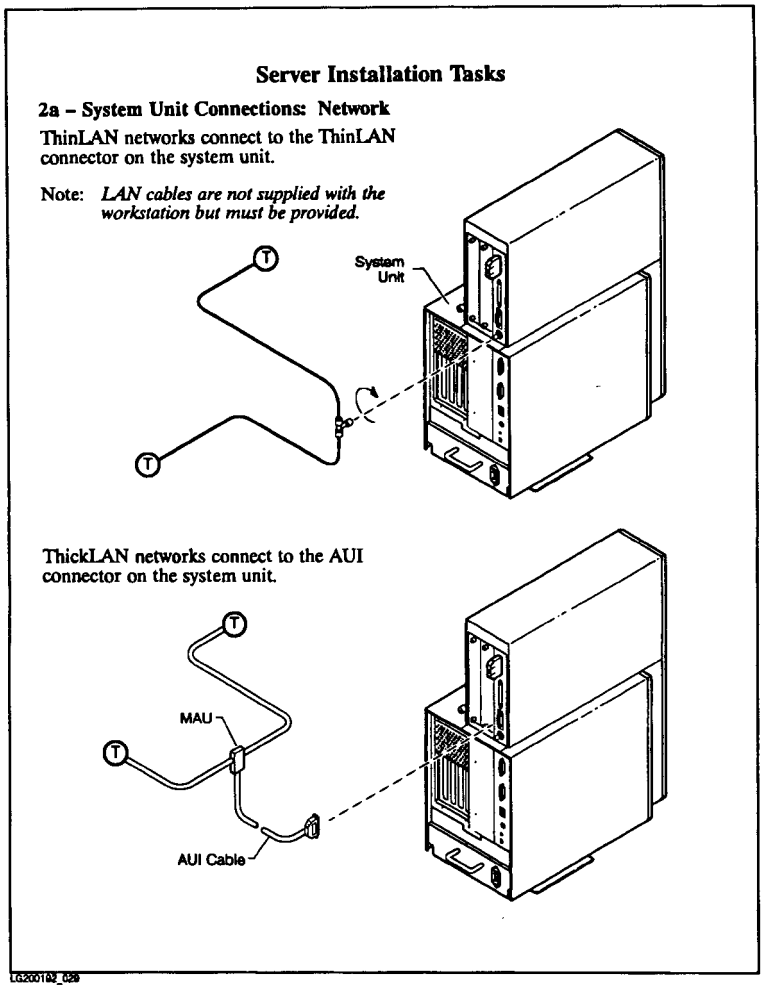


Figure 3a-14. Server LAN Network Connections

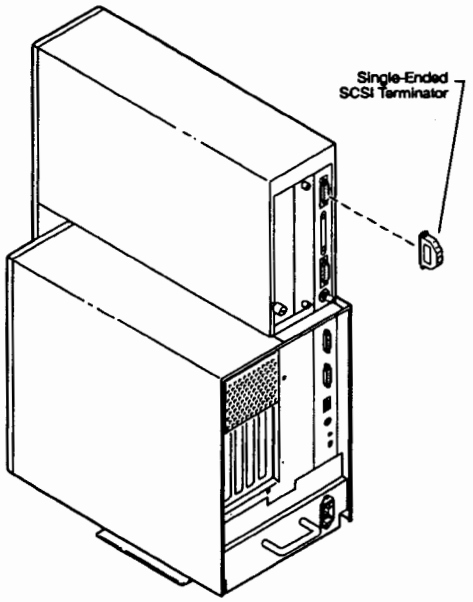
Server SCSI Device Connections (page twenty-one)

Server Installation Tasks

2b – System Unit Connections: SCSI Devices

Skip this task if the SCSI terminator is installed.

Connect the small, single-ended SCSI terminator as shown below for the embedded devices.



Additional external SCSI devices are connected to the single-ended SCSI connector; however, the last SCSI device must be terminated.

Refer to accompanying device installation manuals.

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Figure 3a-15. Server SCSI Device Connections

Server EISA Host Adapter Connections (page twenty-two)

2c - System Unit Connections: EISA Cards

NOTE: *Skip this task if no EISA cards are included and go to step 3.*

1). If there are EISA cards included with your system, proceed to the end of the "Server Installation Tasks" for instructions to install EISA cards.

2). After installing the EISA cards, go to step 3 to continue the server installation tasks.

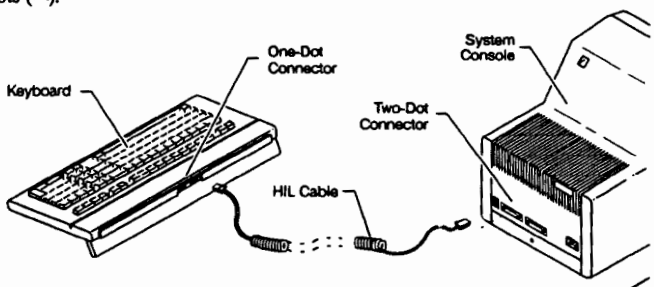
Server System Console Connections (page twenty-three)

Server Installation Tasks

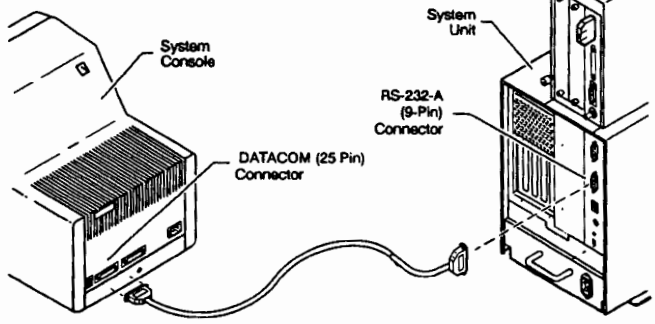
3 – System Console Connections

Connect the end of the HP-HIL cable that is marked with one dot (•) to the connector on the back of the keyboard that is also marked with one dot (•).

Connect the other end of the same HP-HIL cable that is marked with two dots (••) to the HP-HIL connector on the back of the system console that is also marked with two dots (••).



Connect the System console to the system unit as shown.



LG200192_031

Figure 3a-16. Server System Console Connections

Server Power-on and Booting HP-UX (page twenty-four)

4 - SERVER POWER-ON and BOOTING HP-UX

1). Connect the power cords from the System Unit, System Console, and any external devices to the nearest AC power outlet. DO NOT CONNECT POWER CORDS TO A POWER STRIP ... as this may cause electrical shock.

Note: The correct power-on sequence is to power on any external devices and the System Console first, and the System Unit last. **If any of the components appear dead:**

- Check all of the power cord connections and AC voltage settings.
- Check the operation of the "Power" switches on the System Unit, System Console, and external devices.

If any of the server's components do NOT power up contact your HP Service Representative to inform him/her of the problem and to establish a plan of action.

2). This is the end of the "Server Installation Tasks." Refer to "Starting Up Your Workstation" in chapter 2 of the document titled *HP Apollo 9000 Model 750 Owner's Guide for HP-UX Users*. (PN A1961-90000)

The remaining pages contain the tasks for INSTALLING EISA CARDS.

Server EISA Host Adapter Connections (page twenty-five)

Installing EISA Cards

The Model 750 can support up to four EISA cards. Installing EISA cards involves gaining access to the EISA card cage within the A1095 System Unit cabinet.

The following pages contain both illustrations and instructions to remove the:

1. Top cover
2. Right-side cover
3. RFI shield
4. Faceplate (discard)

Installing the Covers

Reverse the above steps to put the covers back onto the System Unit cabinet.

Hints for installing the RFI shield:

The RFI shield will snap-fit into position when its bottom 5 tabs are inserted into the slots and a slight down-ward force is applied while pushing its top 4 tabs into the slots in the cabinet.

Hints for installing the right-side cover:

The right-side panel will mate with the bottom of the card cage and fit flush with the cabinet when the panel is lifted upwards and its top 2 tabs are inserted into the slots in the cabinet.

Hints for installing the top cover:

The top cover will mate with the front of the cabinet when it is lowered down and overlaps both the left and right-side panels and pushed towards the front of the cabinet.

ESD Precautions

- Wear a *grounded* static strap to discharge any accumulated electrostatic charge from your body to ground when installing or removing EISA cards.

  Note: Attach the clip end of the static strap to the EISA card cage after removing the RFI shield.

- Handle EISA cards by their edges, once you have removed them from their protective antistatic bags.

Server EISA Host Adapter Connections (page twenty-six)

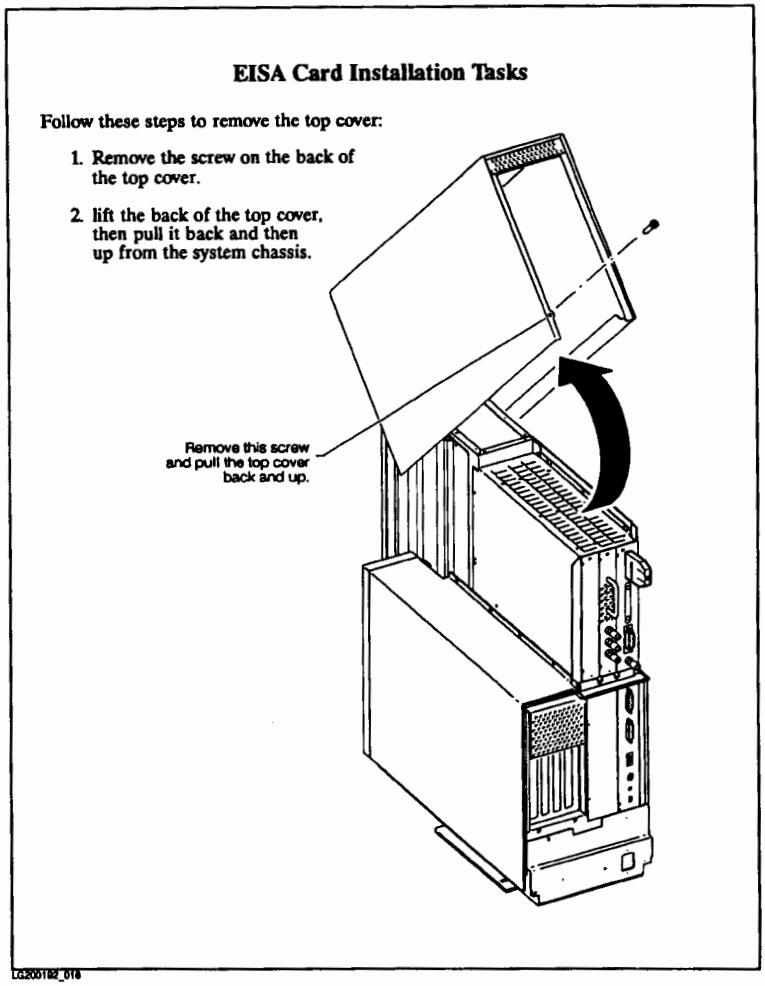


Figure 3a-17. Top Cover Removal

Server EISA Host Adapter Connections (page twenty-seven)

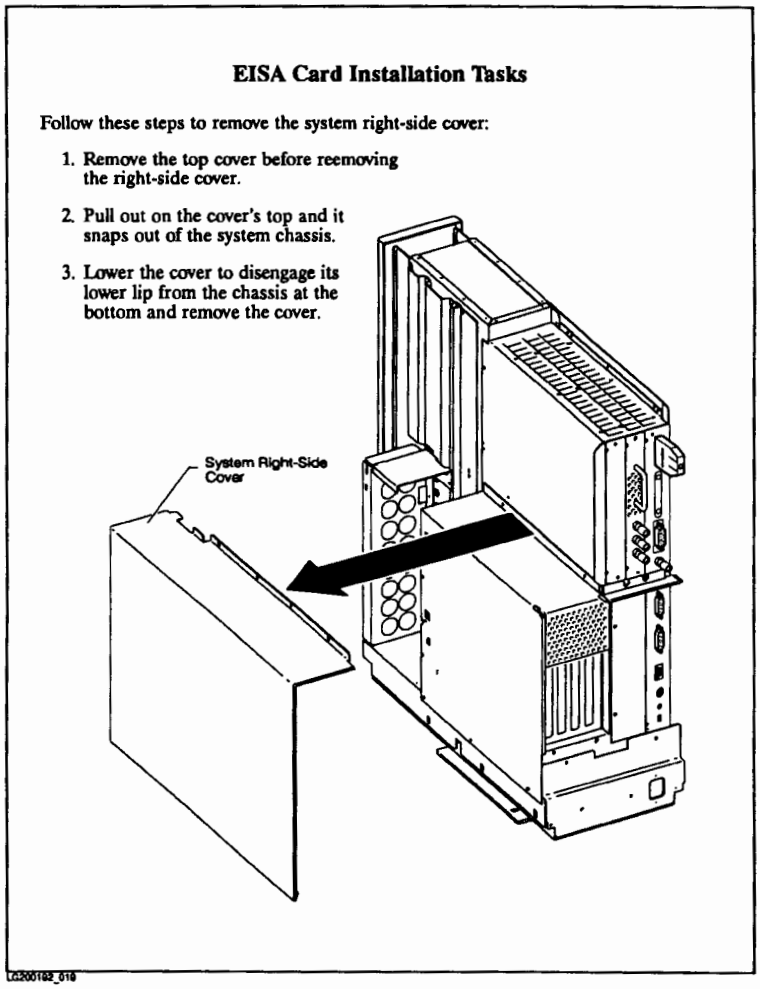


Figure 3a-18. Right-Side Cover Removal

Server EISA Host Adapter Connections (page twenty-eight)

EISA Card Installation Tasks

Follow these steps to remove the RFI shield:

1. Remove the top and right-side cover.
2. On the top edge of the RFI shield, press down on the four tabs that fit into the center wall and pull the cover out.
3. Lift the RFI shield up so that its five bottom tabs clear their slots in the bottom outside edge of the EISA card cage and remove the RFI shield.

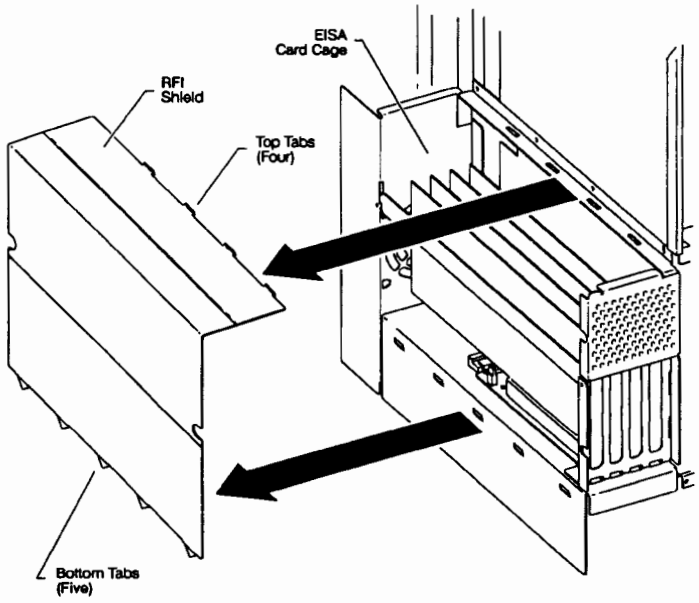


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Figure 3a-19. EISA RFI Shield Removal

Server EISA Host Adapter Connections (page twenty-nine)

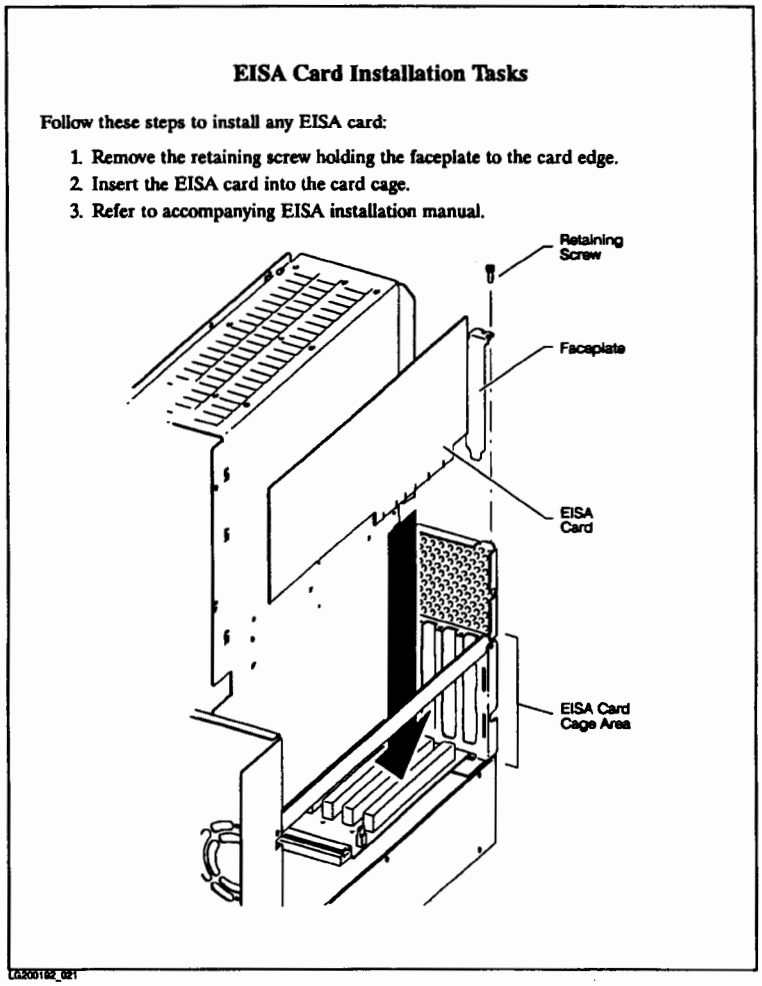

Figure 3a-20. EISA Host Adapter Installation

4

Series 700 Verification/Recovery Tasks

This chapter contains both procedures and commands to verify the functionality of the Series 700's hardware components from power-on to running HP-UX.

Missing from this chapter are the instructions to run the offline and online programs. Refer to chapter 1 for the list of related reference material.

Verification Tasks

All Series 700 workstations and servers provide two offline and one online diagnostic environments: during Boot Administration (Admin.), during ISL, and during HP-UX. Both the Boot Admin. and ISL environments allow the user to examine or modify internal settings that control the O/S booting process.

The ISL environment also provides execution of diagnostic/utility programs through user-entered commands. The HP-UX environment provides the user with a suite of exerciser programs to verify the operation of the subsystem components from a screen menu on workstations and through a command line on servers.

The verification tasks in this chapter are organized as follows:

Invoking the Boot Administration Environment

1). Power-on (or cycle the power) on the System Unit.

This will execute internal selftests and perform an *automatic search* for a console device on either of the RS-232 ports only if no graphics card is installed. Note that the search for a system console will NOT proceed if an HP-HIL keyboard is installed.

The following BOOT_ADMIN banner is displayed on the system console or graphics monitor:

```
(c) Copyright.  Hewlett-Packard Company.  1991.
All rights reserved.

PDC ROM rev. 2.0
IODC ROM rev. 2.0
16 MB of memory configured and tested.
```

Note: When both the **AUTOBOOT** and **AUTOSEARCH** modes are enabled, the following messages are displayed:

```
Selecting a system to boot.
To stop the selection process, press and hold the ESCAPE key.
```

2a). Press and hold the ESCAPE key to stop the selection process.

Note: When both the **AUTOBOOT** and **AUTOSEARCH** modes are NOT enabled, the following messages are displayed:

```
Searching for Potential Boot Devices.
To terminate search, press and hold the ESCAPE key.
```

2b). Press and hold the ESCAPE key to stop the searching process.

```
b)  Boot from specified device
s)  Search for bootable devices
a)  Enter Boot Administration mode
x)  Exit and continue boot sequence
?)  Help

Select from menu: _
```

3). Type **a** (CR) to invoke the Boot Administration (BOOT_ADMIN) mode and display the following prompt:

BOOT_ADMIN>

4). Type **?** (CR) or **help** (CR) to display a menu of commands. (A brief description of the commands is presented on the following page.)

Boot Administration Environment

The Boot Console User Interface provides an "autoselect" or "interactive" environment after the power-on sequence. The Boot Console User Interface must be invoked before the Initial Program Loader (IPL) routine. Users need not interact with the interface when both the AUTOBOOT and AUTOSEARCH modes are enabled.

The Boot Console User Interface executes user-entered commands that perform the following functions:

- Display the state of Autoboot/Autosearch modes using the **AUTO** command.
- Set the state of the Autoboot mode using the **AUTOBOOT** command with either the **ON / OFF** option.
- Set the state of the Autosearch mode using the **AUTOSEARCH** command with either one of the **ON / OFF** options.
- Boot from the primary or alternate boot path or any specified path using the **BOOT** command.
- Set or display the real-time clock value using the **DATE** command.
- Set the operational mode of the system (either as a Model 720 or as a Model 730) using the **DEFAULT** command with one of the **720 / 730** options; no option sets the mode for Model 750 operation.
- Return to previous menu using the **EXIT** command.
- Set or display the Fastsize value (amount of memory initialized during boot) using the **FASTSIZE** command.
- Display a menu of commands using the **HELP** command or a description of any command as an *option* to the **HELP** command.
- Display the model number, version numbers, and the jumper settings on the System (core I/O) card for Model 720/730 systems (or the System card for Model 750 systems) using the **INFO** command.
- Display the current STATION ADDRESS value in stable storage using the **LAN_ADDR** command. Must use **SS_CONFIG** to set this value.
- Select an operating system for the next boot attempt using the **OS** command.
- Set or display the *current* values for the console, keyboard, primary, or alternate boot paths using the **PATH** command.
- Display the most recent HPMC, LPMC, or TOC error information logged into Stable Storage using the **PIM_INFO** command.
- Reset the System Unit using the **RESET** command.
- Search for possible boot devices using the **SEARCH** command.
- Display/Set secure boot mode or the ability to interact with the console device within the first 10 seconds before boot device selection is disabled using the **SECURE** command.
- Display the results of the previous search command using the **SHOW** command.
- Set or display the *current* operational mode (either as a Model 720 or as a Model 730) using the **UPGRADE** command with one of the **720 / 730** options; no option sets the mode for Model 750 operation.

Syntax checking is performed for any supported commands. Error status will be displayed on the console along with any relevant information.

Stable Storage

Stable Storage is non-volatile memory associated with each PA-RISC processor module. Stable storage is used by the processor (CPU) to store device path information, the state of the boot flags, HPMC error information, and operating system initialization data.

Boot Command Notations

The **BOOT** command supports three notations: mnemonic, PA-RISC I/O, and path number. **Note:** Type "help scsi" or "help lan" or "help eisa" for more information on the boot path parameters.

1. Mnemonic notation examples:
   a. **BOOT** (CR) with "no parameters" will select the primary boot path in stable storage.
   b. **BOOT** with the **ALTERNATE** or **ALT** parameter will select the alternate boot path in stable storage.
2. PA-RISC I/O notation examples:
   a. **BOOT scsi.**<scsi_addr>.<scsi_lun> or **BOOT 2/0/1.**<scsi_addr>.<scsi_lun>
   b. **BOOT lan.**<server_address>.<init_timeout>.<io_timeout> or **BOOT 2/0/2.**<server_address>.<init_timeout>.<io_timeout>
   c. **BOOT eisa.**<eisa_slot>.<optional_info> or **BOOT 3.**<eisa_slot>.<optional_info>
3. Path number notation example:
   a. **BOOT P1** (CR) will attempt to boot from the *second path* indicated by the **SEARCH** command.

Supported Boot Paths

For Model 720/730 Workstations and Servers: SCSI devices are bootable when connected to the SCSI port on the System (core I/O) card or the SCSI port on the EISA-SCSI-2 card. Diskless workstations can only boot from the LAN port on the System (core I/O) card.

For Model 750 Workstations and Servers: SCSI devices are bootable when connected to the SCSI port on the System card or the SCSI port on the EISA-SCSI-2 card. Diskless workstations can only boot from the LAN port on the System card.

PATH Command Menu

The **PATH** command has several options to display or define paths. For example, typing (upper or lower case) **PATH** (CR) with "no options" will display all paths.

- the **pri** or **primary** option will display the primary path
- the **alt** or **alternate** option will display the alternate path
- the **con** or **console** option will display the console path
- the **key** or **keyboard** option will display the keyboard path

To define or re-define the console path, type **path con rs232_a.9600.8.none** (CR). Upon power-up or reset, the new console path will be directed to RS232 port A, 9600 BAUD, 8 data bits, and no parity checking.

HELP Command Menu

Typing **?** or (upper or lower case) **H** or **HELP** (CR) will display the Boot Console User Interface command menu. The menu contains a list of the supported commands and a brief description of each command.

OS Command MENU

Typing (upper or lower case) **OS** (CR) allows selecting either the HP-UX or OSF operating system, if installed.

FASTSIZE Command Menu

The **FASTSIZE** command has several parameters, for example, typing (upper or lower case) **F** or **FASTSIZE** ("00 - 0f") (CR) will initialize the following amounts of main memory:

- **Use 00** to initialize the first 256 Kilobytes of memory
- **Use 01** to initialize the first 512 Kilobytes of memory
- **Use 02** to initialize the first 1 Megabytes of memory
- **Use 03** to initialize the first 2 Megabytes of memory
- **Use 04** to initialize the first 4 Megabytes of memory
- **Use 05** to initialize the first 8 Megabytes of memory
- **Use 06** to initialize the first 16 Megabytes of memory
- **Use 07** to initialize the first 32 Megabytes of memory
- **Use 08** to initialize the first 64 Megabytes of memory
- **Use 09** to initialize the first 128 Megabytes of memory
- **Use 0a** to initialize the first 256 Megabytes of memory
- **Use 0b** to initialize the first 512 Megabytes of memory
- **Use 0c** to initialize the first 1 Gigabytes of memory
- **Use 0d** to initialize the first 2 Gigabytes of memory
- **Use 0e** to initialize all of memory
- **Use 0f** to initialize all of memory

Initializing less memory than installed will reduce the time to boot the ISL program. The ISL program will operate in 256 Kilobytes, however, the system will report an "out of memory" message when trying to load a diagnostic or utility program.

Note

HP-UX expects that all main memory installed on the Processor card to be initialized or it will not use it.

Invoking the ISL Environment from a SCSI Device

1). Power-on (or cycle the power) on the System Unit to invoke the Boot Admin. mode (environment). (See page 4-2.)

```
b)  Boot from specified device
s)  Search for bootable devices
a)  Enter Boot Administration mode
x)  Exit and continue boot sequence
?)  Help

Select from menu: _
```

2). Type **s** (CR) to search for devices with the ISL program and hpux (loader) utility in their LIF directory.

```
Searching for bootable devices.
To terminate search, press and hold the ESCAPE key.

Device Selection        Device Path             Device Type
------------------------------------------------------------------------
P0                      scsi.6.0                QUANTUM PD210S

b)  Boot from specified device
s)  Search for bootable devices
a)  Enter Boot Administration mode
x)  Exit and continue boot sequence
?)  Help

Select from menu: _
```

3). Type **b p0 ipl** (CR) to invoke the ISL environment from the 210 MB Quantum disk. The following messages, the ISL banner, and the ISL prompt are displayed:

```
Trying scsi.6.0
Boot path initialized.
Attempting to load IPL.

Hard booted.

ISL Revision A.00.09 March 27, 1990

ISL> _
```

4a). Type **ls** (CR) or **listf** (CR) to review the state of the ISL boot flags, the ISL commands, and the files in the LIF directory on the scsi device.

4b). Type **hpux boot disc(;0)/hp-ux** (CR) to load the HP-UX environment from the scsi device.

ISL Environment

The ISL environment provides the means to load the operating system (HP-UX) environment. The ISL environment also provides an offline platform to execute diagnostic and utility programs from a boot device when HP-UX does not load.

The ISL program is the first program loaded into main memory from an external media (i.e., LAN, disk, or tape) and launched by the initial program loader (IPL) routine during the Boot Administration environment.

The ISL environment provides the following capabilities:

- Execute user-entered commands to modify boot device paths and boot options in stable storage.
- Run off-line diagnostic programs (MULTIDIAG, IOMAP, EST, and DEX).
- Provide automatic booting of the HP-UX O/S after power-on or reset.

The ISL program provides a standalone environment for loading offline diagnostic and utility programs from the LIF directory. The ISL program also provides user commands to configure the boot parameters into Stable Storage.

ISL User Commands

There are several commands available in the ISL environment that allow a user to obtain information about the boot characteristics of the system or to modify these characteristics.

Use the display command after the ISL prompt to display the boot and console paths in Stable Storage and to determine the current setting of the ISL Boot Flags.

Use the primpath command after the ISL prompt to modify the primary boot path entry in Stable Storage. The entry in Stable Storage for the primary boot device begins at byte address 0 and ends at byte address 31.

Use the altpath command after the ISL prompt to modify the alternate boot path entry in Stable Storage. The entry for the alternate boot device begins at byte address 128 and ends at 159.

Use the conspath command after the ISL prompt to modify the console path entry in Stable Storage. The entry in Stable Storage for the console device begins at byte address 96 and ends at byte address 127. The entry for the keyboard and mouse devices begins at byte address 160 and ends at 191.

Use the listautofl or lsautofl command after the ISL prompt to list the contents of the (HP-UX) autoboot file.

Use the support command after the ISL prompt to boot the Support Tape from the boot device.

Use the readss command after the ISL prompt to display 4 bytes (one word) from Stable Storage. The readss command requires a decimal number between 0 and 255 to *address* four bytes in Stable Storage.

ISL Boot Flags

There are three "FLAGS" implemented in the ISL program that are associated with the boot process: **Fastsize, Autoboot, and Autosearch**. Each flag has an ISL command associated with it.

The **Fastsize** command toggles a flag in Stable Storage that is used to determine how much main memory to initialize and test in PA-RISC systems during the IPL boot process. A Fastsize hexadecimal byte value in the range hex 00 to hex 0F is stored in Stable Storage at byte address 95. (Default Fastsize byte value is 0F)

The **Autoboot** command toggles a flag in Stable Storage to allow automatic booting of the O/S without user intervention.

The **Autosearch** command toggles a flag in Stable Storage to allow automatic searching of potential boot devices when the AUTOBOOT flag is set.

Searching begins in the following order:

1. primary boot path in stable storage;
2. single-ended scsi device addresses 6, 5, and 4;
3. LAN station address in stable storage;
4. single-ended scsi device addresses 3, 2, and 1;
5. differential scsi devices 6, 5, 4, 3, 2, and 1 on EISA SCSI-2 host adapter card in slot 1;
6. differential scsi devices 6, 5, 4, 3, 2, and 1 on EISA SCSI-2 host adapter card in slot 2;
7. differential scsi devices 6, 5, 4, 3, 2, and 1 on EISA SCSI-2 host adapter card in slot 3.

Note

Due to a limitation in HP-UX version 8.05, only the first three HP 25525A EISA SCSI-2 host adapter cards can have their Boot ROM's enabled when four HP 25525A host adapter cards are installed in a Model 750 system.

Running the Disk-based ISL Diagnostics

To run the ISL-based diagnostics in the LIF directory on the System Disk:

1). Invoke the ISL environment from the System Disk. (See page 4-6.)

2). Type **ls (or listf)** (CR) after the ISL prompt to list the ISL diagnostics and utilities available in the LIF directory. (See examples below.)

```
ISL (standard version of the Initial System Loader program)
FS (disk-based file system for the Diagnostic EXecutive program)
HPUX (standard version of the secondary loader to launch the HP-UX kernel)
IOMAP (utility to test the core LAN, core SCSI-2, and EISA SCSI-2 ports)
MULTIDIAG (diagnostic to test the CPU, coprocessor, cache, and memory)
DEX (program used to execute/control hardware tests on the SPU logic)
```

To run MULTIDIAG:

3a). Type **multidiag** (CR) after the ISL prompt to invoke the multidiag test from the System Disk. (This test takes several minutes to complete and appears to be in a loop when a graphics monitor is the system console.)

Note: Refer to the *Series 700 Support Tape User's Manual* (PN B2380-90000) for the commands and instructions to run this diagnostic.

To run IOMAP:

3b). Type **iomap** (CR) after the ISL prompt to invoke the IOMAP test from the System Disk.

Note: Refer to the *Precision Architecture RISC: HP Apollo 9000 Series 700 Diagnostics Manual* (PN 09740-90041) for the commands and instructions to run this diagnostic.

Running the Disk-based DEX Diagnostics

To run the DEX diagnostic programs in the LIF directory on the System Disk:

1). Invoke the ISL environment from the System Disk. (See page 4-6.)

To run the extended selftests (EST):

2a). Type **hpux boot disc(;0)/etc/diag/est** (CR) after the ISL prompt to invoke the extended selftests (a subset of the DEX diagnostics) on the System Disk.

To run the Diagnostic EXecutive (DEX):

2b). Type **hpux boot disc(;0)/etc/diag/dex/dex** (CR) after the ISL prompt to invoke the diagnostics executer program prompt (DEX>).

Note: See Table 4-1 on the following page for a list of the DEX commands.

3). Type **dev** (CR) after the DEX prompt to list available diagnostics. (See example below.)

```
CPU.DEX
MEM.DEX
CORE_IO.DEX (LEDs, EEPROM, RTC, all internal I/O ports except LAN and SCSI)
LAN.DEX (network on the internal LAN port)
WIN.DEX (disks on the internal SCSI port)
EISA.DEX (uses an EISA interface tester to test the EISA card adapter)
DISP.DEX (graphics display)
```

4). Type **sel core_io** (CR) after the DEX prompt to load the core_io.dex diagnostic.

Note: Answer the questions regarding configuration.

5). Type **sel -list** (CR) after the DEX prompt to examine the selected test(s).

6). Type **go -pass 5** (CR) after the DEX prompt to execute all tests in the selected list and set the pass counter to 5.

Note: Refer to the *Using DEX and SAX with HP-UX* (PN A1926-90001) for the commands and instructions to run the DEX diagnostics.

7). Type **q** (CR) after the DEX prompt to terminate DEX and return to the ISL environment.

DEX Command Descriptions

Table 4-1 describes the DEX command set.

Table 4-1. DEX Command Set

Command	Description
auto	Invokes automatic test selection
debug	Shows or sets DEX debug information
dev[ices]	Lists and configures system hardware
di[sk]	Selects boot device
do	Executes a command file
exi[t]	Terminates a command file
go	Executes selected tests
he[lp]	Displays help text information on a module or command
if	Process rest of command line only if tested condition is true
in[put]	Modifies or displays the source of character input
ld	Lists file system objects
li[st]	Lists the contents of an object in memory
lo[ad]	Loads an object into memory
log	Displays error log contents
loop	Enters a scope loop
md	Mnemonic debugger
msg[level]	Controls output of progress and error messages
onerr[or]	Specifies the action to take on a diagnostic error
pad	Displays the transcript pad
pass	Sets the system pass count
query	Sets and lists the system Query mode
q[uit]	Terminates DEX and returns to the ISL prompt
read	Reads a string into the CLI variable
reloc	Relocates DEX in memory
r[un]	Loads and executes a diagnostic module
sel[ect]	Selects tests for execution
st[code]	Displays error code text
ty[pe]	Displays text on the console device

Invoking the ISL Environment from the Series 700 Support Tape

1). Load the Series 700 Support Tape into the DDS. Power-on (or cycle the power) on the System Unit to invoke the Boot Admin. mode. (See page 4-2.)

```
b)  Boot from specified device
s)  Search for bootable devices
a)  Enter Boot Administration mode
x)  Exit and continue boot sequence
?)  Help

Select from menu: _
```

2). Type **s** (CR) to search for devices with the ISL program and hpux (loader) utility in their LIF directory.

```
Searching for bootable devices.
To terminate search, press and hold the ESCAPE key.

Device Selection        Device Path             Device Type
------------------------------------------------------------------------
P0                      scsi.6.0                QUANTUM PD210S
P1                      scsi.4.0                HP      HP35450A    -A
```

3). Type **b p1** (CR) to invoke the ISL environment from the DDS device. The following messages, the ISL banner, and the ISL prompt are displayed:

```
Trying scsi.4.0
Boot path initialized.
Attempting to load IPL.

Hard booted.

ISL Revision A.00.09 March 27, 1990
    Cannot find an auto-execute file. AUTOBOOT ABORTED.

ISL> _
```

4). Type **ls** (CR) or **listf** (CR) to review the state of the ISL boot flags, the ISL commands, and the files in the LIF directory on the Series 700 Support Tape.

Recovering from a System Disk Failure in the ISL Environment

In most instances of system disk failure, data loss will not occur. During boot, the system checks the disk for corruption and, if a problem is detected, will attempt to repair the file system.

In the event of a catastrophic system failure, it may be necessary to rebuild the system. Backups are the only method to insure against loss of data.

Note **The system should be backed up on a regular basis.** It is the responsibility of the customer to back up the system and to ensure that the backups are successful.

Where the file system cannot be repaired and the workstation/server is inoperable, the following steps must be taken to *replace* the file system on the system disk:

1). Install the Series 700 Support Tape into the DDS and invoke the ISL environment from the Series 700 Support Tape. (See page 4-12.)

2). At the ISL prompt, type **support** (CR) or type **hpux boot tape** ():**RECOVERY** (CR). (A minimal HP-UX operating system with only the commands needed to repair or restore the file system will be loaded in about 30 minutes.) The following choices are available:

```
b. Backup System Disks
d. Restore Development Environment
r. Restore Runtime Environment
s. Shutdown System
x. Exit to shell
```

Note: Refer to the *Series 700 Support Tape User's Manual* (PN B2380-90000) for the commands and instructions to run this utility.

3). After restoring the run-time environment or the developer's environment, exit to the shell and use *fsck* to check and repair the file system(s). (This may take up to one hour.)

Note: To get back from the shell to the main menu simply type "menu."

4). Shutdown the system and recover the user files and *altered system files* from the backup media using the appropriate tools.

Running the Support Tape-based ISL Diagnostics

When programs cannot be loaded or read from a *differential* SCSI disk connected to an EISA SCSI-2 host adapter, the following steps must be taken to diagnose the system unit components:

1). Install the Series 700 Support Tape into the DDS and invoke the ISL environment from the Series 700 Support Tape. (See page 4-12.)

To run the ISL-based diagnostics in the LIF directory on the Support Tape:

2). Type **ls (or listf)** (CR) after the ISL prompt to list the ISL diagnostics and utilities available in the LIF directory. (See examples below.)

```
HPUX (standard version of the secondary loader to launch the recovery kernel)
RECOVERY (support-version of HP-UX kernel with a memory-based file system)
IOMAP (utility to test the core LAN, core SCSI-2, and EISA SCSI-2 ports)
SS_CONFIG (utility for updating system-level information in stable storage)
MULTIDIAG (diagnostic to test the CPU, coprocessor, cache, and memory)
```

Run MULTIDIAG to test the Processor and SIMM card FRUs:

3a). Type **multidiag** (CR) after the ISL prompt to invoke the multidiag test from the Support Tape. (This test takes several minutes to complete and appears to be in a loop when a graphics monitor is the system console.)

Note: Refer to the *Series 700 Support Tape User's Manual* (PN B2380-90000) for the commands and instructions to run this diagnostic.

Run IOMAP to test the EISA SCSI-2 host adapter and SCSI devices:

3b). Type **iomap** (CR) after the ISL prompt to invoke the IOMAP utility from the Support Tape.

Note: Refer to the *Precision Architecture RISC: HP Apollo 9000 Series 700 Diagnostics Manual* (PN 09740-90041) for the commands and instructions to run this utility.

3c). Type **ss_config** (CR) after the ISL prompt to invoke the stable storage configuration utility from the Support Tape.

Note: The ss_config utility is for "HP internal use only." Hewlett Packard CEs must refer to their District Manager for instructions to run this utility.

Invoking the HP-UX Environment from any Bootable Device

The hpux (loader) program, that resides in the LIF directory of a bootable device, is loaded into main memory by the IPL loader routine during the Boot Admin. environment and launched by the ISL program during the ISL environment.

The hpux (loader) program, in turn, loads and launches the HP-UX operating system. HP-UX provides a multi-user multi-tasking (online) environment to load and run both local and remote applications, system diagnostics, and exercisers.

1). Power-on (or cycle the power) on the System Unit. The following BOOT_ADMIN banner is displayed:

```
(c) Copyright.  Hewlett-Packard Company.  1991.
All rights reserved.

PDC ROM rev. 2.0
IODC ROM rev. 2.0
16 MB of memory configured and tested.
```

Note: When both the **AUTOBOOT** and **AUTOSEARCH** modes are enabled, the following messages are displayed:

```
Selecting a system to boot.
To stop the selection process, press and hold the ESCAPE key.

Searching for Potential Boot Devices.

Booting from:           scsi.6.0                QUANTUM PD420S

Hard booted.

ISL Revision A.00.09 March 27, 1990

ISL booting hpux boot disc(;0)/hp-ux

Secondary Loader
Revision 2.1
Booting disc(;0)/hp-ux
1462188 + 335872 + 485128 start 0x25254
```

Note: All of the above messages are generated by the boot handler in PDC and may vary depending on the location of the boot device.

The remaining messages are generated by the kernel. These messages include a list of interfaces found by the kernel and their addresses.

Invoking the HP-UX Environment from a Specific Bootable Device

1). Power-on (or cycle the power) on the System Unit to invoke the Boot Admin. mode. (See page 4-2.)

```
b)  Boot from specified device
s)  Search for bootable devices
a)  Enter Boot Administration mode
x)  Exit and continue boot sequence
?)  Help

Select from menu: _
```

2). Type **s** (CR) to search for devices with the ISL program and hpux (loader) utility in their LIF directory.

```
Searching for bootble devices.
To terminate search, press and hold the ESCAPE key.

Device Selection        Device Path              Device Type
------------------------------------------------------------------------
P0                      scsi.6.0                 QUANTUM PD420S
P1                      scsi.4.0                 QUANTUM PD210S
P2                      lan.(host_address)       (host_name)
P3                      scsi.3.0                 TOSHIBA CD-ROM DRIVE:XM

b)  Boot from specified device
s)  Search for bootable devices
a)  Enter Boot Administration mode
x)  Exit and continue boot sequence
?)  Help

Select from menu: _
```

3a). Type **b p0** (CR) to boot the HP-UX environment from the 420 MB Quantum disk.

3b). Type **b p1** (CR) to boot the HP-UX environment from the 210 MB Quantum disk.

3c). Type **b p2** (CR) to boot the HP-UX environment over the LAN network.

3d). Type **b p3** (CR) to boot the HP-UX environment from the CD-ROM device.

Running SAX in the HP-UX Environment

The System Acceptance eXecutive (SAX) is a system-level exerciser that is capable of local node or remote node testing in the HP-UX Environment. Refer to the *Using DEX and SAX with HP-UX* (PN A1926-90001) for the commands and options to run the System Acceptance Exerciser.

1). Invoke the HP-UX environment. (See page 4-15 or 4-16.)

Note: SCSI devices with removable media drives must have write-enabled media inserted in the drive prior to running SAX.

2). After logging in type **cd /etc/diag/sax** (CR) to establish a new working directory.

To run SAX in the customer installation test mode:

3a). At the HP-UX prompt (%), type **sax -cit** (CR) to invoke the *Customer Installation Test* mode in SAX.

The *-cit* option sizes (configures and exercises) the following group of tests and reports any problems found.

```
1 - CPUTEST (Central "integer" Processing Unit Test)
2 - FPTEST (Floating-Point Unit Test)
3 - GRTEST (Graphics Test for internal SGC graphics cards)
4 - MEMTEST (Main Memory "SIMM card" Test)
5 - NETTEST (Local Area Network Test)
6 - SST (Storage System Test for SCSI devices)
```

Note: Press (CTRL) and type **c** to exit SAX while testing during the *cit* mode.

To run SAX in the graphical screen interface mode:

3a). At the HP-UX prompt (%), type **sax** (CR) to invoke the *Graphical Screen Interface* mode in SAX.

The graphical screen interface allows the user to configure and run diagnostic programs such as SST and GRTEST. This interface provides three screen levels: novice, intermediate, and expert.

The *novice screen* contains the "Test-All" pop-up, and the "selected tests" pop-ups. You can de-select a test by clicking on the test's pop-up.

The *intermediate screen* contains a section of Push Buttons and a section listing "Enabled Devices." This screen allows you to test a particular Device (a disk drive, for example). It also allows you to select which device(s) you want to test and the status of these devices. You can select "Help on Devices" to get more information on the Device Screen.

The *expert screen* is broken into two boxes, the "Group Selection (of tests)" and "Available Tests for a Group." This screen allows you to run just one test or a group of tests. This allows you to simulate or stress test the workstation for intermittent faults.

Running GRTEST or SST in the HP-UX Environment

Both the Storage Subsystem Test (SST) and the Graphics Test (GRTEST) are online system-level exercisers that run under SAX or as a stand-alone utility in the HP-UX Environment. Refer to the *Using DEX and SAX with HP-UX* (PN A1926-90001) for the commands and options to run either SST or GRTEST.

1). Invoke the HP-UX environment. (See page 4-15 or 4-16.)

Note: SCSI devices with removable media drives must have write-enabled media inserted in the drive prior to running SAX.

2). After logging in type **cd /etc/diag/sax** (CR) to establish a new working directory.

To run SST in the interactive stand-alone mode:

3a). At the HP-UX prompt (%), type **sst** (CR) to invoke the Storage Subsystem Tests and put SAX into the *interactive* mode.

To select all tests within the selected group:

4). Type **test all yes** (CR) after the SST prompt to select all tests and ignore sizing results.

5). Type **storage** (CR) after the SST prompt to execute the appropriate tests for **all SCSI devices on the core SCSI port**. (See Table 4-2 for a list of the tests for SCSI storage devices.)

Note: Type **quit** after the SST prompt to exit SST during the *interactive* mode and return to the HP-UX shell.

To run GRTEST in the interactive stand-alone mode:

3b). At the HP-UX prompt (%), type **grtest** (CR) to invoke the Graphics Tests and put SAX into the *interactive* mode.

Note: Type **quit** after the GRTEST prompt to exit GRTEST during the *interactive* mode and return to the HP-UX shell.

Storage System Tests for SCSI Devices

Table 4-2 describes the SST for SCSI storage devices.

Table 4-2. Tests for SCSI Storage Devices

Number	Description
1	Select
2	Drive Reset
3	Drive Diagnostics Test
4	Drive Read/Write Buffer Test
5	Illegal Command Rejection
6	Recalibrate Test
7	Verify Disk Test
8	Write Disk Test
9	Read Disk Test
10	Random Read Test
11	Write/Read/Verify Disk Test
12	Exerciser Write Test
13	Exerciser Read Test
14	Exerciser Write/Read/Verify Test
15	Rewind
16	Retension
17	Reset During Retension
18	Write Filemarks
19	Space Forward Filemarks
20	Read Filemark Handling
21	Write Selected Length
22	Read Selected Length
23	Space Forward Files
24	Write/Read/Verify Single Record
25	Write/Read/Verify Multiple Records
26	Write/Read/Verify Selected Length
27	Write/Read/Verify Start-Stop Mode
28	Erase Entire Tape
29	Write Protect
30	No Cartridge

Note Not all tests are valid for all SCSI devices.

Running (DUI) Diagnostics in the HP-UX Environment

DUI diagnostics provide the user with the ability to diagnose subsystem hardware (disk, tape, LAN, printer, etc.) to the FRU level during the HP-UX environment. Refer to the *Precision Architecture RISC: HP Apollo 9000 Series 700 Diagnostics Manual* (PN 09740-90041) for the commands and options to run specific *DUI* diagnostics.

1). Invoke the ISL environment. (See page 4-6.)

2). Invoke the HP-UX (single-user) environment. Type **hpux -is boot disc(;0)/hp-ux** CR to load the HP-UX (single-user) environment from the system disk.

To run the diagnostic user's interface (DUI) on the system disk:

3). After logging in type **cd /usr/diag/bin** CR to establish a new working directory.

4). At the HP-UX prompt (%), type **DUI** CR to invoke the DUI diagnostics.

5). At the DUI prompt (DUI>), type **list** CR to list the available diagnostics.

Note: Use the *pdev* values below to run the following *DUI* diagnostics:

```
LANDAD (use pdev=2.0.2 for /dev/diag/lan32 "core" port; use pdev=3.1.0
        for HP 25567A EISA LAN Adapter card in slot 1)

G98705DG (default is for /dev/diag/crt16 "external" graphics in slot 1 of
          model 750 systems only; use pdev=1.0.0 for "external" graphics
          in slot 2 of Models 720/730/750 systems)

SCSIDSK2 (use pdev=2.0.1.6.0 for single-ended SCSI device 6; use pdev=3.1.?
          for differential device with SCSI address "?" connected to HP
          25525A EISA SCSI-2 card in slot 1)

SCSIDDS (use pdev=2.0.1.4.0 for /dev/diag/mt/4 single-ended DDS device)

SCSICD (use pdev=2.0.1.3.0 for /dev/diag/dsk/3ss single-ended CD-ROM
        device)

CARTDIAG (use pdev=3.1.? for HP-IB Cartridge Tape device with SCSI address
          "?" connected to HP 25560A EISA HP-IB Host Adapter card in slot 1)

DASSDIAG (use pdev=3.1.? for HP-IB Magneto Optical device with SCSI address
          "?" connected to HP 25560A EISA HP-IB Host Adapter card in slot 1)
```

5

Replacing FRUs and Adding Options to Models 720 and 730

This chapter contains the correct procedures to remove and replace FRUs in the Model 720/730 System Unit and components on the System (core I/O) card FRU. Each procedure references one or more illustrations for the task at hand. A list of the replaceable parts is located on page 5-2 in this chapter.

Missing from this chapter (document) are the procedures to replace FRUs in the Graphics Unit, monitor, and peripherals. Refer to the existing service documentation available for these products.

Removal and Replacement Tasks

The tasks in this chapter are organized as follows:

Parts List for Models 720 and 730

A1094 System Unit FRUs

- Major FRUs include:
  - chassis assembly, less plastic top & bottom (HP A1094-60001; top cover is HP 5041-2452; bottom cover is HP)
  - M720 Processor card (HP A1094-66510/A1094-69510; M730 Processor card is HP A1094-66515/A1094-69515)
  - M720 System (core I/O) card (HP A1094-60005/A1094-69005; M730 System (core I/O) card is HP A1094-60009/A1094-69009)
  - Power Supply assembly (HP 0950-2081)
  - VSC Backplane assembly (HP A1094-66500)
- Minor FRUs include:
  - Tower package (HP A1094-62022)
  - Large cooling fan with cable (HP 5061-6572)
  - Small cooling fan with cable (HP 5061-6573)
  - LED Display card is (HP A1094-66540); LED cable is HP A1094-61602)
  - Switch card is (HP A1094-66541); VSC backplane cable is HP A1094-61603)
- Chassis options include:
  - SCSI device tray assembly is (HP A1094-62021; ribbon cable is HP A1094-61606; power cable is HP A1094-61605)
  - 210 Megabyte Fixed Disk assembly (from Quantum is HP A1094-60006/A1094-69006)
  - 420 Megabyte Fixed Disk assembly (from Quantum is HP A1094-60008/A1094-69008
  - 1.3 Megabyte Floppy Disk assembly (from Teac is HP A1094-60007/A1094-69007)
  - Optional Bezel for Floppy Disk (HP A1094-60003); standard bezel without Floppy Disk (HP A1094-60002)
  - short high-density (spring) to high-density (spring) SCSI cable (HP A1094-61601)
  - High-density (spring) SCSI Terminator (HP 1252-3932)
  - EISA Card Adapter assembly (HP A1094-62033); EISA interface card (HP A1094-66531/A1094-69531); EISA interface tester (HP A1421-66523/A1421-69523)
  - EISA SCSI-2 host adapter (HP 25525-60001/25525-69001); EISA LAN adapter (HP 25567-60001/25567-69001); EISA HP-IB adapter (HP 25560-60001/25560-69001)
  - SGC Graphics (interface) card (HP 98705-66582) for HP 98705B Graphics Unit
  - SGC Graphics (interface) card (HP 98765-66584) for HP 98765A/98766A Graphics Units
  - SGC Graphics (color) card (HP A1659-66001)
  - SGC Graphics (grayscale) card (HP A1924-66001)
- Replaceable component(s) on the Processor card include:
  - SIMM card, 2 Megabyte (HP A1094-66520/A1094-69520)
  - SIMM card, 8 Megabyte (HP A1094-66521/A1094-69521)
- Replaceable component(s) on the System (core I/O) card include:
  - Battery for time-of-day clock (HP 1420-0314; 3.0 Volt coin battery)
  - Fuse for external AUI (HP 2110-0520)
  - EEPROM for Stable Storage (blank is HP 1818-5097; programmed is 1818-5125)
  - EPROM for Processor-Dependent Code (HP A1094-80015)
  - EPROM for Input/Output-Dependent Code (HP A1094-80001)
- Replaceable component(s) on the SGC Graphics (interface) card include:
  - EPROM for Standard Text Interface (HP 1818-4984)

The following **semantic definitions** are used in the context of this chapter.

Terms	Definition
Replacing	Implies removing a FRU and installing the replacement FRU of the same type. Example: to replace a bad FRU to resolve a hardware problem.
Changing	Implies changing the functionality of the FRU. Example: to change 802.3 LAN types between thin or thick cables.
Upgrading	Implies removing a FRU and installing another version of the same FRU type. Example: to change fixed disk units to increase capacity.
Adding	Implies installing a FRU where no previous FRU was installed. Example: to add an optional EISA host adapter card or increase main memory capacity.
Updating	Implies removing a component of a FRU and installing another version of the component. Example: to change PDC or IODC EPROM versions to correct bugs or enhance functionality.
Transferring	Implies installing the replaceable components from one FRU to another FRU of the same type. Example: to transfer the functionality from one FRU to another.

Powering Down Workstations and Servers

Perform the following steps to safely power down your workstation/server:

1). At the O/S prompt, type **reboot -h** (CR).

2). Wait for the console message that instructs you to **Power off the workstation/server.**

The **reboot** command has several options, **-h** to *halt* the system prior to powering down and **-r** to *restart* the system without powering down.

3). Power off all of the workstation/server's components and **remove the power cord before replacing FRUs or adding options to the System Unit cabinet.**

Caution Electrostatic Discharge (ESD) Precautions

This workstation/server contains electronic components that can be damaged by static electricity. Observe the following guidelines during these removal and replacement tasks to prevent damage:

- We strongly recommend that you wear a *grounded* static strap on your wrist to ensure that any accumulated electrostatic charge will be discharged from your body to ground.
- Handle all printed circuit card (FRUs) by their edges.
- Store printed circuit card (FRUs) in their conductive plastic bags.

Replacing any SGC Graphics Card

There are several types of SGC Graphics cards for Model 720/730 workstations that use the graphic card slot. The SGC Graphics card is accessed directly from the rear of the System Unit cabinet.

Perform the following steps in the order given to replace any SGC Graphics card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect any cables connected to the SGC Graphics card.

2). Remove the SGC Graphics card from the bottom slot of the System Unit cabinet as shown in Figure 5-1.

3). Install the replacement SGC Graphics card of the same type into the bottom slot of the System Unit cabinet and re-connect the cable(s). See chapter 3 for cable connections to the SGC Graphics card.

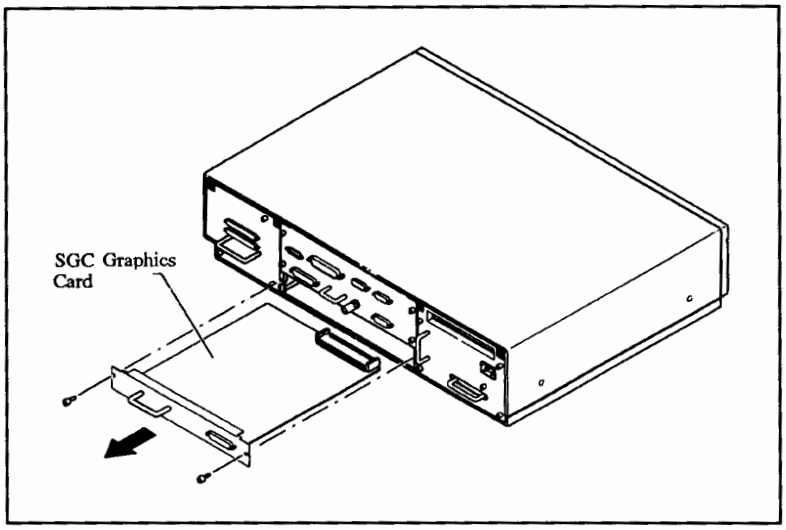

Figure 5-1. SGC Graphics Card Removal

Replacing or Upgrading the System (core I/O) Card

The System (core I/O) card is accessed directly from the rear of the System Unit cabinet.

Perform the following steps in the order given to replace the System (core I/O) card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System (core I/O) card.

2). Remove the System (core I/O) Card from the middle slot of the System Unit cabinet as shown in Figure 5-2.

To replace any System (core I/O) card:

3). Configure the LAN type and SCSI frequency jumper settings on the replacement System (core I/O) card with those on the original System (core I/O) card. (See Figure 5-7 for both LAN type and SCSI frequency jumper positions.)

4). Remove the single EEPROM on the original System (core I/O) card and re-install it on the replacement System (core I/O) card. (See Figure 5-7 for the location of these components.)

5). Install the replacement System (core I/O) Card into the middle slot of the System Unit cabinet and re-connect all the cables. See chapter 3 for cable connections to the System (core I/O) card. **Skip the remaining steps.**

To upgrade a Model 720 to a Model 730:

Note: The system must have a (M730) Processor card and the EISA Card Adapter option installed before installing the (M730) System (core I/O) card.

6). Install the PDC and IODC EPROMs included with the EISA Card Adapter option into the appropriate sockets on the (M730) System (core I/O) card. (See Figure 5-7 for the location of these components.)

7). Remove the single EEPROM on the original (M720) System (core I/O) card and insert it into the appropriate socket on the (M730) System (core I/O) card.

The EEPROM contains console and boot device path information, STATION address for LAN, software ID, and configuration data in Stable Storage that must remain with the workstation/server.

8). Configure the LAN type jumper settings on the (M730) System (core I/O) card the same as those on the (M720) System (core I/O) card. (See Figure 5-7 for the location of the LAN type jumpers.)

9). Configure the SCSI frequency jumper settings on the (M730) System (core I/O) card for Model 730 operation. (See Figure 5-7 for SCSI frequency jumper positions.)

10). Install the (M730) System (core I/O) Card into the middle slot of the System Unit cabinet. See chapter 3 for cable connections to the System (core I/O) card.

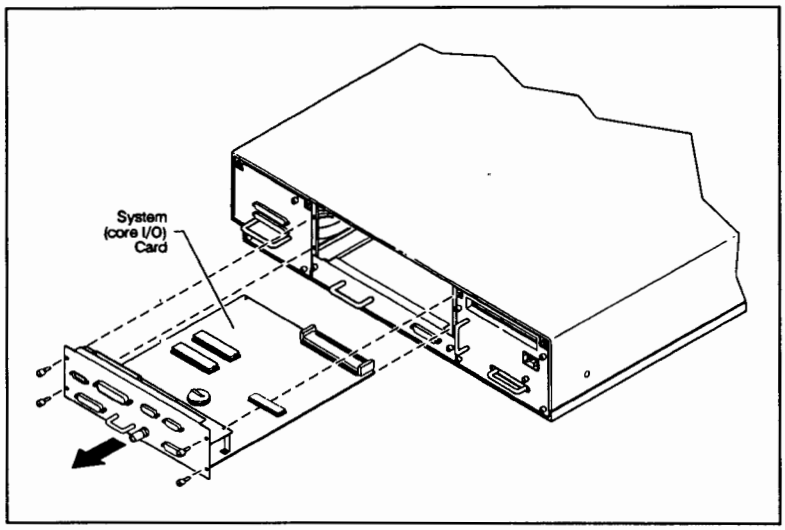

Figure 5-2. System (core I/O) Card Removal

Replacing or Upgrading the Processor Card

Perform the following steps in the order given to *update* the base (M720) Processor card with an optional (M730) Processor card.

1). Perform the steps on page 5-3 to safely power down the workstation/server components. Do NOT disconnect any cables at this time.

2). Invoke the Boot Admin. environment and execute the **UPGRADE** command with the 730 option.

Note: This will establish the appropriate values in stable storage for Model 730 operation.

3). Power down all the workstation/server components; disconnect the power cord from the System Unit.

4). Remove the System (core I/O) Card from the middle slot of the System Unit cabinet as shown in Figure 5-2.

5). Remove the Processor Card from the top slot of the System Unit cabinet as shown in Figure 5-3.

6). Remove all of the SIMM cards from the original (M720) Processor card and install them on the (M730) Processor card.

7). Install the (M730) Processor card into the top slot of the System Unit cabinet.

8). Refer to page 5-6 for instructions to upgrade the (M720) System (core I/O) Card at this time. **Skip the remaining steps.**

Perform the following steps iu the order given to *replace* any Processor card with a replacement card of the same type.

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the System (core I/O) Card from the middle slot of the System Unit cabinet as shown in Figure 5-2.

3). Remove the Processor Card from the top slot of the System Unit cabinet as shown in Figure 5-3.

4). Remove all of the SIMM cards from the original Processor card and re-install them on the replacement Processor card of the same type Processor card.

5). Install the (replacement) Processor card into the top slot of the System Unit cabinet.

6). Re-install the original System (core I/O) Card back into the middle slot of the System Unit cabinet. See chapter 3 for cable connections to the System (core I/O) card. h

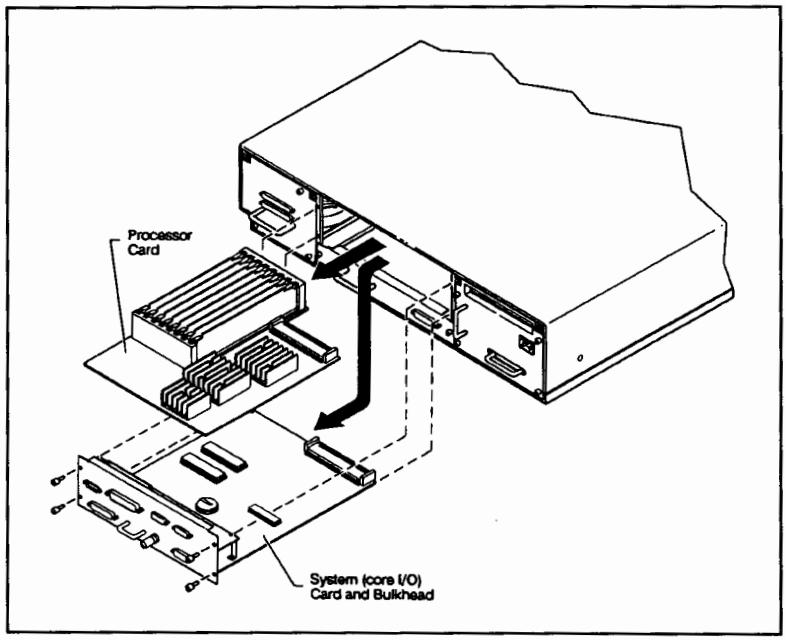

Figure 5-3. Processor Card Removal

Adding or Replacing SIMM Cards

The Processor card must be removed to gain access to the SIMM cards.

Perform the following steps in the order given to update, replace, or add SIMM cards plugged into the Processor card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the System (core I/O) Card from the middle slot of the System Unit cabinet as shown in Figure 5-2.

3). Remove the Processor Card from the top slot of the System Unit cabinet as shown in Figure 5-3.

To replace a SIMM card:

4). Remove the *suspect* SIMM card on the Processor Card and replace it with the replacement SIMM card the same size as shown in Figure 5-4. **Skip Step 5.**

To add additional SIMM card pairs: (SIMM card pairs must be the same size)

5). Install the new SIMM card pairs into the next adjacent empty connector pairs on the Processor Card. Both 2 Megabyte and 8 Megabyte SIMM card pairs may be mixed together in any order.

6). Re-install the Processor card into the top slot of the System Unit cabinet.

7). Re-install the System (core I/O) Card into the middle slot of the System Unit cabinet.

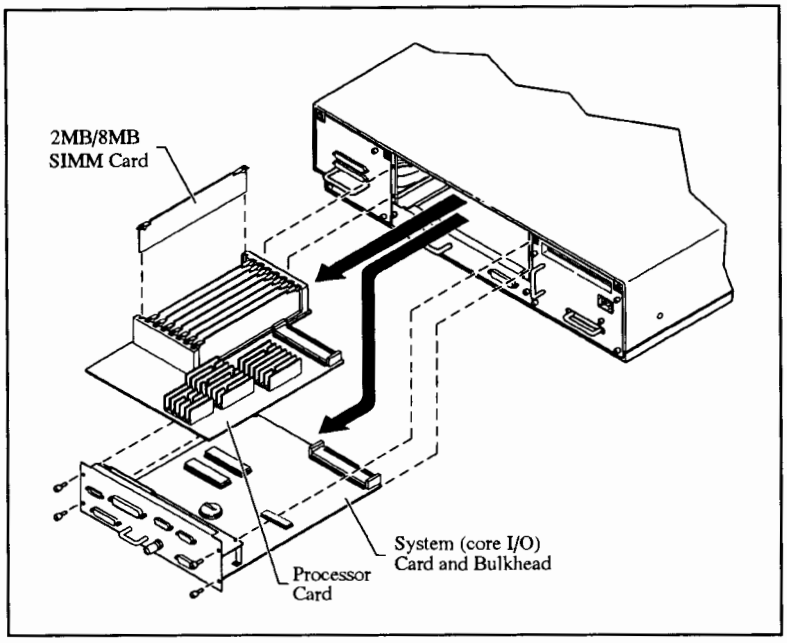

Figure 5-4. SIMM Card Removal

Adding or Replacing Embedded Devices

The SCSI device tray assembly is accessed directly from the rear of the System Unit cabinet.

Perform the following steps in the order given to replace the embedded devices attached to the SCSI device tray assembly:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect the SCSI cables/terminator.

2). Remove the SCSI device tray assembly from the System Unit cabinet as shown in Figure 5-5.

To replace an embedded device: (*See CAUTION below.*)

3). Remove the flat ribbon cable and the power cable from the device to expose the holding screw.

4). Use a Pozidrive screwdriver to remove the single screw that holds the device to the SCSI device tray assembly.

5). Set/check the SCSI address jumper settings, located on the underside of the unit. (This requires removing the mounting bracket.) Single internal fixed disk should be 6 (jumpers on both A1 and A2).

6). Install the replacement device of the same type into the same space on the SCSI device tray assembly.

7). Re-connect the flat ribbon cable and the power cable. **Skip Steps 8 and 9.**

To add a second device: (*See CAUTION below.*)

8). Set/check the SCSI address jumper settings, located on the underside of the unit. Second internal fixed disk should be address 5. (Refer to the accompanying device documentation for jumper locations.)

9). Install the second device into the empty space on the SCSI device tray assembly. Connect the flat ribbon cable and the power cable to the device.

Note: Some SCSI devices (CD-ROM and Floppy Disk) require changing bezels to access the removable media through the front of the System Unit cabinet.

10). Install the SCSI device tray assembly back into the System Unit cabinet and re-connect the SCSI cables/terminator. See chapter 2 for SCSI device configurations and precautions.

Caution

Care must be taken when handling the SCSI devices during removal or installation as internal damage to the unit may result.

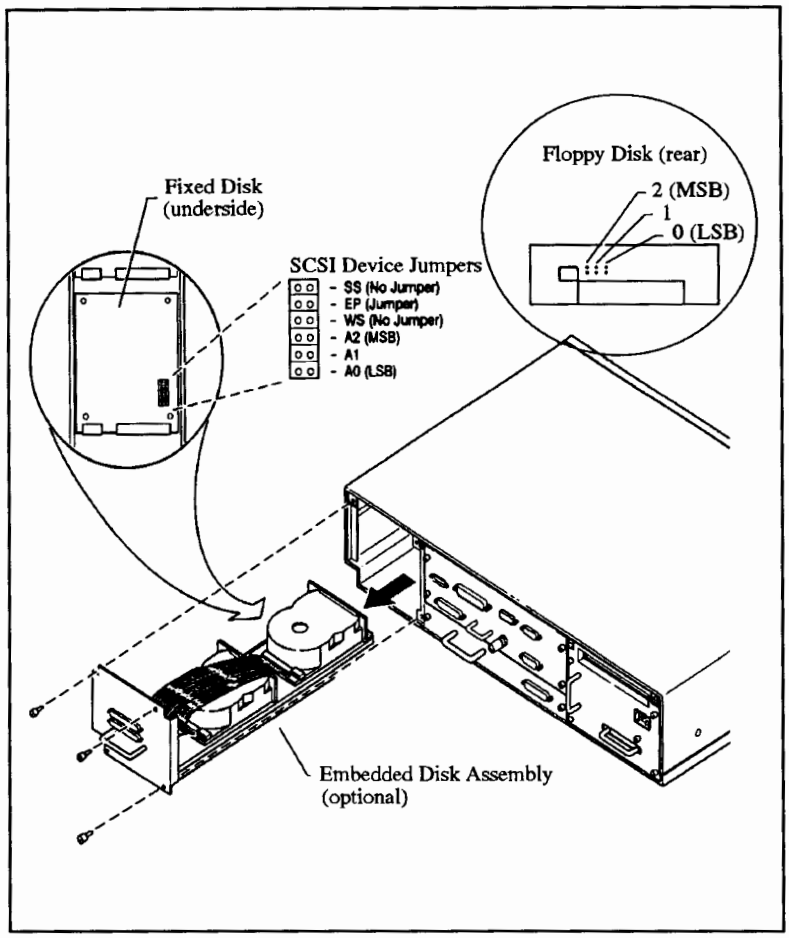

Figure 5-5. Embedded Device Removal

Adding or Replacing EISA Host Adapter Cards

The EISA Card Adapter is accessed directly from the rear of the System Unit cabinet.

Perform the following steps in the order given to replace the EISA host adapter card plugged into the EISA Card Adapter:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect any cables connected to the EISA host adapter card.

2). Remove the EISA Card Adapter from the System Unit cabinet as shown in Figure 5-6.

3). Remove the EISA host adapter card from the EISA Card Adapter assembly as shown in Figure 5-6.

To replace an EISA card adapter assembly:

4). Configure the EISA Bus frequency jumpers on the replacement EISA card adapter for 25 Mega-Hertz operation on Model 720 systems and for 33 Mega-Hertz operation on Model 730 systems. See Figure 5-6 for jumper positions. **Skip Steps 5 and 6.**

To replace an EISA host adapter card:

5). Install the replacement EISA host adapter card of the same type into the connector on the EISA Card Adapter and re-connect any cables. **Skip Step 6.**

To add an EISA host adapter card:

6). Install a new EISA host adapter card into the connector in the EISA Card Adapter. See chapter 8 for cable connections and description of the host adapter card's settings.

Note: Do NOT attempt to boot from the host adapter card until configuring the card using the eisa_config utility in HP-UX.

7). Re-install the EISA Card Adapter back into the System Unit cabinet.

Changing EISA Bus Frequency Jumper Settings

Perform the following steps in the order given to change the EISA Bus frequency jumper on the EISA Card Adapter:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect any cables connected to the EISA host adapter card.

2). Remove the EISA Card Adapter from the System Unit cabinet as shown in Figure 5-6.

3). Change the EISA Bus frequency jumper settings on the EISA Card Adapter as shown in Figure 5-7.

4). Re-install the EISA Card Adapter back into the System Unit cabinet.

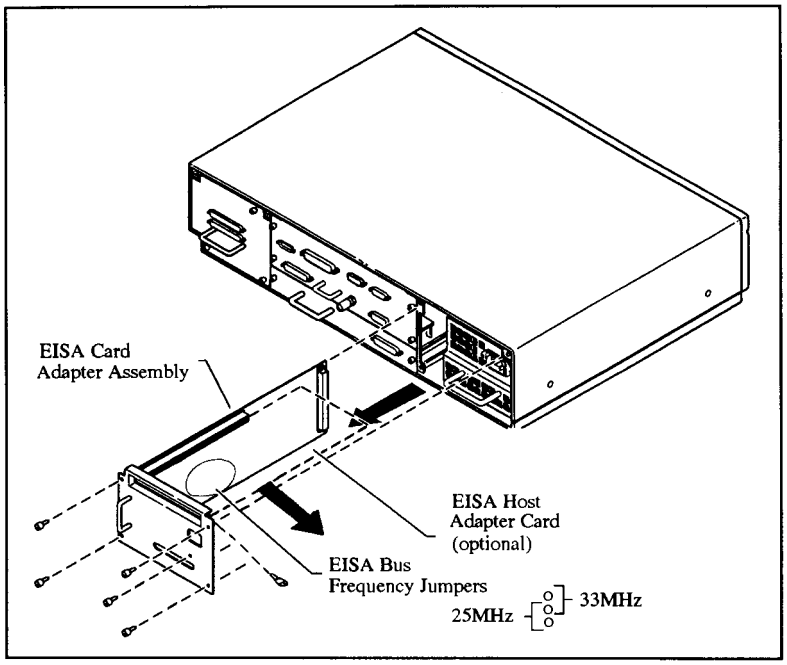

Figure 5-6. EISA Host Adapter Card Removal

Changing 802.3 LAN Type Jumper Settings

Perform the following steps in the order given to change the 802.3 LAN type jumpers on the System (core I/O) card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the System (core I/O) Card from the middle slot of the System Unit cabinet as shown in Figure 5-2.

3). Change the LAN type jumper settings on the System (core I/O) Card as shown in Figure 5-7.

4). Re-install the System (core I/O) Card into the middle slot of the System Unit cabinet

LAN Cable Connections

For thick LANs, an external MAU must be connected between the AUI port on the System (core I/O) card and the thick LAN cable.

For thin LANs, a "T" is used to connect the internal MAU on the System (core I/O) card to the BNC cables.

Changing SCSI Frequency Jumper Settings

Perform the following steps in the order given to change the SCSI frequency jumpers on the System (core I/O) card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the System (core I/O) Card from the middle slot of the System Unit cabinet as shown in Figure 5-2.

3). Change the SCSI frequency jumper settings on the System (core I/O) Card as shown in Figure 5-7.

4). Re-install the System (core I/O) Card into the middle slot of the System Unit cabinet.

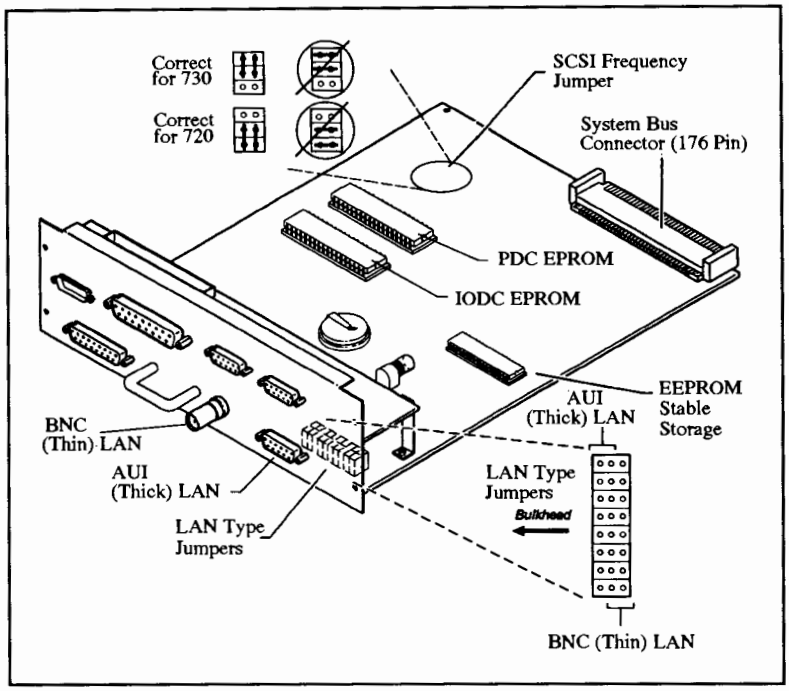

Figure 5-7. Component and Jumper Locations on the System (core I/O) Card

Updating or Transferring PDC or IODC EPROM Versions

Perform the following steps in the order given to transfer the EEPROM for Stable Storage onto a replacement System (core I/O) card or to change the PDC EPROM version on the original System (core I/O) card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the System (core I/O) Card from the middle slot of the System Unit cabinet as shown in Figure 5-2.

To update the PDC or IODC EPROM:

3). Remove the PDC or IODC EPROM on the System (core I/O) Card as shown in Figure 5-7 and install a new version of the PDC or IODC EPROM into the same socket. Skip step 4.

To transfer the PDC and IODC EPROMs:

4). Remove both PDC and IODC EPROMs from the original System (core I/O) Card and install them into the same sockets on the replacement System (core I/O) card.

5). Re-install the System (core I/O) Card into the middle slot of the System Unit cabinet.

Replacing the Time-of-Day Clock Battery

Perform the following steps in the order given to change the battery for the time-of-day clock on the System (core I/O) card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the System (core I/O) Card from the middle slot of the System Unit cabinet as shown in Figure 5-2.

3). Lift the edge of the battery at the notch in the holder, and slide the battery away from the clip. Reverse the removal procedure to install the replacement battery into the holder with the positive (+) side up.

4). Re-install the System (core I/O) Card into the middle slot of the System Unit cabinet.

5). Execute the **DATE** command during the Boot Admin. mode to establish the correct date and time.

Replacing the Stable Storage EEPROM

Perform the following steps when the Stable Storage EEPROM needs replacement:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the System (core I/O) Card from the middle slot of the System Unit cabinet as shown in Figure 5-2.

3). Remove the Stable Storage EEPROM on the System (core I/O) Card as shown in Figure 5-7 and install the replacement EEPROM into the same socket on the System (core I/O) card.

4). Copy the 12-digit station address from the old EEPROM to the label on top of the replacement EEPROM.

5). Re-install the System (core I/O) Card into the middle slot of the System Unit cabinet.

6). Execute the **DEFAULT 720** or **DEFAULT 730** command during the Boot Admin. mode to initialize the *default* values into stable starage.

Note: Both the **station address** and the **sw_id** must be written into stable storage before HP-UX can be booted.

Replacing the External AUI Fuse

Perform the following steps in the order given to change the fuse for the external AUI on the System (core I/O) card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the System (core I/O) Card from the middle slot of the System Unit cabinet as shown in Figure 5-2.

3). Remove the fuse for the external AUI on the System (core I/O) Card as shown in Figure 5-7 and install a replacement fuse into the same socket.

4). Re-install the System (core I/O) Card into the middle slot of the System Unit cabinet.

Replacing the Power Supply Assembly

The EISA Card Adapter must be removed to gain access to the Power Supply assembly.

Perform the following steps in the order given to replace the Power Supply:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the EISA Card Adapter from the System Unit cabinet as shown in Figure 5-6.

3). Remove the Power Supply assembly from the System Unit cabinet as shown in Figure 5-8.

4). Install the replacement Power Supply assembly into the System Unit cabinet.

6). Re-install the EISA Card Adapter back into the System Unit cabinet and re-connect the AC power cord.

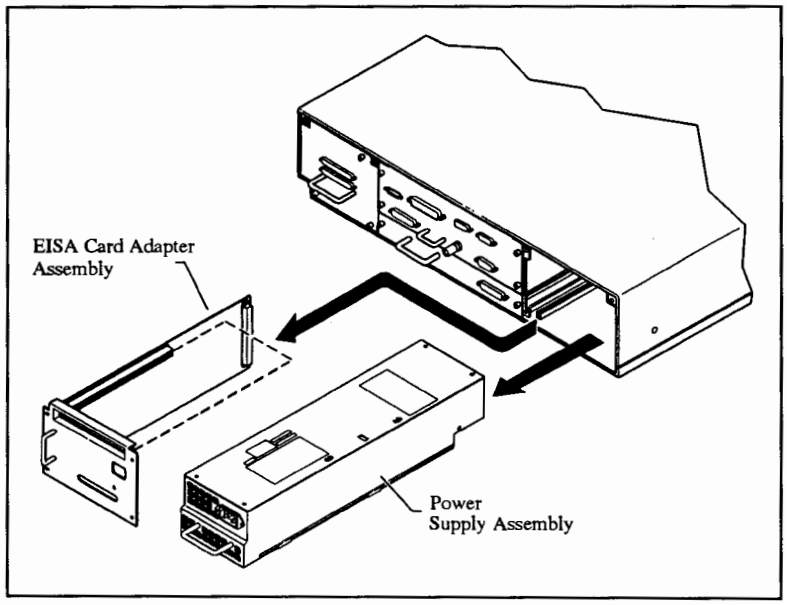

Figure 5-8. Power Supply Removal

Replacing Switch or LED Display Cards

Perform the following steps in the order given to replace the Switch or LED Display cards from within the System Unit cabinet:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Use a Pozidrive screwdriver to remove the 4 screws holding the top (plastic) cover to the System Unit cabinet as shown in Figure 5-10.

3). Use a Pozidrive screwdriver to remove the 16 screws holding the top (metal) cover to the System Unit cabinet as shown in Figure 5-11.

4). Remove the SCSI device tray assembly from the System Unit cabinet as shown in Figure 5-5.

5). Disconnect the ribbon cable on the Switch card going to the VSC Backplane assembly as shown in Figure 5-12.

To replace the LED Display card

6a). Use a Pozidrive screwdriver to remove the 2 screws holding the LED Display card to the System Unit cabinet as shown in Figure 5-9.

7a). Install the replacement LED Display card into the into the System Unit cabinet.

8a). Re-connect the ribbon cables and re-install SCSI device tray assembly back into the System Unit cabinet.

To replace the Switch card

6b). Use a Pozidrive screwdriver to remove the 2 screws holding the Switch card to the System Unit cabinet as shown in Figure 5-9.

7b). Install the replacement Switch card into the into the System Unit cabinet.

8b). Re-connect the ribbon cables and re-install SCSI device tray assembly back into the System Unit cabinet.

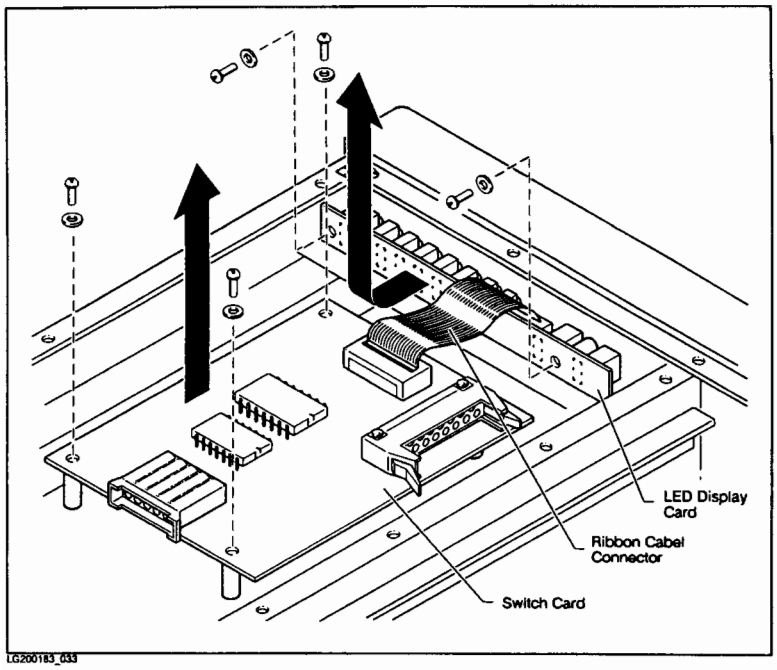

Figure 5-9. Switch and LED Display Card Removal

Replacing the VSC Backplane Assembly

Both the plastic and metal cover must be removed to gain access to the VSC Backplane assembly.

Perform the following steps in the order given to replace the VSC Backplane assembly from within the System Unit cabinet:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

For Deskside installations only

Rest the System Unit cabinet on a table top, use a Pozidrive screwdriver to remove the 2 screws holding the optional foot assembly to the System Unit cabinet.

For both Desktop and Deskside installations

2). Use a Pozidrive screwdriver to remove the 4 screws holding the top (plastic) cover to the System Unit cabinet as shown in Figure 5-10.

Go to step 3.

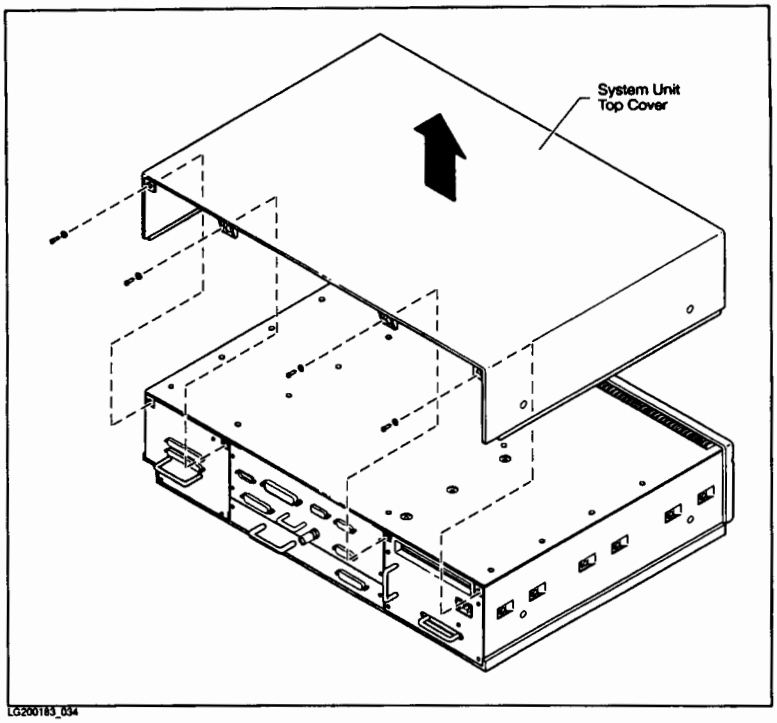

Figure 5-10. Plastic Cover Removal

3). Use a Pozidrive screwdriver to remove the 16 screws holding the top (metal) cover to the System Unit cabinet as shown in Figure 5-11.

Go to step 4.

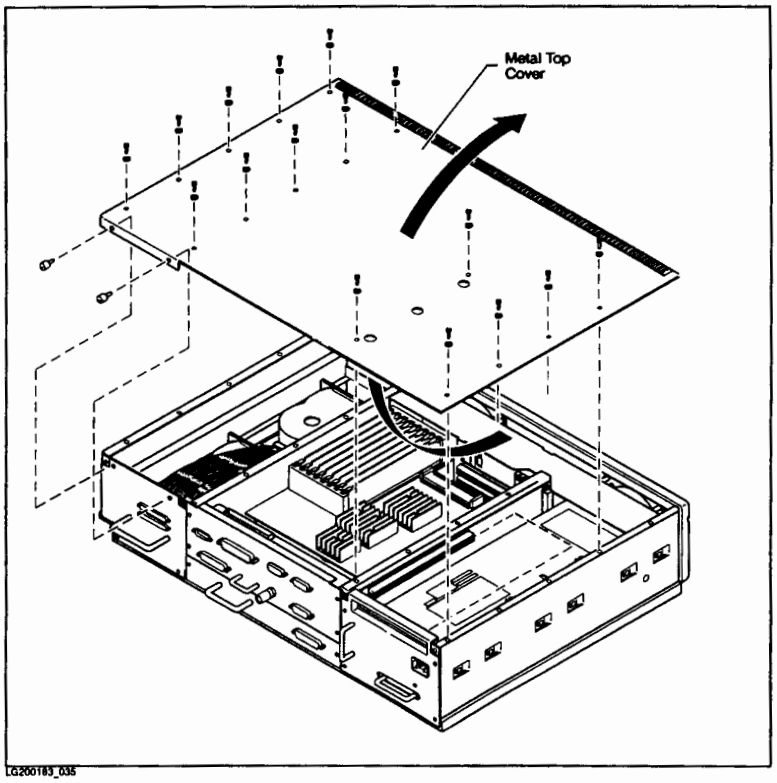

Figure 5-11. Metal Cover Removal

Replacing the VSC Backplane Assembly, continued

4). Remove the EISA Card Adapter, power supply assembly, System (core I/O) card, Processor card, and SGC Graphics card from the System Unit cabinet.

5). Disconnect the ribbon cables on the VSC Backplane assembly going to the Switch card and SCSI device tray assembly as shown in Figure 5-9.

6). Use a Pozidrive screwdriver to remove the 2 screws holding the VSC backplane/fan module to the System Unit cabinet as shown in Figure 5-12.

7). Use a Pozidrive screwdriver to remove the 7 screws holding the VSC Backplane assembly to the VSC backplane/fan module as shown in Figure 5-13.

8). Install the replacement VSC Backplane assembly into the VSC backplane/fan module, and re-install the VSC backplane/fan module back into the System Unit cabinet.

9). Re-assemble the metal and plastic top covers; re-install all of the logic cards, the Power Supply assembly, and the EISA Card Adapter back into the System Unit cabinet; re-connect the cables to the System (core I/O) card.

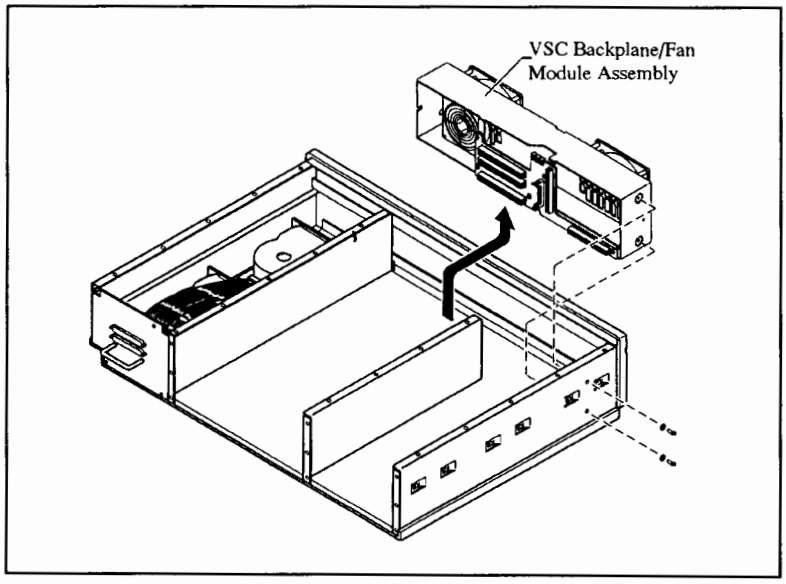

Figure 5-12. VSC Backplane/Fan Module Removal

Replacing the Fan Assemblies

The VSC backplane/fan module must be removed to gain access to the fan assemblies.

Perform the following steps in the order given to replace the Fan assemblies mounted on the VSC backplane/fan module within the System Unit cabinet:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

For Deskside installations only

Rest the System Unit cabinet on a table top, use a Pozidrive screwdriver to remove the 2 screws holding the optional foot assembly to the System Unit cabinet.

For both Desktop and Deskside installations

2). Use a Pozidrive screwdriver to remove the 4 screws holding the top (plastic) cover to the System Unit cabinet as shown in Figure 5-10.

3). Remove the EISA Card Adapter, power supply assembly, System (core I/O) card, Processor card, and SGC Graphics card from the System Unit cabinet.

4). Use a Pozidrive screwdriver to remove the 16 screws holding the top (metal) cover to the System Unit cabinet as shown in Figure 5-11.

5). Disconnect the ribbon cables on the VSC Backplane assembly going to the Switch card and SCSI device tray assembly as shown in Figure 5-12.

6). Use a Pozidrive screwdriver to remove the 2 screws holding the VSC backplane/fan module to the System Unit cabinet.

7). Use a Pozidrive screwdriver to remove the 2 screws holding the Fan assembly to the VSC backplane/fan module as shown in Figure 5-13.

8). Install the replacement Fan assembly into the VSC backplane/fan module, and re-install the VSC backplane/fan module back into the System Unit cabinet.

9). Re-assemble the metal and plastic top covers; re-install all of the logic cards, the Power Supply assembly, and the EISA Card Adapter back into the System Unit cabinet; re-connect the cables to the System (core I/O) card.

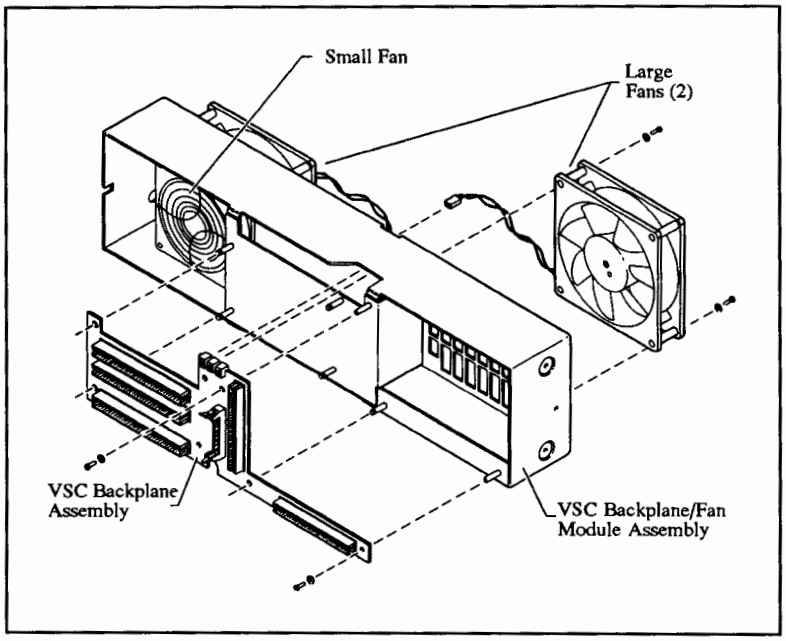

Figure 5-13. VSC Backplane or Fan Assembly Removal

5a

Replacing FRUs and Adding Options to Model 750's

This chapter contains the correct procedures to remove and replace FRUs in the Model 750 System Unit and components on the System card FRU. Each procedure references one or more illustrations for the task at hand. A list of the replaceable parts is located on page 5a-2 in this chapter.

Missing from this chapter (document) are the procedures to replace FRUs in the Graphics Unit, monitor, and peripherals. Refer to the existing service documentation available for these products.

Model 750 Removal and Replacement Tasks

The tasks in this chapter are organized as follows:

Parts List for Model 750's

System Unit FRUs

- Major FRUs include:
  - chassis assembly (HP 5001-7497; door assembly is HP A1421-87909; top cover assembly is HP 5001-7498; left side cover is HP 5001-9069; EISA (RFI) plate cover is HP 5001-7430; disk-access cover is HP 5001-7423)
  - System card with 66 MHz. processor (HP A1095-69510)
  - EISA card cage assembly (HP 5002-2101; Regulator card is HP A1095-65502; EISA backplane assembly is HP A1095-66507; cooling fan with cable is HP 5180-5246; power cable to VSC backplane is HP A1421-61607; RFI plate is HP 5001-9092)
  - EISA SCSI-2 host adapter (HP 25525-60001/25525-69001); EISA LAN adapter (HP 25567-60001/25567-69001); EISA HP-IB adapter (HP 25560-60001/25560-69001)
  - Power Supply assembly (HP 0950-2107; power cable to VSC Backplane is HP A1421-61601; cable to power switch is HP A1421-61608)
  - VSC Backplane assembly (HP ;SCSI data cable with terminator is HP A1426-61603; SCSI power cable is HP A1421-61604)
  - Fan tray assembly (HP 5001-7494; cooling fan with cable is HP 5180-5247)
- Minor FRUs include:
  - Top cover, plastic (HP 5001-7498)
  - Power-On/Standby switch with cable (A1421-61608)
  - LED Display card (A1094-66540; cable to VSC backplane is HP A1421-61602)
- Chassis options include:
  - 660 Megabyte Fixed Disk assembly (from Micropolis is HP A1095-69001)
  - 1.4 Gigabyte Fixed Disk assembly (from Micropolis is HP A1095-69002; from DMD is HP A1095-690xx)
  - 1.4 Gigabyte DDS Disk assembly (from DMD is HP xxxxx-x9xxx)
  - 600 Megabyte CD-ROM assembly (from from DMD is HP xxxxx-x9xxx)
  - 1.3 Megabyte Floppy Disk assembly (from Teac is HP A1094-60007/A1094-69007)
  - short high-density (spring) to high-density (spring) SCSI cable (PN A1094-61601)
  - High-density (spring) SCSI Terminator (PN 1251-3932)
  - SGC Graphics (interface) card (PN 98705-66582) for HP 98705B Graphics Unit
  - SGC Graphics (interface) card (PN 98765-66584) for HP 98765A/98766A Graphics Units
  - SGC Graphics (color) card (PN A1659-66001)
  - SGC Graphics (grayscale) card (PN A1924-66001)
- Replaceable component(s) on the System card include:
  - SIMM card (8 Megabyte) (PN A1094-69521)
  - SIMM card (16 Megabyte) (PN A1470-69521)
  - Battery for time-of-day clock (HP 1420-0314; 3.0 Volt coin battery)
  - Fuse for external AUI (PN 2110-0520)
  - EEPROM for Stable Storage (blank is HP 1818-5097; programmed is 1818-5125)
  - EPROM for Processor-Dependent Code (HP 1818-5219)
  - EPROM for Input/Output-Dependent Code (HP 1818-5220)
- Replaceable component(s) on the SGC Graphics (interface) card include:
  - EPROM for Standard Text Interface (PN 1818-4984)

The following **semantic definitions** are used in the context of this chapter.

Terms	Definition
Replacing	Implies removing a FRU and installing the replacement FRU of the same type. Example: to replace a bad FRU to resolve a hardware problem.
Changing	Implies changing the functionality of the FRU. Example: to change 802.3 LAN types between thin or thick cables.
Upgrading	Implies removing a FRU and installing another version of the same FRU type. Example: to change fixed disk units to increase capacity.
Adding	Implies installing a FRU where no previous FRU was installed. Example: to add an optional EISA card or increase main memory capacity.
Updating	Implies removing a component of a FRU and installing another version of the component. Example: to change PDC or IODC EPROM versions to correct bugs or enhance functionality.
Transferring	Implies installing the replaceable components from one FRU to another FRU of the same type. Example: to transfer the functionality from one FRU to another.

Powering Down Workstations and Servers

Perform the following steps to safely power down your workstation/server:

1). At the O/S prompt, type **reboot -h** CR.

2). Wait for the console message that instructs you to **Power off the workstation/server.**

The **reboot** command has several options, **-h** to *halt* the system prior to powering down and **-r** to *restart* the system without powering down.

3). Power off all of the workstation/server's components and **remove the power cord before replacing FRUs or adding options to the System Unit cabinet.**

Caution Electrostatic Discharge (ESD) Precautions

This workstation/server contains electronic components that can be damaged by static electricity. Observe the following guidelines during these removal and replacement tasks to prevent damage:

- We strongly recommend that you wear a *grounded* static strap on your wrist to ensure that any accumulated electrostatic charge will be discharged from your body to ground.
- Handle all printed circuit card (FRUs) by their edges.
- Store printed circuit card (FRUs) in their conductive plastic bags.

Replacing any SGC Graphics Card

There are several types of SGC Graphics cards for Model 720/730 workstations that use the two graphic card slots. Both SGC Graphics cards are accessed directly from the rear of the System Unit cabinet.

Perform the following steps in the order given to replace any SGC Graphics card:

1). Power down all the workstation components; disconnect the power cord from the System Unit; disconnect any cables connected to the SGC Graphics card.

2). Remove the SGC Graphics card from the appropriate slot in the System Unit cabinet as shown in Figure 5a-1.

3). Install the replacement SGC Graphics card of the same type into the same slot of the System Unit cabinet and re-connect the cable(s). See chapter 3a for cable connections to the SGC Graphics card.

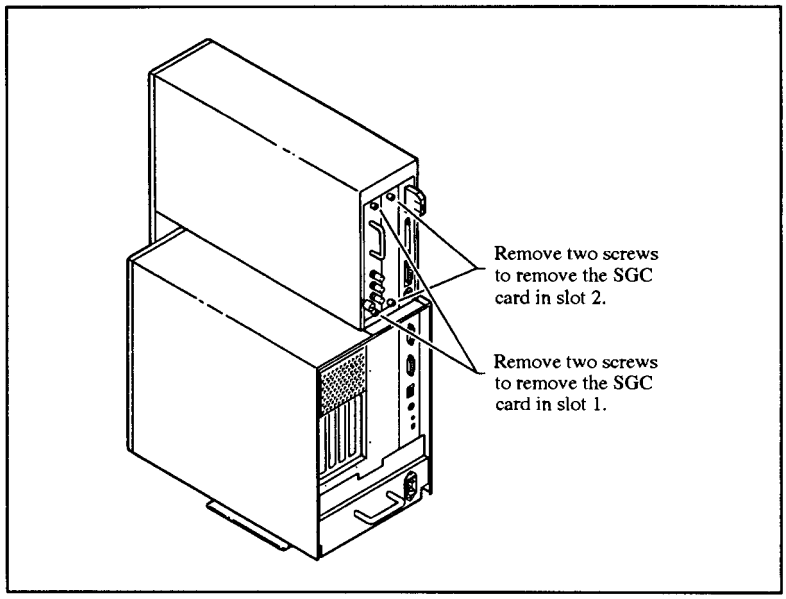

Figure 5a-1. SGC Graphics Card Removal

Replacing the Power Supply Assembly

The Power Supply assembly is accessed directly from the rear of the System Unit cabinet.

Perform the following steps in the order given to replace the Power Supply:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Use a 5.5 mm nutdriver to remove 4 sheet-metal screws holding the Power Supply assembly into the System Unit cabinet as shown in Figure 5a-2.

3). Slide the Power Supply partway out and disconnect the power cable harness (2 connectors) from the Power Supply assembly.

4). Remove the Power Supply assembly from the System Unit cabinet.

5). Install the replacement Power Supply assembly into the same slot in the System Unit cabinet and re-connect the power cable harness.

6). Plug the AC power cord back into the Power Supply assembly.

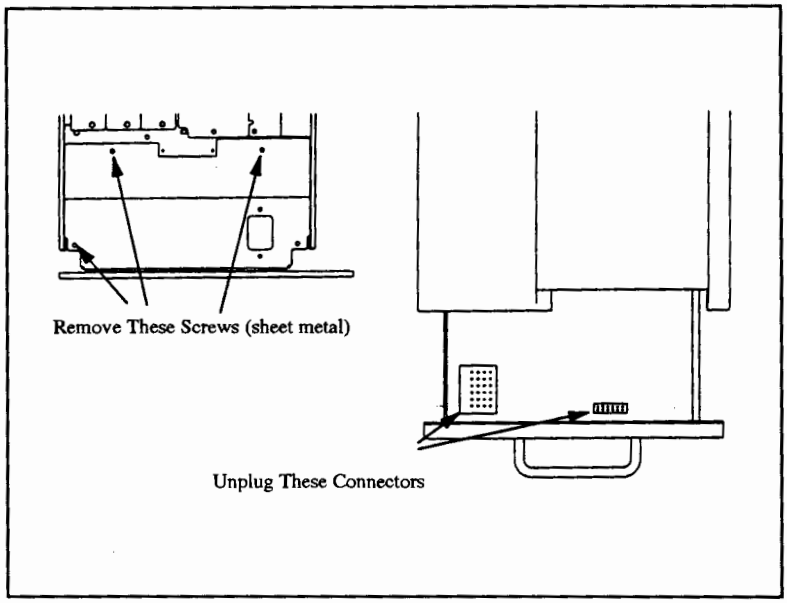

Figure 5a-2. Power Supply Removal

Replacing the System Card

The System card is accessed directly from the rear of the System Unit cabinet.

Perform the following steps in the order given to replace the System card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System card.

2). Remove the System card from the rear of the System Unit cabinet as shown in Figure 5a-3.

Refer to Figure 5a-5 for the location of the following Replaceable Components:

3). Remove the single EEPROM on the original System card and install it on the replacement System card. The EEPROM contains console and boot device path information, STATION address for LAN, and software ID and configuration data in Stable Storage that must remain with the workstation/server.

4). Configure the LAN type jumper settings on the replacement System card with those on the original System card.

5). Install the replacement System card into the same slot of the System Unit cabinet and re-connect all the cables. See chapter 3a for cable connections to the System card.

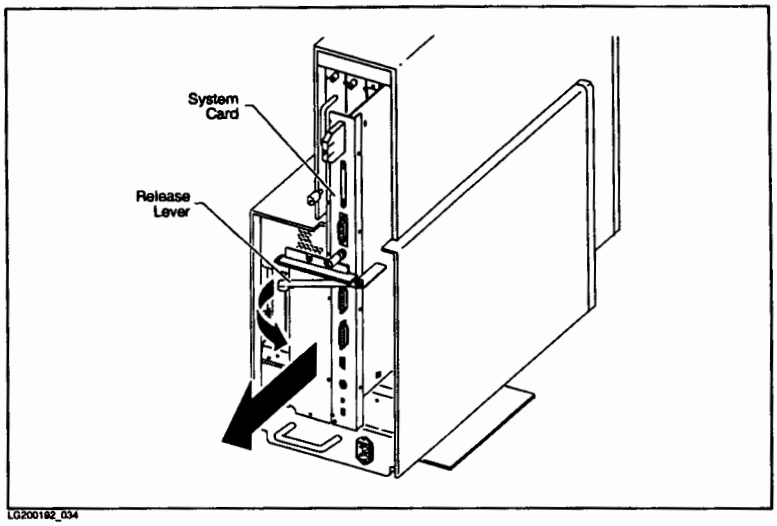

Figure 5a-3. System Card Removal

Adding or Replacing SIMM Cards

The System card must be removed to gain access to the SIMM cards.

Perform the following steps in the order given to replace or add SIMM cards plugged into the System card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System card.

2). Remove the System card from the System Unit cabinet as shown in Figure 5a-3.

To replace a SIMM card:

3). Remove the *suspect* SIMM card on the System card and replace it with the replacement SIMM card the same size as shown in Figure 5a-4. **Skip Step 4.**

To add additional SIMM card pairs:

4). Install the new SIMM card pairs into the next adjacent empty connector pairs on the System card. (SIMM card pairs must be the same size.)

5). Re-install the System card back into the System Unit cabinet and re-connect all of the cables. See chapter 3a for cable connections to the System card.

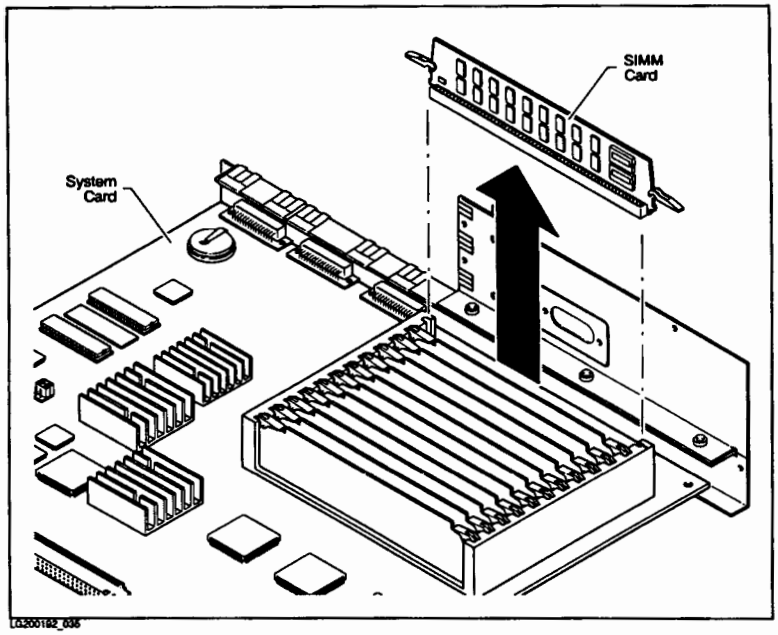

Figure 5a-4. SIMM Card Removal

Changing 802.3 LAN Type Jumper Settings

Perform the following steps in the order given to change the 802.3 LAN type jumpers on the System card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System card.

2). Remove the System card from the System Unit cabinet as shown in Figure 5a-3.

3). Change the LAN type jumper settings on the System card as shown in Figure 5a-5.

4). Re-install the System card back into the System Unit cabinet and re-connect all of the cables. See chapter 3a for cable connections to the System card.

LAN Cable Connections

For thick LANs, an external MAU must be connected between the AUI port on the System card and the thick LAN cable.

For thin LANs, a "T" is used to connect the internal MAU on the System card to the BNC cables.

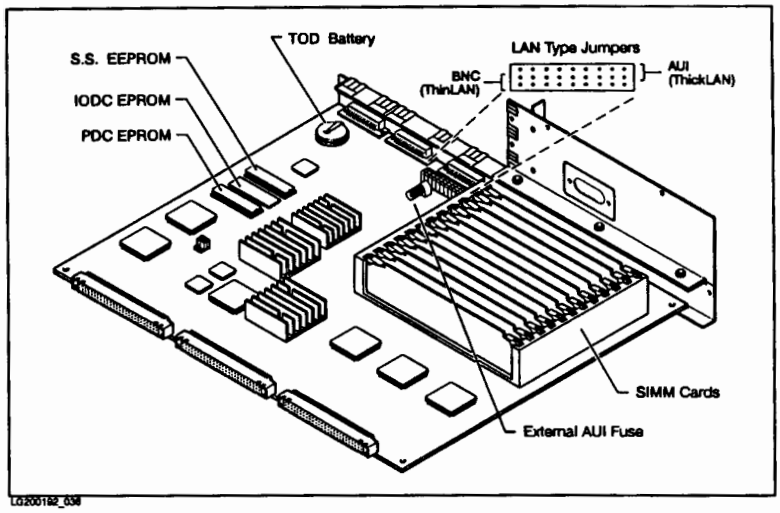

Figure 5a-5. Component and Jumper Locations on the System Card

Updating or Transferring PDC or IODC EPROM Versions

Perform the following steps in the order given to transfer the EEPROM for Stable Storage onto a replacement System card or to change the PDC or IODC EPROM versions on the original System card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System card.

2). Remove the System card from the System Unit cabinet as shown in Figure 5a-3.

To update the PDC or IODC EPROM:

3). Remove the PDC or IODC EPROM on the System card as shown in Figure 5a-5 and install a new version of the PDC or IODC EPROM into the appropriate socket. Skip step 4.

To transfer the PDC and IODC EPROMs:

4). Remove both PDC and IODC EPROMs from the original System card and install them into the appropriate sockets on the replacement System card.

5). Re-install the System card back into the System Unit cabinet and re-connect all of the cables. See chapter 3a for cable connections to the System card.

Replacing the Time-of-Day Clock Battery

Perform the following steps in the order given to change the battery for the time-of-day clock on the System card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System card.

2). Remove the System card from the System Unit cabinet as shown in Figure 5a-3.

3). Lift the edge of the battery at the notch in the holder, and slide the battery away from the clip. Reverse the removal procedure to install the replacement battery into the holder with the positive (+) side up.

4). Re-install the System card back into the System Unit cabinet and re-connect all of the cables. See chapter 3a for cable connections to the System card.

5). Execute the **DATE** command during the Boot Admin. mode to establish the correct date and time.

Replacing the Stable Storage EEPROM

Perform the following steps when the Stable Storage EEPROM needs replacement:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System card.

2). Remove the System card from the System Unit cabinet as shown in Figure 5a-3.

3). Remove the stable storage EEPROM on the System card as shown in Figure 5a-5 and install a replacement EEPROM into the same socket.

4). Copy the 12-digit station address from the old EEPROM to the label on top of the replacement EEPROM.

5). Re-install the System card back into the System Unit cabinet and re-connect all of the cables. See chapter 3a for cable connections to the System card.

6). Execute the **DEFAULT 750** command during the Boot Admin. mode to initialize the *default* values into stable starage.

Note: Both the **station address** and the **sw_id** must be written into stable storage before HP-UX can be booted.

Replacing the External AUI Fuse

Perform the following steps in the order given to change the fuse for the external AUI on the System card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System card.

2). Remove the System card from the System Unit cabinet as shown in Figure 5a-3.

3). Remove the fuse for the external AUI on the System card as shown in Figure 5a-5 and install a replacement fuse into the same socket.

4). Re-install the System card back into the System Unit cabinet and re-connect all of the cables. See chapter 3a for cable connections to the System card.

Replacing any Fan on the Fan Tray Assembly

Both the and right-side covers of the A1095 System Unit cabinet must be removed to gain access to the Fan Tray assembly.

Perform the following steps in the order given to replace any fan on the Fan Tray assembly mounted within the System Unit cabinet:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System card.

2). Remove the System card from the System Unit cabinet as shown in Figure 5a-3 to expose the fan power cables connected to the VSC backplane.

3). Remove the thumbscrew holding the top cover to the A1095 System Unit cabinet as shown in Figure 5a-6. Pull back and upwards to remove the top cover; pull away to remove the right-side cover and expose the Fan Tray assembly.

4). Use a 5.5 mm nutdriver to remove the single sheet-metal screw holding the Fan Tray assembly into the System Unit cabinet as shown in Figure 5a-7.

5). Disconnect the two power cables on the VSC Backplane assembly going to the Fan Tray assembly prior to fully removing the Fan Tray assembly.

6). Use a Pozidrive screwdriver to remove the 4 screws holding the cooling fan to the Fan Tray assembly as shown in Figure 5a-8.

7). Install the replacement cooling fan into the Fan Tray assembly. **Note:** Fan must be oriented with its arrow pointing downward.

8). Re-install the Fan Tray assembly back into the System Unit cabinet; re-connect the fan power cables to the VSC backplane.

9). Re-install the System card back into the System Unit cabinet and re-connect all of the cables. See chapter 3a for cable connections to the System card.

10). Re-install the top and side covers onto the System Unit cabinet; plug the AC power cord back into the Power Supply.

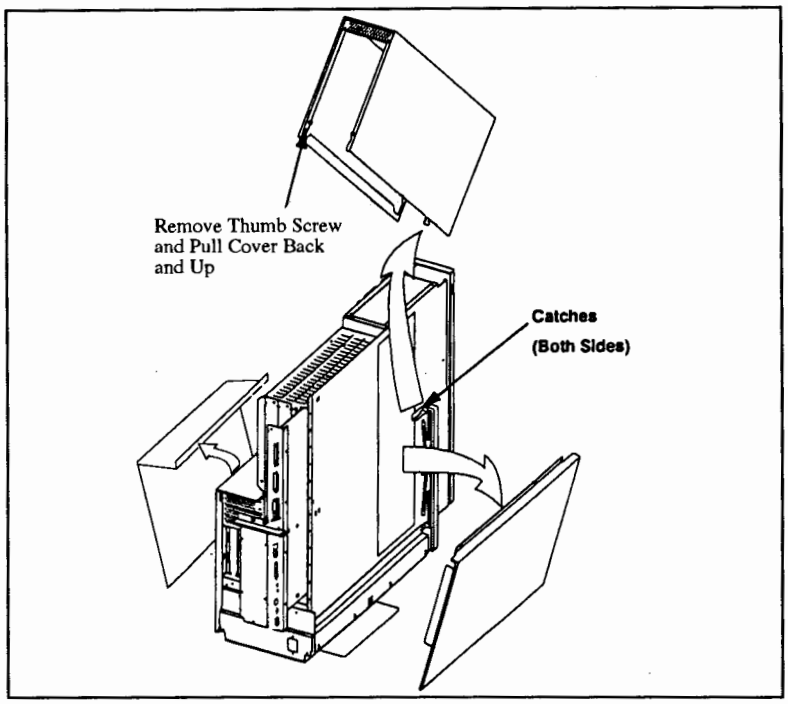

Figure 5a-6. Top and Side Panel Removal

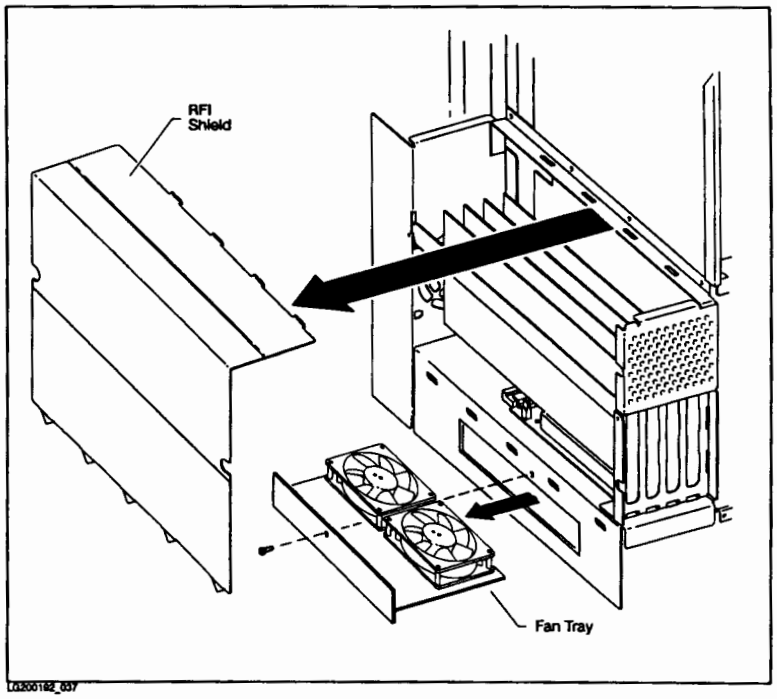

Figure 5a-7. Fan Tray Assembly Removal

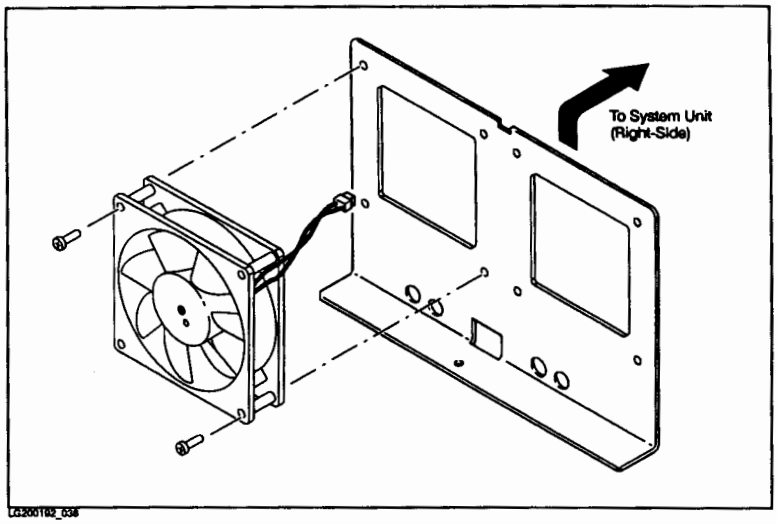

Figure 5a-8. Cooling Fan Removal

Adding or Replacing EISA Host Adapter Cards

The top and right-side covers, and the EISA RFI shield of the A1095 System Unit cabinet must be removed to gain access to the EISA host adapter cards.

Perform the following steps in the order given to add or replace EISA host adapter cards:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the thumbscrew holding the top cover to the A1095 System Unit cabinet as shown in Figure 5a-6. Pull back and upwards to remove the top cover; pull away to remove the right-side cover and expose the Fan Tray assembly.

3). Remove the EISA RFI shield as shown in Figure 5a-9.

To replace an EISA host adapter card:

4). Disconnect any cables and use a Pozidrive screwdriver to remove the single screw holding the EISA host adapter card into the EISA card cage as shown in Figure 5a-9.

5). Install the replacement EISA host adapter card of the same type back into the same connector on the EISA backplane and re-connect any cables. **Skip Step 6.**

To add an EISA host adapter card:

6). Install the new EISA host adapter card into any unused connector in the EISA backplane and connect any cables.

7). Re-install the EISA RFI shield and the top and side covers onto the System Unit cabinet; plug the AC power cord back into the Power Supply.

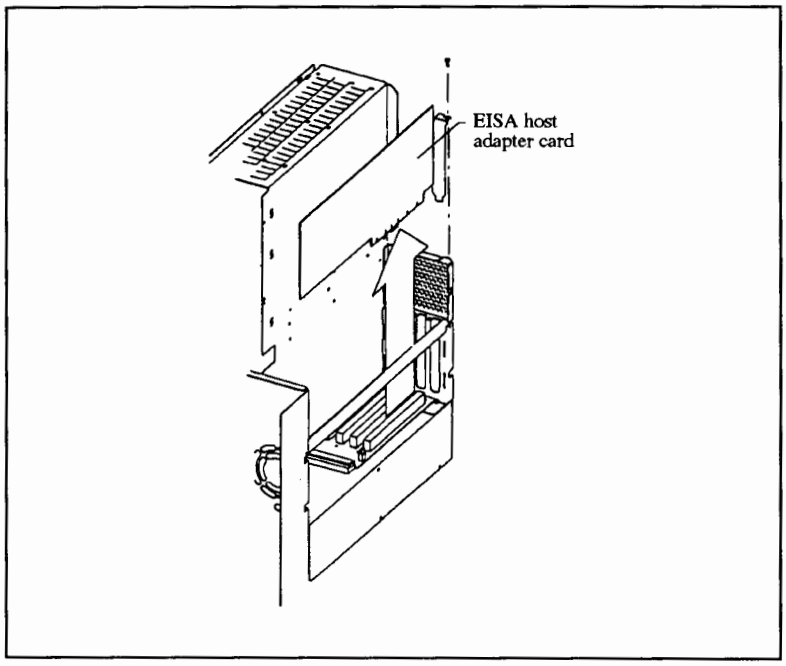

Figure 5a-9. EISA Host Adapter Card Removal

Replacing the EISA Backplane Assembly

The top and right-side covers, the EISA RFI shield, and all of the EISA host adapter cards must be removed from the System Unit cabinet to gain access to the EISA Backplane.

Perform the following steps in the order given to replace EISA Backplane assembly:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the thumbscrew holding the top cover to the A1095 System Unit cabinet as shown in Figure 5a-6. Pull back and upwards to remove the top cover; pull away to remove the right-side cover and expose the Fan Tray assembly.

3). Remove the EISA RFI shield as shown in Figure 5a-9.

4). Disconnect any signal cables connected to the EISA host adapter cards. Use a Pozidrive screwdriver to remove the single screw holding each EISA host adapter card into the EISA card cage as shown in Figure 5a-9.

5). Disconnect the large power cable harness and the fan power cable from the EISA Backplane.

6). Use a 5.5 mm nutdriver to remove the 2 sheet-metal screws holding the EISA Backplane into the EISA card cage as shown in Figure 5a-10. Pull back and upwards to remove the EISA Backplane from the connectors on the Regulator card.

7). Install the replacement EISA Backplane assembly into the EISA card cage and re-connect the cables.

Note: You must "partially" remove the System card to inspect that the connectors on the EISA Backplane are fully inserted into the connectors on the Regulator card.

8). Re-install the EISA host adapter cards into their original connectors and re-connect their cables.

9). Re-install the EISA RFI shield and the top and side covers onto the System Unit cabinet; plug the AC power cord back into the Power Supply.

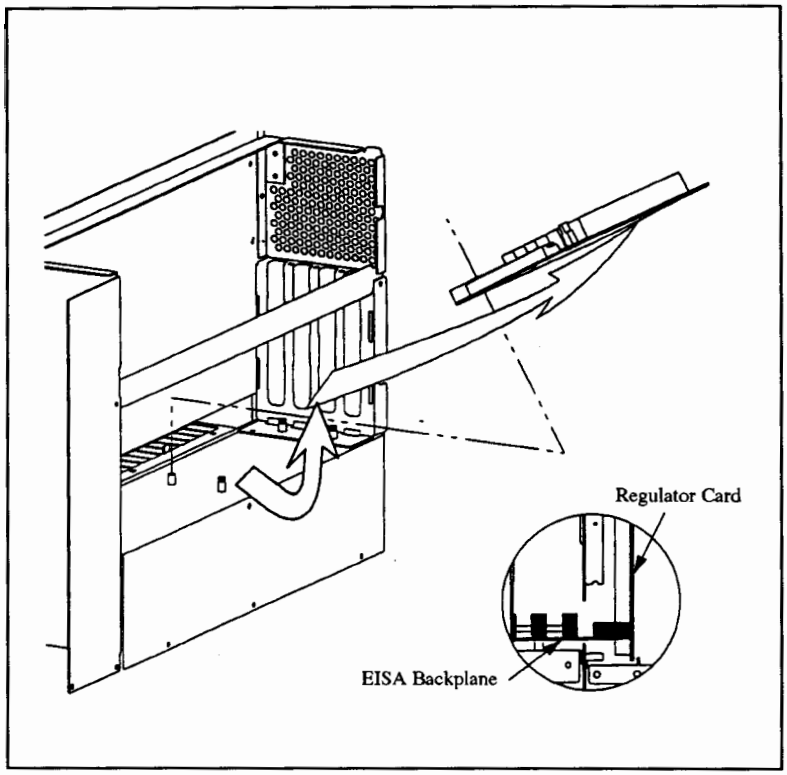

Figure 5a-10. EISA Backplane Removal

Replacing the EISA Card Cage Cooling Fan

The top and right-side covers, the EISA RFI shield, all of the EISA host adapter cards, the EISA backplane, and the EISA card cage must be removed from the System Unit cabinet to gain access to the cooling fan.

Perform the following steps in the order given to replace EISA card cage cooling fan:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the thumbscrew holding the top cover to the A1095 System Unit cabinet as shown in Figure 5a-6. Pull back and upwards to remove the top cover; pull away to remove the right-side cover and expose the Fan Tray assembly.

3). Remove the EISA RFI shield as shown in Figure 5a-9.

4). Disconnect any signal cables connected to the EISA host adapter cards. Use a Pozidrive screwdriver to remove the single screw holding each EISA host adapter card into the EISA card cage as shown in Figure 5a-9.

5). Disconnect the large power cable harness and the fan power cable from the EISA Backplane.

6). Use a 5.5 mm nutdriver to remove the 2 sheet-metal screws holding the EISA Backplane into the EISA card cage as shown in Figure 5a-10. Pull back and upwards to remove the EISA Backplane from the connectors on the Regulator card.

7). Use a 5.5 mm nutdriver to remove the 9 sheet-metal screws holding the EISA card cage to the center wall as shown in Figure 5a-11.

8). Remove the original cooling fan and install the replacement cooling fan into the EISA card cage. (No tools are required for this task.)

9). Re-install the EISA card cage onto the center wall of the System Unit cabinet.

10). Re-install the EISA Backplane assembly into the EISA card cage and re-connect the fan power and cable harness.

Note: You must "partially" remove the System card to inspect that the connectors on the EISA Backplane are fully inserted into the connectors on the Regulator card.

11). Re-install the EISA host adapter cards into their original connectors and re-connect their cables.

12). Re-install the EISA RFI shield and the top and side covers onto the System Unit cabinet; plug the AC power cord back into the Power Supply.

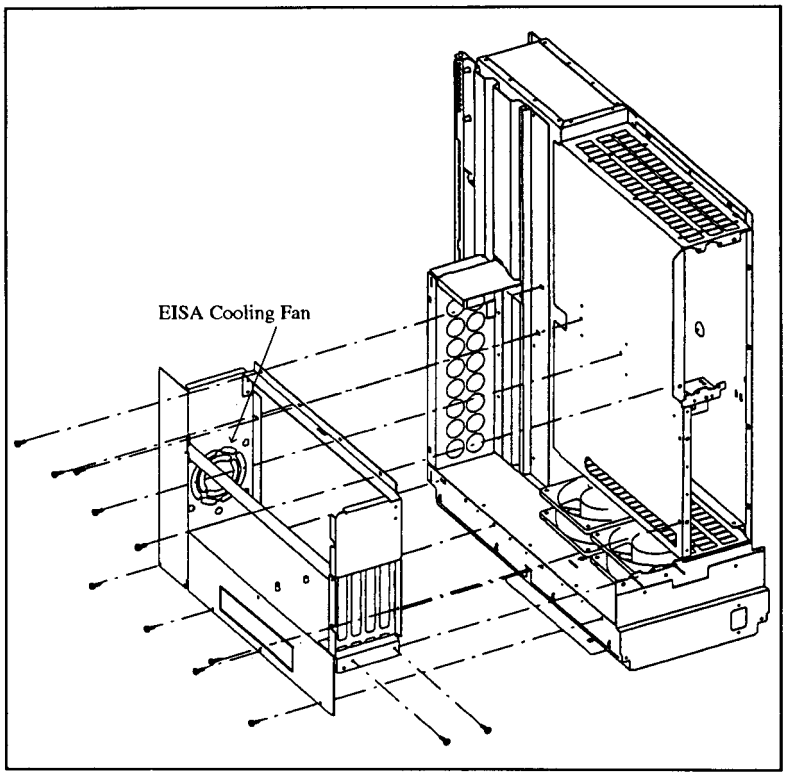

Figure 5a-11. EISA Card Cage Removal

Replacing the Regulator Card

The System card, the top and right-side covers, the EISA RFI shield, all of the EISA host adapter cards, and the EISA backplane must be removed from the System Unit cabinet prior to removing the Regulator card.

Perform the following steps in the order given to replace the Regulator card:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System card.

2). Remove the System card from the System Unit cabinet as shown in Figure 5a-3.

3). Remove the thumbscrew holding the top cover to the A1095 System Unit cabinet as shown in Figure 5a-6. Pull back and upwards to remove the top cover; pull away to remove the right-side cover and expose the Fan Tray assembly.

4). Remove the EISA RFI shield as shown in Figure 5a-9.

5). Disconnect any signal cables connected to the EISA host adapter cards. Use a Pozidrive screwdriver to remove the single screw holding each EISA host adapter card into the EISA card cage as shown in Figure 5a-9.

6). Use a 5.5 mm nutdriver to remove the 2 sheet-metal screws holding the EISA Backplane into the EISA card cage as shown in Figure 5a-10. Pull back and upwards to remove the EISA Backplane from the connectors on the Regulator card.

7). Install the replacement Regulator card into the VSC backplane.

8). Re-install the EISA backplane assembly into the EISA card cage and re-connect the cables.

Note: Inspect the connection between the EISA Backplane and the Regulator card.

9). Re-install the EISA host adapter cards into their original connectors and re-connect their cables.

10). Re-install the System card back into the System Unit cabinet and re-connect all of the cables. See chapter 3a for cable connections to the System card.

11). Re-install the EISA RFI shield and the top and side covers onto the System Unit cabinet; plug the AC power cord back into the Power Supply.

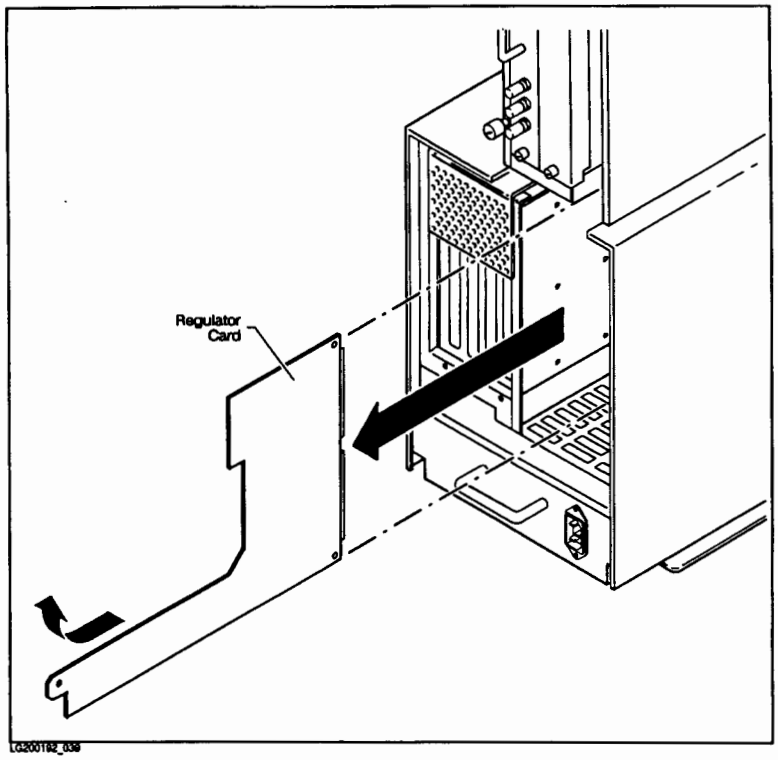

Figure 5a-12. Regulator Card Removal

Replacing the Power-On/Standby Switch

The top cover, the right-side cover, and the EISA RFI shield of the A1095 System Unit cabinet must be removed to gain access to the Power-On/Standby switch.

Perform the following steps in the order given to replace the Power-On/Standby switch on the front of the System Unit cabinet:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the thumbscrew holding the top cover to the A1095 System Unit cabinet as shown in Figure 5a-6. Pull back and upwards to remove the top cover; pull away to remove the right-side cover and expose the Fan Tray assembly.

3). Remove the EISA RFI shield as shown in Figure 5a-9.

4). Use a 5.5 mm nutdriver to remove the single sheet-metal screw holding the access cover onto the center wall of the System Unit cabinet as shown in Figure 5a-13.

5). Remove the Power-On/Standby switch by gently squeezing the tabs and pulling out. Disconnect the connector on the other end of the switch from the VSC backplane.

6). Install the replacement Power-On/Standby switch into the System Unit cabinet.

7). Re-connect the cable to the VSC backplane; re-install the access cover onto the center wall;

8). Re-install the EISA RFI shield and the top and side covers onto the System Unit cabinet; plug the AC power cord back into the Power Supply.

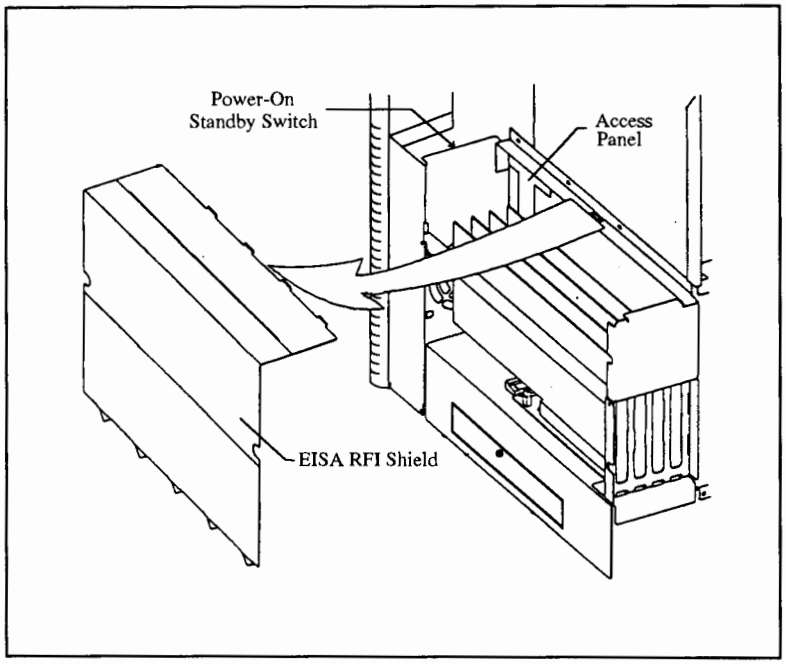

Figure 5a-13. Power-On/Standby Switch Removal

Replacing the LED Display Card

The front door and the top cover of the A1095 System Unit cabinet must be removed to gain access to the LED Display card.

Perform the following steps in the order given to replace the LED Display card on the front of the System Unit cabinet:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the thumbscrew holding the top cover to the A1095 System Unit cabinet as shown in Figure 5a-6. Pull back and upwards to remove the top cover.

3). Remove the front door by lifting and pulling forward at the same time.

4). Use a 5.5 mm nutdriver to remove the 2 sheet-metal screws holding the LED Display card and RFI shield to the System Unit cabinet as shown in Figure 5a-14.

5). Disconnect the ribbon cable on the LED Display card going to the VSC Backplane assembly.

6). Re-connect the ribbon cable to the replacement LED Display card; install replacement LED Display card and the original RFI shield back onto the System Unit cabinet.

CAUTION: The RFI shield must be aligned or possible damage to the LED card could result by shorting pins to ground.

7). Re-install front door and the top cover onto the System Unit cabinet; plug the AC power cord back into the Power Supply.

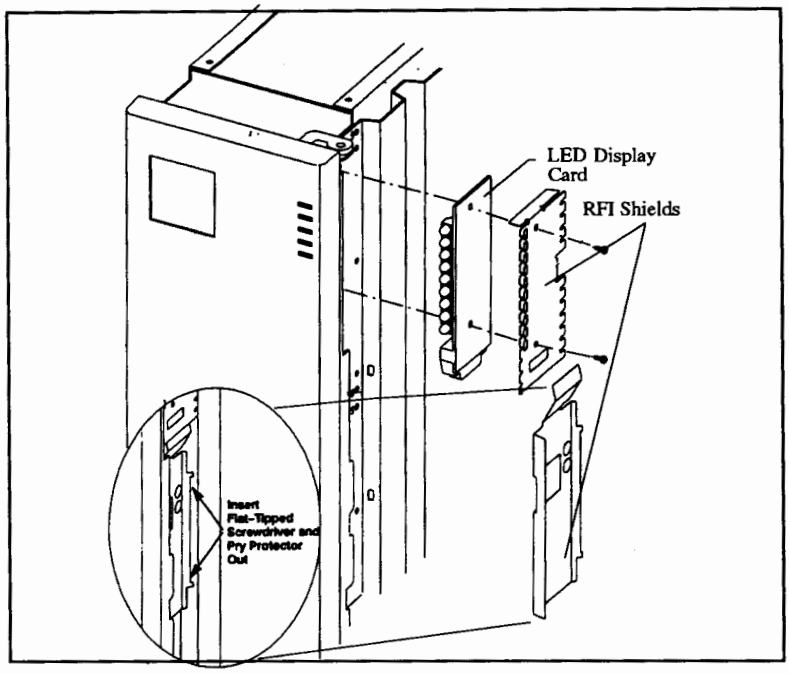

Figure 5a-14. LED Display Card Removal

Replacing the VSC Backplane Assembly

The System card, SGC graphics card(s), the top and both side covers, the small right-side plastic cover, the EISA RFI shield, all of the EISA host adapter cards, the EISA backplane, the Regulator card, and the front door must be removed from the System Unit cabinet prior to removing the VSC Backplane assembly.

Perform the following steps in the order given to replace the VSC Backplane:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit; disconnect all the cables connected to the System card.

2). Remove the SGC Graphics card(s) from the appropriate slot(s) in the System Unit cabinet as shown in Figure 5a-1.

3). Remove the System card from the System Unit cabinet as shown in Figure 5a-3.

4). Remove the thumbscrew holding the top cover to the A1095 System Unit cabinet as shown in Figure 5a-6. Pull back and upwards to remove the top cover; pull away to remove the right-side cover and expose the EISA RFI shield.

5). Remove the EISA RFI shield as shown in Figure 5a-9.

6). Disconnect any signal cables connected to the EISA host adapter cards. Use a Pozidrive screwdriver to remove the single screw holding each EISA host adapter card into the EISA card cage as shown in Figure 5a-9.

7). Use a 5.5 mm nutdriver to remove the 2 sheet-metal screws holding the EISA Backplane into the EISA card cage as shown in Figure 5a-10. Pull back and upwards to remove the EISA Backplane from the connectors on the Regulator card.

8). Remove the Regulator card as shown in Figure 5a-12.

9). Remove the power supply harness, cooling fan power cables, EISA power cable, Power-On/Standby switch cable, LED Display card ribbon cable on the frontside of the VSC backplane as shown in Figure 5a-15.

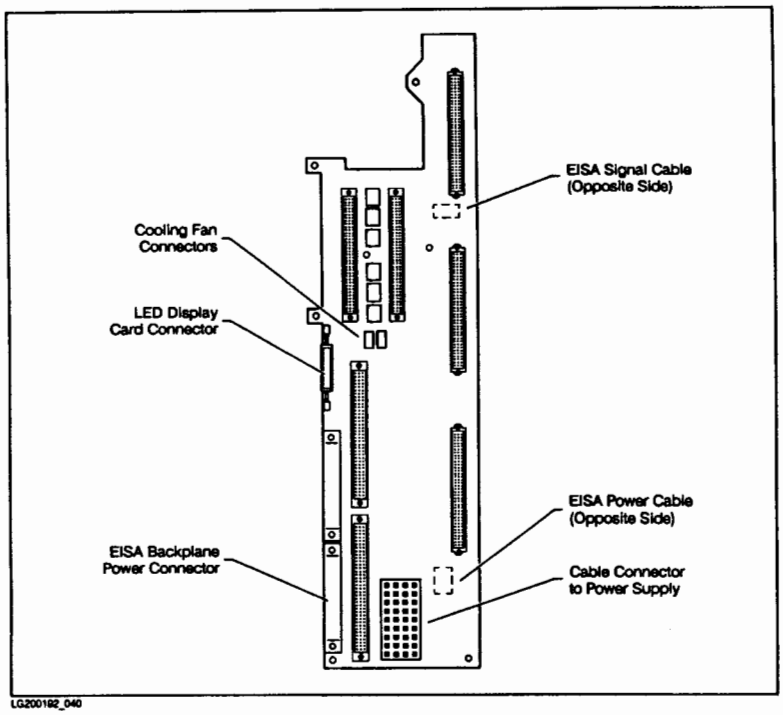

Figure 5a-15. VSC Backplane, Front and Rear Cable Removal

Replacing the VSC Backplane Assembly, continued

10). Use a Pozidrive screwdriver to remove the top and bottom access panels to the SCSI device compartments as shown in Figure 5a-16.

11). Remove the SCSI signal cable and the SCSI power cable on the backside of the VSC backplane as shown in Figure 5a-17.

12). Use a Pozidrive screwdriver to remove the 4 screws holding the VSC backplane assembly to the System Unit cabinet as shown in Figure 5a-18.

13). Install the replacement VSC Backplane assembly into the System Unit cabinet and re-connect the cables.

14). Re-install the Regulator card into the replacement VSC backplane.

15). Re-install the EISA backplane assembly into the EISA card cage and re-connect the cables.

Note: Inspect the connection between the EISA Backplane and the Regulator card.

16). Re-install the EISA host adapter cards into their original connectors and re-connect their cables.

17). Re-install the System card back into the System Unit cabinet and re-connect all of the cables. See chapter 3a for cable connections to the System card.

18). Re-install the EISA RFI shield and the top and side covers onto the System Unit cabinet; plug the AC power cord back into the Power Supply.

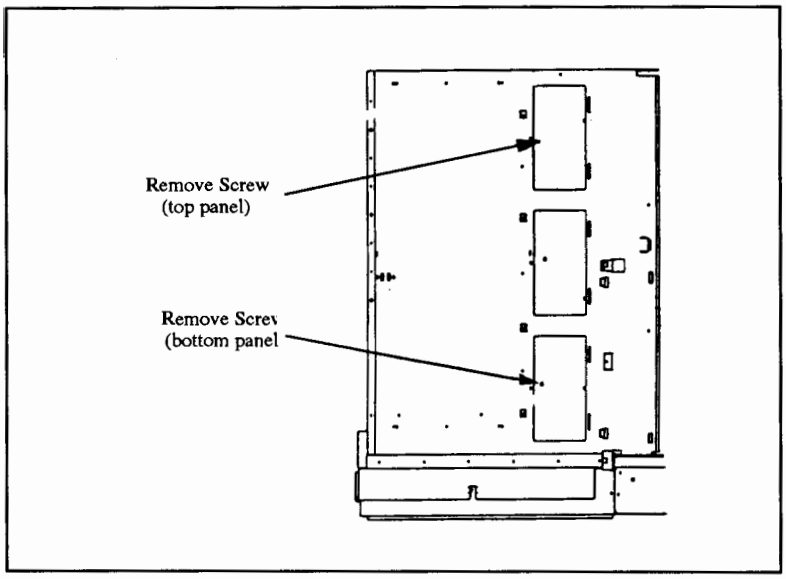

Figure 5a-16. Access Panel Removal

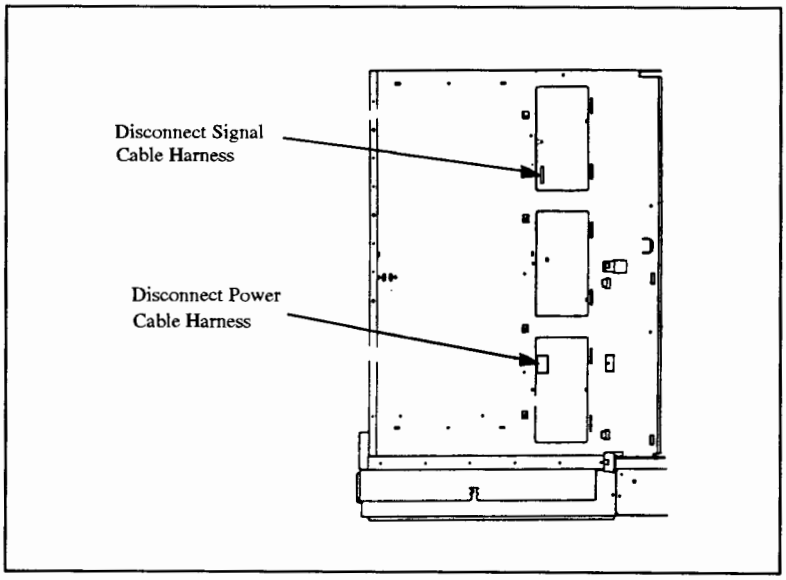

Figure 5a-17. VSC Backplane, Rear Cable Removal

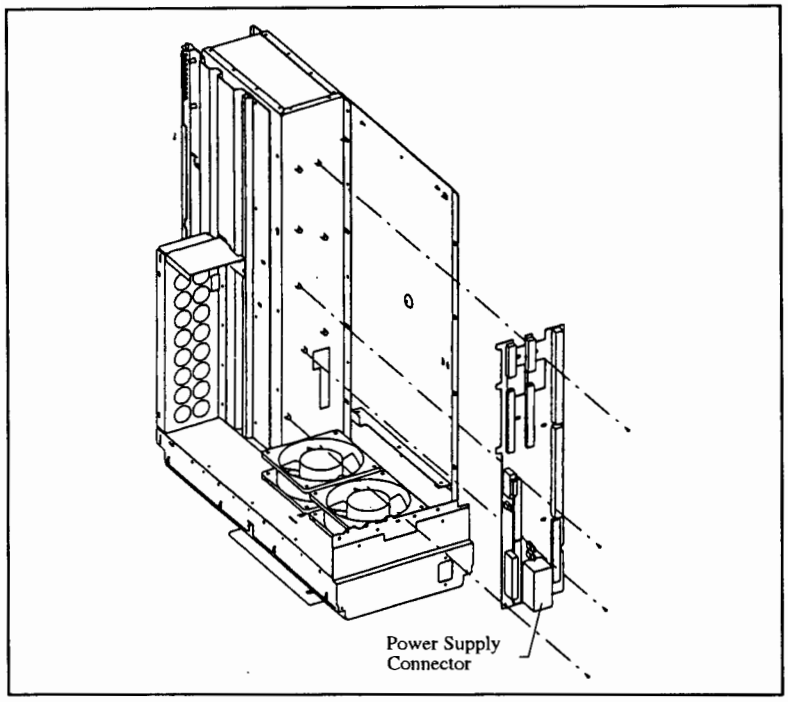

Figure 5a-18. VSC Backplane Removal

Adding or Replacing Embedded Devices

The three EISA device compartments require access from the front and both sides of the A1095 System Unit cabinet.

Perform the following steps in the order given to add or replace an embedded device:

1). Power down all the workstation/server components; disconnect the power cord from the System Unit.

2). Remove the thumbscrew holding the top cover to the A1095 System Unit cabinet as shown in Figure 5a-6. Pull back and upwards to remove the top cover; pull away to remove the left-side cover and expose the three access panels to the SCSI device compartments.

3). Remove the front door by lifting and pulling forward at the same time.

4). Push in and away to remove the small plastic side panel on the right-side of the System Unit cabinet as shown in Figure 5a-19.

To replace an embedded device: (*See CAUTION below.*)

5). Use a 5.5 mm nutdriver to remove the 2 sheet-metal screws that hold the device(s) into the SCSI device compartment as shown in Figure 5a-21.

6). Push the device forward to gain access to the cables. Remove the SCSI signal cable and the power cable from the rear of the device prior to removal.

7). Use a Pozidrive screwdriver to remove the 2 screws that holds the replacement device(s) to the mounting bracket.

8). Install the mounting bracket onto the replacement device of the same type; set the SCSI address jumper settings on the replacement device to match those on the original device.

9). Install the replacement device of the same type into the same SCSI device compartment. **Skip Steps 10, 11, and 12.**

Caution

Care must be taken when handling the SCSI devices during replacement to prevent internal damage to the unit.

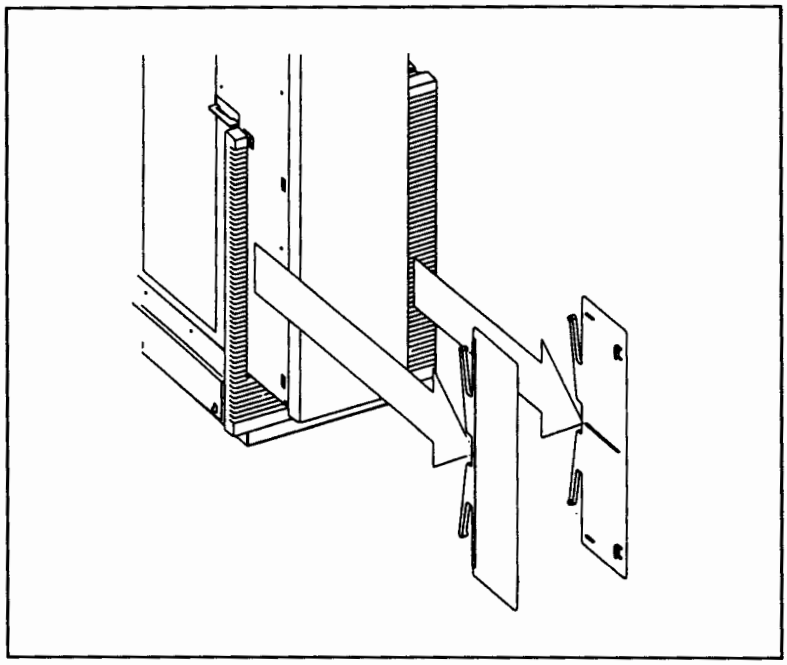

Figure 5a-19. Plastic Side Panel Removal

Adding or Replacing Embedded Devices, continued

To add another SCSI device: (*See CAUTION below.*)

10). Use a Pozidrive screwdriver to install the mounting bracket onto the new device(s).

11). Set/check the SCSI address jumper settings, located on the rear/underside of the unit.

- First internal fixed disk should have SCSI address set to 6 as shown in Figure 5a-22;
- Second internal fixed disk should have SCSI address set to 5 as shown in Figure 5a-22;
- Compact disc (CD-ROM) should have SCSI address set to 3 as shown in Figure 5a-23;
- DDS (DAT) tape should have SCSI address set to 4 as shown in Figure 5a-24;
- Floppy disk should have SCSI address set to 1 as shown in Figure 5-5 in chapter 5.

Note: All SCSI devices must have their parity jumper enabled.

12). Install the second SCSI fixed disk into the middle SCSI device compartment; install the DDS into the middle (if no second fixed disk) or top compartment; install the CD-ROM and or floppy disk into the top compartment.

13). Push the device(s) part way into the compartment to make both signal and power cable connections.

14). Use a 5.5 mm nutdriver to install the 2 sheet-metal screws to hold the new device(s) into the System Unit cabinet.

15). Use a Pozidrive screwdriver to re-install the left-side access covers back onto the System Unit cabinet.

16). Re-install the front door, side covers, and top cover back onto the System Unit cabinet; plug the AC power cord back into the Power Supply.

Caution

Care must be taken when handling the SCSI devices during installation to prevent internal damage to the unit.

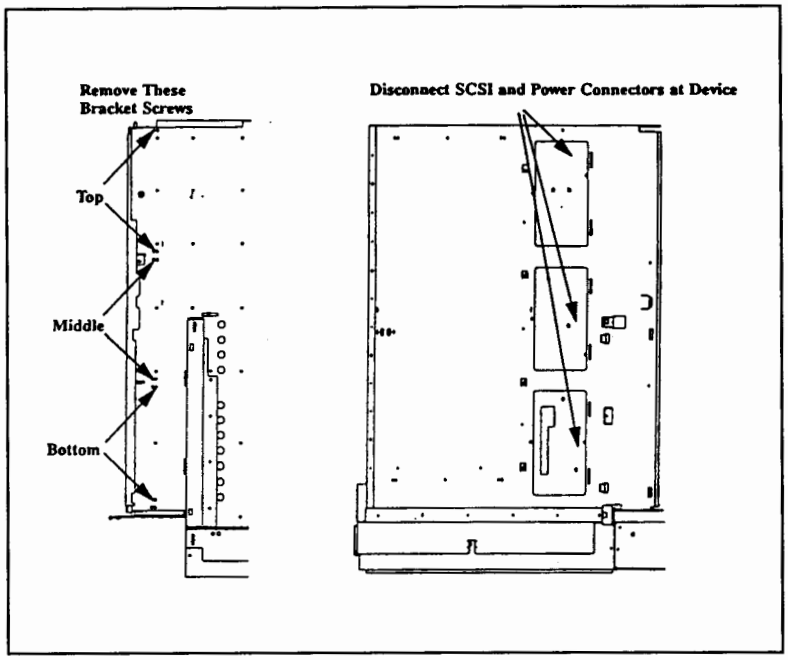

Figure 5a-20. Access Panel Removal

6

Troubleshooting Series 700 Workstation/Server Faults

This chapter provides instructions to help identify the *most probable FRU* that caused the hardware fault(s). Follow the procedures in chapter 5 or 5a to replace the FRU and the procedures in chapter 4 to verify the functionality of the replacement FRU.

Missing from this chapter (document) are the procedures to identify failed FRUs in the Graphic subsystems, monitors, and peripheral devices.

Troubleshooting Toolset

The troubleshooting strategy for Series 700 workstation/servers is to identify and replace any *failed* field replaceable unit (FRU). Identifying the *most probable FRU* involves the following hardware/software tools:

- Decoding front panel LEDs to determine SPU error/status information
- Using Boot Administration commands to examine internal settings
- Running offline ISL and DEX diagnostics to identify failed FRUs
- Running online DUI diagnostics and SAX exercisers to identify failed subsystems
- Examining HPMC error information logged into Stable Storage to identify failed modules

Troubleshooting Methods

This chapter provides *two* methods to identify the failed or failing FRU: tutorial panels and LED tables ... you may use either method when indicated by the flowchart.

The LED tables contain all of the error/status codes displayed in the front panel LEDs from power on to running the O/S. They provide a brief description of the code displayed and actions to identify a *failed* FRU. **LED tables are useful for solid hardware faults detected by selftests.**

To troubleshoot using the LED Tables, compare the state of the front panel LEDs at the time of the fault with the values given in Tables 6-1 to 6-6 and follow the *ACTION* suggested for that value.

The tutorial panels provide dialog that explains the flow of the operation that was executing when the fault occurred and step(s) to correct the fault. They are useful for identifying the *most probable FRU* for faults detected during power on through loading the operating system. **Tutorial panels are useful for both solid and intermittent hardware faults detected by the system.**

Troubleshooting Map (Start Here)

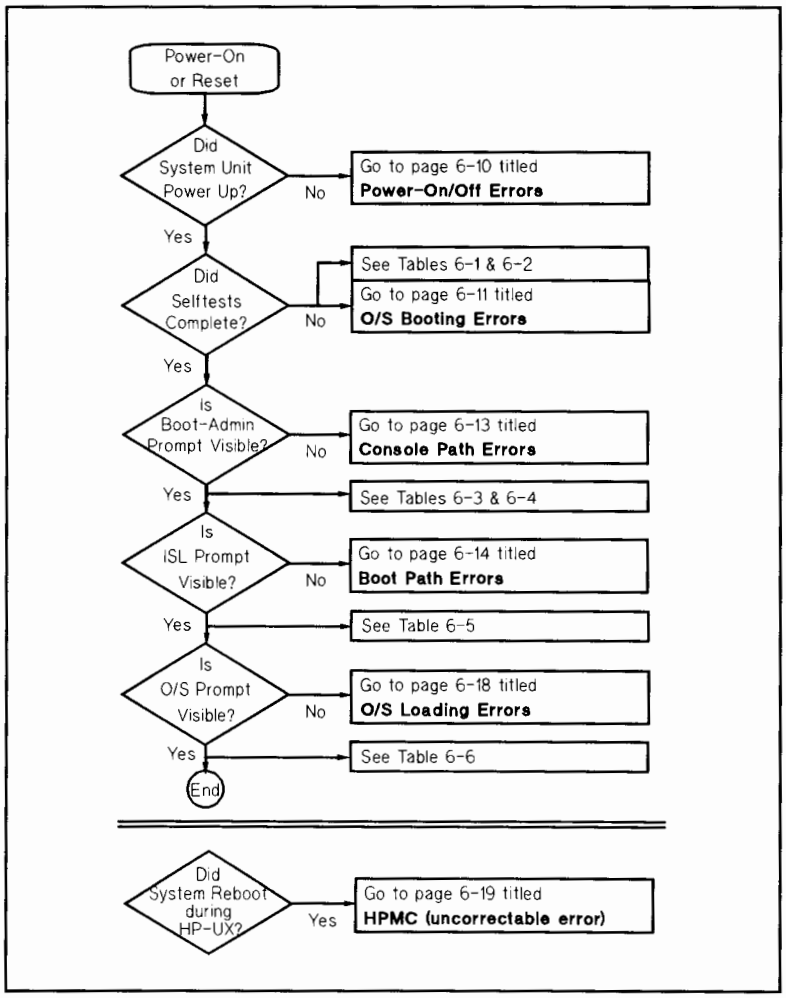

Figure 6-1. Series 700 Troubleshooting Map

Using the LED Tables

In Table 6-1 through Table 6-8, the ON state of a LED = 1; the OFF state of a LED = 0; and "x" = either 0 or 1.

Selftest Error Codes

Table 6-1 and Table 6-2 describe the selftest error codes displayed in the front panel LEDs after reset or power-on.

Table 6-1. Selftest Error Codes in Front Panel LEDs

(hidden)|(visible)	Description / Action
0 0 0 1 | x x x x	Selftest ERROR: CPU is BAD. ACTION: Replace Processor card if Model 720/730 (or System card if Model 750).
0 0 1 0 | x x x x	Selftest ERROR: Cache is BAD. ACTION: Replace Processor card if Model 720/730 (or System card if Model 750).
0 0 1 1 | x x x x	Selftest ERROR: VSC bus is BAD. ACTION: Replace Processor card if Model 720/730 (or System card if Model 750).
0 1 0 0 | x x x x	Selftest ERROR: Coproc is BAD. ACTION: Replace Processor card if Model 720/730 (or System card if Model 750).
0 1 0 1 | x x x x	Selftest ERROR: EISA Card (adapter) is BAD. ACTION: Replace FRU.
0 1 1 0 | 0 0 0 0	Selftest ERROR: SIMM Card (slot 0A) is BAD. ACTION: Replace FRU.
0 1 1 0 | 0 0 0 1	Selftest ERROR: SIMM Card (slot 0B) is BAD. ACTION: Replace FRU.
0 1 1 0 | 0 0 1 0	Selftest ERROR: SIMM Card (slot 1A) is BAD. ACTION: Replace FRU.
0 1 1 0 | 0 0 1 1	Selftest ERROR: SIMM Card (slot 1B) is BAD. ACTION: Replace FRU.
0 1 1 0 | 0 1 0 0	Selftest ERROR: SIMM Card (slot 2A) is BAD. ACTION: Replace FRU.
0 1 1 0 | 0 1 0 1	Selftest ERROR: SIMM Card (slot 2B) is BAD. ACTION: Replace FRU.
0 1 1 0 | 0 1 1 0	Selftest ERROR: SIMM Card (slot 3A) is BAD. ACTION: Replace FRU.
0 1 1 0 | 0 1 1 1	Selftest ERROR: SIMM Card (slot 3B) is BAD. ACTION: Replace FRU.
0 1 1 0 | 1 0 0 0	Selftest ERROR: SIMM Card (slot 4A) is BAD. ACTION: Replace FRU.
0 1 1 0 | 1 0 0 1	Selftest ERROR: SIMM Card (slot 4B) is BAD. ACTION: Replace FRU.
0 1 1 0 | 1 0 1 0	Selftest ERROR: SIMM Card (slot 5A) is BAD. ACTION: Replace FRU.
0 1 1 0 | 1 0 1 1	Selftest ERROR: SIMM Card (slot 5B) is BAD. ACTION: Replace FRU.

Note

Refer to figure 1-2 to locate SIMM card slot locations for Model 720/730 systems.

Refer to figure 1a-2 to locate SIMM card slot locations for Model 750 systems.

Selftest Error Codes, continued

Table 6-2. Selftest Error Codes in Front Panel LEDs

(hidden)|(visible)	Description / Action
0 1 1 1 | 1 1 0 1	ERROR: No SIMM card found. ACTION: Check the Processor card if Model 720/730 (or System card if Model 750).
0 1 1 1 | 1 1 1 1	ERROR: Executing internal selfests. ACTION: Replace the Processor card if Model 720/730 (or System card if Model 750).
1 0 0 0 | 0 0 0 0	ERROR: Unknown I/O Device. ACTION: Execute the "PATH" command; correct the path/device address.
1 0 0 0 | 0 0 0 1	ERROR: (Core) SCSI device 1 – 7 failed. ACTION: Go to page 6-15 titled "Local Boot Device Errors."
1 0 0 0 | 0 0 1 0	ERROR: (Core) LAN port failed. ACTION: Go to page 6-17 titled "Remote Boot Device Errors."
1 0 0 0 | 0 0 1 1	ERROR: (Core) HP-HIL port failed. ACTION: Replace the System (core I/O) card for Model 720/730 (or the System card for Model 750).
1 0 0 0 | 0 1 0 0	ERROR: (Core) RS232_A port failed. ACTION: Go to page 6-13 titled "Console Path Errors."
1 0 0 0 | 0 1 0 1	ERROR: (Core) RS232_B port failed. ACTION: Go to page 6-13 titled "Console Path Errors."
1 0 0 0 | 0 1 1 0	ERROR: (Core) Centronics port failed. ACTION: Replace the System (core I/O) card for Model 720/730 (or the System card for Model 750).
1 0 0 0 | 0 1 1 1	ERROR: Graphics card (slot 1; used by Model 750 only) failed. ACTION: Go to page 6-13 titled "Console Path Errors."
1 0 0 0 | 1 0 0 0	ERROR: Graphics card (slot 2) failed. ACTION: Go to page 6-13 titled "Console Path Errors."
1 0 0 0 | 1 0 0 1	ERROR: EISA card (slot 1) failed. ACTION: Run the EISA.DEX diagnostic on the Support Tape. (See chapter 4.)
1 0 0 0 | 1 x x x	ERROR: EISA card (slot 2 – 4; used by Model 750 only) failed. ACTION: Run the EISA.DEX diagnostic on the Support Tape. (See chapter 4.)

Boot Admin. Error Codes

Table 6-3 and Table 6-4 contain the error codes displayed in the front panel LEDs during the Boot Administration environment.

Note All internal selftests must complete without errors to enter the Boot Administration environment.

Table 6-3. Boot Admin. Error Codes in Front Panel LEDs

(hidden)|(visible)	Description / Action
1 0 1 0 | 0 0 0 0	ERROR: (reserved)
1 0 1 0 | 0 0 0 1	ERROR: Begin destructive memory initialization. ACTION: Go to page 6-11 titled "Reduce to Minimum Configuration."
1 0 1 0 | 0 0 1 0	ERROR: Begin non-destructive memory initialization. ACTION: Go to page 6-11 titled "Reduce to Minimum Configuration."
1 0 1 0 | 0 0 1 1	ERROR: Begin search for a console device. ACTION: Go to page 6-13 titled "Console Path Errors."
1 0 1 0 | 0 1 0 0	ERROR: Begin boot device selection. ACTION: Go to page 6-14 titled "Boot Path Errors."
1 0 1 0 | 0 1 0 1	ERROR: No boot device found. ACTION: Go to page 6-14 titled "Boot Path Errors."
1 0 1 0 | 0 1 1 0	ERROR: Branch to IPL routine in PDC. ACTION: Go to page 6-11 titled "Reduce to Minimum Configuration."
1 0 1 0 | 0 1 1 1	ERROR: Branch to TOC handler in PDC. ACTION: Go to page 6-11 titled "Reduce to Minimum Configuration."
1 0 1 0 | 1 0 0 0	ERROR: Branch to TOC handler in O/S kernel. Go to page 6-11 titled "Reduce to Minimum Configuration."
1 0 1 0 | 1 0 0 1	ERROR: Branch to HPMC handler in O/S kernel. ACTION: Go to page 6-11 titled "Reduce to Minimum Configuration."

Boot Admin. Error Codes, continued

Table 6-4. Boot Admin. Error Codes in Front Panel LEDs

(hidden)|(visible)	Description / Action
1 0 1 1 | 0 0 0 0	ERROR: (reserved). ACTION: None.
1 0 1 1 | 0 0 0 1	ERROR: (reading Stable Storage). ACTION: Execute the "DEFAULT" command to correct the checksum.
1 0 1 1 | 0 0 1 0	ERROR: (unexpected interrupt). ACTION: Replace System (core I/O) card if Model 720/730 (or System card if Model 750).
1 0 1 1 | 0 0 1 1	ERROR: (no console found). ACTION: Go to page 6-13 titled "Console Path Errors."
1 0 1 1 | 0 1 0 0	ERROR: (initiate HPMC handler). ACTION: Go to page 6-19 titled "HPMC (uncorrectable error)."
1 0 1 1 | 0 1 0 1	ERROR: (HPMC cache error). ACTION: Replace Processor card if Model 720/730 (or System card if Model 750).
1 0 1 1 | 0 1 1 0	ERROR: (HPMC memory error). ACTION: Go to page 6-11 titled "O/S Booting Errors."
1 0 1 1 | 0 1 1 1	ERROR: (HPMC bus error). ACTION: Go to page 6-19 titled "HPMC (uncorrectable error)."
1 0 1 1 | 1 0 0 0	ERROR: (nested HPMCs). ACTION: Go to page 6-19 titled "HPMC (uncorrectable error)."
1 0 1 1 | 1 0 0 1	ERROR: Writing Stable Storage. ACTION: Replace Processor card if Model 720/730 (or System card if Model 750).

ISL Error Codes

Table 6-5 describes the error codes displayed in the front panel LEDs during the ISL environment. The EST and DEX diagnostics display error messages either on the graphics monitor or on an ASCII terminal connected to the (core) RS-232_A port.

Note

The initial program loader (IPL) routine must have successfully loaded the ISL program from a boot device to enter the ISL environment.

Table 6-5. ISL Error Codes in Front Panel LEDs

(hidden)|(visible)	Description / Action
0 0 0 0 | 0 0 0 0	STATUS: No boot device error detected. ACTION: None.
0 0 0 0 | 0 0 0 1	ERROR: Can't find ENTRY_INIT for this device. ACTION: Go to page 6-14 titled "Boot Path Errors."
0 0 0 0 | 0 0 1 0	ERROR: Error during ENTRY_INIT. ACTION: Go to page 6-14 titled "Boot Path Errors."
0 0 0 0 | 0 0 1 1	ERROR: Can't find ENTRY_IO for this device. ACTION: Use Tutorial Panels to diagnose this error.
0 0 0 0 | 0 1 0 0	ERROR: Error during ENTRY_IO. ACTION: Go to page 6-14 titled "Boot Path Errors."
0 0 0 0 | 0 1 0 1	ERROR: Not a bootable device. ACTION: Try booting from another boot device.
0 0 0 0 | 0 1 1 0	ERROR: Bad LIF directory on device media. ACTION: Change media.
0 0 0 0 | 0 1 1 1	ERROR: Bad IPL address on device media. ACTION: Change media.
0 0 0 0 | 1 0 0 0	ERROR: Bad IPL size on device media. ACTION: Change media.
0 0 0 0 | 1 0 0 1	ERROR: BAD IPL entry on device media. ACTION: Change media.
0 0 0 0 | 1 0 1 0	ERROR: Bad IPL checksum on device media. ACTION: Change media.
0 0 0 0 | 1 1 1 1	ERROR: No console device found. ACTION: Go to page 6-13 titled "Console Path Errors."

HP-UX Error and Status Codes

Table 6-6 describes the error/status codes displayed in the front panel LEDs during the HP-UX environment.

Note The initial system loader (ISL) program must have successfully loaded the HP-UX operating system from a boot device to enter the HP-UX environment.

Table 6-6. HP-UX Error/Status Codes in Front Panel LEDs

(hidden) |(visible	Description / Action
1 1 0 0 | x x x x	STATUS: O/S (initialization) Codes. ACTION: None.
1 1 0 1 | x x x x	ERROR: O/S Codes (reserved). ACTION: Get help from the Response Center.
1 1 1 0 | x x x x	STATUS: O/S Codes (reserved). ACTION: None.
0 0 0 0 |0/1x x x	STATUS: O/S is Running (heartbeat). ACTION: None.
0 0 0 0 | x 1 x x	STATUS: Disk Access in Progress. ACTION: None.
0 0 0 0 | x x 1 x	STATUS: Network Receive in Progress. ACTION: None.
0 0 0 0 | x x x 1	STATUS: Network Transmit in Progress. ACTION: None.

Note If the system appears *hung* and does not respond, press the TOC switch on the front panel to capture the state of the CPU registers and the contents of main memory at this time before restarting the system.

Note

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Using the Tutorial Panels

Power-On/Off Errors

POWER-ON -> SELFTEST -> CONSOLE PATH -> BOOT ADMIN. MODE -> BOOT PATH -> ISL MODE -> HP-UX MODE

The *green-colored* Power LED on the front panel should turn ON and all of the cooling fans should spin when the Power-on/Standby switch is fully depressed.

If the workstation/server appears dead after power is applied:

1a). Check the operation of the Power switch on the System Unit. ("In" position is ON, "out" position is OFF.)

Model 720/730 Action: Replace the Switch card FRU if the Power Supply cannot be switched ON.

Model 750 Action: Replace the Power-On/Standby switch assembly if the Power Supply cannot be switched ON.

1b). Check both connections of the power cord for the System Unit. A *red-colored* LED, inside the Power Supply, will turn on when AC power is applied. This LED is visible from the rear of the cabinet on Model 720/730 systems.

Model 720/730/750 Action: Replace the Power Supply assembly if none of the *amber-colored* LEDs on the front panel turn ON after the Power switch is depressed.

2). Refer to chapter 5 or 5a for FRU replacement instructions and to chapter 4 for instructions to verify workstation/server operation.

If the workstation/server powers up but nothing appears on the Graphics Monitor/system console after several minutes:

1). Check the On/Off state of the *green-colored* Power LED on the front panel. **Note:** The ON state of the *green-colored* Power LED indicates all of the DC outputs are functioning.

Model 720/730/750 Action: Replace the Power Supply assembly if the *green-colored* Power LED on the front panel is OFF and the *amber-colored* LEDs are ON.

2). Refer to chapter 5 or 5a for FRU replacement instructions and to chapter 4 for instructions to verify workstation/server operation.

If the workstation/server powers up but cannot be powered off:

Model 720/730 Action: Replace the Switch card FRU in the System Unit.

Model 750 Action: Replace the Power-On/Standby switch assembly in the System Unit.

1). Refer to chapter 5 or 5a for FRU replacement instructions and to chapter 4 for instructions to verify workstation/server operation.

O/S Booting Errors

Selftest Errors

POWER-ON -> **SELFTEST** -> CONSOLE PATH -> BOOT ADMIN. MODE -> BOOT PATH -> ISL MODE -> HP-UX MODE

During selftest the left-most visible *amber-colored* LED (4) on the front panel will toggle On/Off.

When a selftest error is detected, an 2-digit (hexadecimal) error code is displayed in the *amber-colored* LEDs (1 to 8) on the front panel.

To identify the failed FRU:

1). Compare the code displayed in the *amber-colored* LEDs on the front panel with the Selftest error codes listed in Table 6-1 or Table 6-2.

Action: Replace the FRU identified in Table 6-1 or Table 6-2.

2). Refer to chapter 5 or 5a for FRU replacement instructions and to chapter 4 for instructions to verify workstation/server operation.

If changing the FRU doesn't resolve the problem, go to page 6-11 titled **Reduce to Minimum Configuration.**

Console Path Errors

POWER-ON -> **SELFTEST** -> **CONSOLE PATH** -> BOOT ADMIN. MODE -> BOOT PATH -> ISL MODE -> HP-UX MODE

If nothing appears on the Graphics Monitor (or System Console), go to page 6-13 titled **Console Path Errors.**

Boot Path Errors

POWER-ON -> **SELFTEST** -> **CONSOLE PATH** -> **BOOT ADMIN. MODE** -> **BOOT PATH** -> ISL MODE -> HP-UX MODE

If the ISL program does not load, go to page 6-14 titled **Boot Path Errors.**

If the O/S fails to load or execute, go to page 6-18 titled **O/S Loading Errors.**

Reduce to Minimum Configuration

Try the following *technique* when replacing the faulty FRU identified by selftests does not resolve the problem on **Model 720/730 systems.** (This technique works for Model 750 systems as well.)

1). Power off the system and remove all of the major FRUs: the EISA card adapter, the Graphics card, and all of the SIMM cards on the Processor card.

2). Disconnect all cables connected to the System (core I/O) card. Power up the system with only the Processor card and System (core I/O) card installed. **See table below for description of LED codes and action(s) to perform:**

3). If the front panel LEDs contain the expected ERROR code, install one of the SIMM cards back into either A0 slot on the Processor card. **See table below for description of LED codes and action(s) to perform:**

4). If the front panel LEDs contain the expected ERROR code, install a second SIMM card back into the other slot 0 on the Processor card. **See table below for description of LED codes and action(s) to perform:**

5). If the front panel LEDs contain the expected STATUS code, install the Graphics card into the System Unit cabinet. **See table below for description of LED codes and action(s) to perform:**

(hidden)	(visible)	Description / Action
0 1 1 1	1 1 0 1	ERROR: No SIMM card found. ACTION: See Note (1) below.
0 1 1 0	0 0 0 0/1	ERROR: SIMM card (slot 0) is BAD. ACTION: See Note (2) below.
1 0 1 0	0 1 0 0	ERROR: Begin boot device selection. ACTION: See Note (3) below.
1 0 0 0	1 0 0 0	ERROR: Graphics card (slot 2) failed. ACTION: See Note (4) below.

Note (1): If the front panel LEDs contain a different code, replace the Processor or System (core I/O) card identified in Table 6-1 or Table 6-2. **Go to step 3.**

Note (2): If the front panel LEDs contain a different code, replace the Processor, SIMM, or System (core I/O) card identified in Table 6-1 or Table 6-2. **Go to step 4.**

Note (3): If the front panel LEDs contain a different code, replace the card (FRU) identified in Table 6-1 or Table 6-2. **Go to step 5.**

Note (4): If the front panel LEDs contain a different code, replace the card identified in Table 6-1 or Table 6-2.

Console Path Errors

POWER-ON -> SELFTEST -> CONSOLE PATH -> BOOT ADMIN. MODE -> BOOT PATH -> ISL MODE -> HP-UX MODE

The IPL boot process initializes the console path from the value "stored" in stable storage. If an error is detected, the process halts and displays an error code in the front panel LEDs. See Table 6-2 for a description of the error codes displayed when a console path error is detected.

To isolate Console Path faults to the Graphics port: (error code = 0x87 or 0x88)

1). Check the external cable connections from the Graphics card in the System Unit to the Graphics Unit, and the Graphics Monitor to the Graphics Unit.

2). Try replacing the Graphics Interface card before tearing into the Graphics Unit. (Refer to chapter 5 or 5a for FRU replacement instructions and to chapter 4 for instructions to verify workstation/server operation.)

3). Check the operation of the Graphics Unit. **See the appropriate Graphics Subsystem manuals for their diagnostic suggestions.**

To isolate Console Path faults to the (core) RS-232 serial ports:(error code = 0x84 or 0x85)

1). Check the external cable connections from the (core) RS-232 serial ports to the terminal.

2). Check the terminal configuration and mode setting in the terminal before replacing the System (core I/O) card for Model 720/730 systems (or the System card for Model 750 systems). (Refer to chapter 5 or 5a for FRU replacement instructions and to chapter 4 for instructions to verify workstation/server operation.)

The following feature permits user input through a terminal to examine or correct invalid paths in stable storage **when the Graphics card is removed**.

To establish a temporary Console Path to a terminal on channel A of the (core) RS-232 port:

1). Connect an external (printer) cable (PN 24542G) from the terminal to RS-232 port A on the System (core I/O) card for Model 720/730 systems (or the System card for Model 750 systems).

2). Configure the internal terminal configurations for 9600 BAUD, word length = 8, 1 stop bit, none parity, and parity disabled. Power on the System Unit and press the return key (on the terminal keyboard) to establish the connection.

3). Examine and correct the console and keyboard paths using the **PATH** command in the Boot environment. Change as needed.

Boot Path Errors

POWER-ON -> SELFTEST -> CONSOLE PATH -> BOOT ADMIN. MODE -> BOOT PATH -> ISL MODE -> HP-UX MODE

After a console path is established, the path for the boot device is either entered in by a user or accessed from stable storage.

When a boot path error is detected, the following events occur:

1. A 2-digit (hexadecimal) error code is displayed in the LEDs.

2a. An error message is displayed on the graphics monitor for workstations.

2b. An error message is displayed on the system console for servers.

The following is an example of a boot path error message written to a graphics monitor or system console:

```
Trying scsi.0.0
Failed to initialize scsi.0.0
ENTRY_INIT status = -7 (see Table 6-7 for description)

 80000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
"0000350b" 00000012 fffff1b8 80240000 010100dc 00000000 0021f000 00000400
 9e030000 ffffff02 0000d80c 00000000 ffffffff 00000000 00000000 00000000
```

When errors are detected by either the ENTRY_INIT or ENTRY_IO routine, 32 words (four rows of 8-digit hexadecimal numbers) are displayed on the console device. The first 16 words (top two rows) are software-dependent status codes and the last 16 words (bottom two rows) are hardware-dependent status codes.

Note: ENTRY_INIT is a PDC routine that accesses instructions from the module's IODC to initialize and test the path to and from the boot device. ENTRY_IO is a PDC routine that accesses instructions from the module's IODC to perform basic I/O with the boot device in a device-independent fashion.

3. When the system is in the manufacturing mode, a 6-digit status code is written to the (core) RS-232 serial port A for manufacturing personnel to examine. The 6-digit code has the following format: 0x (hex) *ss nn dd*, where:

ss contains a 2-digit code of device-specific information such as address or slot.
nn contains a 2-digit code of the error encountered during initialization or testing (see Table 6-8 for a description of the error code).
dd contains the same 2-digit code displayed in the front panel LEDs.

If the boot device is local to the system go to page 6-16 titled **Local Boot Device Errors.**

If the boot device is remote to the system go to page 6-17 titled **Remote Boot Device Errors.**

Boot Path Errors, continued

Table 6-7 describes the status values returned by either ENTRY_INIT or ENTRY_IO during the Boot Administration environment. Table 6-8 describes the I/O device codes displayed on RS-232 port A during the Boot Administration environment.

Table 6-7. ENTRY_INIT/ENTRY_IO Status Values

Status Value	Description
2	Recoverable error
1	Inexact I/O transfer
0	OK
−2	Nonexistent option
−3	Cannot complete call without error
−4	Unrecoverable hardware error
−5	Unrecoverable data error
−6	Illegal device address
−7	Nonexistent device / duplicate SCSI address
−8	Module/device not ready
−9	Cannot locate boot device
−10	Invalid argument
−11	Data buffer too small
−12	Unsupported record size

Table 6-8. 6-Digit I/O Device-specific Codes

ss	*nn*	dd	Description of the 2-digit code (nn)
ss	0 0 0 0 | 0 0 0 0	dd	No boot device error detected
ss	0 0 0 0 | 0 0 0 1	dd	Can't find ENTRY_INIT for this device
ss	0 0 0 0 | 0 0 1 0	dd	Error during ENTRY_INIT
ss	0 0 0 0 | 0 0 1 1	dd	Can't find ENTRY_IO for this device
ss	0 0 0 0 | 0 1 0 0	dd	Error during ENTRY_IO
ss	0 0 0 0 | 0 1 0 1	dd	Not a bootable device
ss	0 0 0 0 | 0 1 1 0	dd	Bad LIF directory on device media
ss	0 0 0 0 | 0 1 1 1	dd	Bad IPL address on device media
ss	0 0 0 0 | 1 0 0 0	dd	Bad IPL size on device media
ss	0 0 0 0 | 1 0 0 1	dd	BAD IPL entry on device media
ss	0 0 0 0 | 1 0 1 0	dd	Bad IPL checksum on device media

Local Boot Device Errors

POWER-ON -> SELFTEST -> CONSOLE PATH -> BOOT ADMIN. MODE -> BOOT PATH -> ISL MODE -> HP-UX MODE

When the Boot Device is a local SCSI device:

1). Examine the error message displayed on the monitor.

2). Refer to Table 6-7 for a description of the boot path error code returned during ENTRY_INIT and ENTRY_IO.

3). Examine the 17th word returned by the ENTRY_INIT or ENTRY_IO routine. (The 17th word is enclosed in quotation marks on page 6-14.) Compare the value returned in the 17th word with those shown below and take appropriate action.

Error Value	Description / Action
0x00003607	A device on the SCSI bus does not conform to the SCSI bus type, either single-ended or differential.
0x00003605	SCSI TERMPWR was not valid. Possible fault is caused by a cable, device, or logic on EISA SCSI-2 card.
0x000036xx	Circuitry on the EISA SCSI-2 card is not functional.
0x000035xx	Device is not responding. Check device/cable/termination.
0x00004xxx	Device is not functional. Check device/cable/termination.

4a). Check the signal cable connections from the *single-ended* SCSI connector on the System (core I/O) card for Model 720/730 systems (or the System card for Model 750 systems) to each *single-ended* SCSI device.

4b). Check the signal cable connections from the *differential* SCSI connector on the (EISA) SCSI-2 host adapter card to the SCSI connector on each *differential* SCSI device.

5). Check the termination on the last SCSI device and the LEDs, fuses, and any address jumper settings in each SCSI device.

Note: SCSI devices on the same port with identical addresses cannot be found during a search for potential boot devices after power-on or reset.

6). Examine the boot paths in stable storage using the **PATH** command in the Boot environment. Change as needed.

7). Examine the jumper settings stable storage using the **INFO** command in the Boot environment. Change as needed.

Remote Boot Device Errors

POWER-ON -> SELFTEST -> CONSOLE PATH -> BOOT ADMIN. MODE -> BOOT PATH -> ISL MODE -> HP-UX MODE

When the Boot Device is a remote SCSI device:

1). Examine the error message displayed on the monitor.

2). Refer to Table 6-7 for a description of the boot path error code returned during ENTRY_INIT and ENTRY_IO.

3a). Check the (core) AUI cable connections to the MAU on the thick LAN cable.

3b). Check the (core) BNC cable connections to the thin LAN cable.

4). Check the fuse and the LAN type jumper settings on the System (core I/O) card for Model 720/730 systems (or the System card for Model 750 systems).

5). Examine the boot paths in stable storage using the **PATH** command in the Boot environment. Change as needed.

6). Examine the jumper settings stable storage using the **INFO** command in the Boot environment. Change as needed.

7). Examine the LAN station address written on the stable storage EEPROM and use the **ss_config** utility on the Support Tape to examine the station address written into the stable storage EEPROM. Change as needed.

O/S Loading Errors

POWER-ON -> SELFTEST -> CONSOLE PATH -> BOOT ADMIN. MODE -> BOOT PATH -> ISL MODE -> HP-UX MODE

It is generally assumed that the internal selftest, the ISL, and the DEX diagnostic programs will test enough of the hardware logic and the HP-UX file system to assure the loading of the operating system.

If HP-UX will not load:

1a). Run the WIN.DEX diagnostic on the Support Tape to identify faults in the *single-ended* SCSI disk. (Refer to chapter 4 for instructions to "Run the Support Tape-based DEX Diagnostics.")

1b). Run the NET.DEX diagnostic on the Support Tape to identify faults in the network link. (Refer to chapter 4 for instructions to "Run the Support Tape-based DEX Diagnostics.")

1c). Run the IOMAP utility on the Support Tape to identify faults in the *differential* SCSI disk. (Refer to chapter 4 for instructions to "Run the Support Tape-based ISL Diagnostics.")

2). Refer to chapter 5 or 5a in this manual for FRU replacement instructions.

If the above diagnostics do not find a fault and HP-UX will not load:

1). Examine the information reported on the console device to determine whether the error is caused by faulty hardware or corrupted software. (Example below is attempting to boot from a System Disk.)

```
ISL Revision A.00.09 March 27, 1990

ISL> hpux boot disc(;0)/hp-ux

ISL booting hpux boot disc(;0)/hp-ux

Secondary Loader
Revision 2.1
Booting disc(;0)/hp-ux
1462188 + 335872 + 485128 start 0x25254
```

Note: The above messages are generated during the ISL environment by the boot handler in PDC and may vary depending on the location of the boot device.

The remaining messages are generated by the HP-UX kernel. These messages include a list of interfaces found by the kernel and their addresses.

Unfortunately, error reporting by the HP-UX loader program is vague and the error data from the kernel can be cryptic.

2). If you need to take "recovery actions" at this time, refer to chapter 4 for instructions to "Recover from a System Disk Failure in the ISL Environment."

3). Call the Response Center in Atlanta, GA for HP-UX assistance!

HPMC (uncorrectable error)

POWER-ON -> SELFTEST -> CONSOLE PATH -> BOOT ADMIN. MODE -> BOOT PATH -> ISL MODE -> HP-UX MODE

When the hardware detects an unrecoverable (HPMC) during the HP-UX environment, an error message, referred to as an HP-UX Kernel Tombstone, is displayed on the monitor. The state of the system is written to main memory and the entire contents of main memory is dumped (written) to the swap area on the system disk.

HPMC error information is logged into Stable Storage; this information is referred to as **PIM** (for Processor Internal Memory) in other PA-RISC systems. The HPMC error information may be examined (displayed) during the Boot Administration environment using the **PIM_INFO** command.

To identify the failed FRU(s) after an HPMC:

1). Examine the first line of the data returned from a **PIM_INFO** command to display the latest error information from the last TOC, LPMC, or HPMC interruption detected.

Go to steps 2a and 3a (on this page) if an HPMC was logged by a Model 720/730 system.

Go to steps 2b and 3b (on page 6-20) if an HPMC was logged by a Model 750 system.

2a). Compare values from PIM_INFO command with those shown below and take appropriate action on Model 720/730 systems.

Check Type word	Cache Check word	Bus Check word	System Resp. Address word	Action (See Note below)
0x80000000	0x40000000	N / A	N / A	Replace Processor card.
0x20000000	N / A	0x00210004	0x00000000 0x0BFFFFFF	Replace SIMM card. (See page 7-18)
0x20000000	N / A	0x00310007	0xF0820000 0xF0FFFFFF	Replace System (core I/O) card.
0x20000000	N / A	0x00310007	0xF8000000 0xFBFFFFFF	Replace SGC Graphics card in slot 2.
0x20000000	N / A	0x00310007	0xFC000000 0xFFBFFFFF	Replace EISA card adapter or EISA host adapter card.

Note: The appropriate diagnostics must be run to determine failed FRU when more than one FRU is identified.

3a). Refer to chapter 7 for examples of module identification, chapter 5 for FRU replacement instructions, and chapter 4 for instructions to verify workstation/server operation.

HPMC (uncorrectable error), continued

POWER-ON -> SELFTEST -> CONSOLE PATH -> BOOT ADMIN. MODE -> BOOT PATH -> ISL MODE -> HP-UX MODE

2b). Compare values from PIM_INFO command with those shown below and take appropriate action on Model 750 systems.

Check Type word	Cache Check word	Bus Check word	System Resp. Address word	Action (See Note below)
0x80000000	0x40000000	N / A	N / A	Replace System card.
0x20000000	N / A	0x00210004	0x00000000 0x0BFFFFFF	Replace SIMM card. (See page 7-18)
0x20000000	N / A	0x00310007	0xF0820000 0xF0FFFFFF	Replace System card.
0x20000000	N / A	0x00310007	0xF4000000 0xF7FFFFFF	Replace Graphics card in slot 1.
0x20000000	N / A	0x00310007	0xF8000000 0xFBFFFFFF	Replace Graphics card in slot 2.
0x20000000	N / A	0x00310007	0xFC000000 0xFFBFFFFF	Replace System card or EISA host adapter card in slot 1 - 4.

Note: The appropriate diagnostics must be run to determine failed FRU when more than one FRU is identified.

3b). Refer to chapter 7 for examples of module identification, chapter 5a for FRU replacement instructions, and chapter 4 for instructions to verify workstation/server operation.

7

Series 700 FRU/Module Descriptions

This chapter contains functional information about the **PA-RISC modules** implemented on the major card FRUs for the Series 700 family of workstations and servers.

Missing from this chapter are functional descriptions of graphics hardware, interface cards, and peripheral devices supported by Series 700 workstations. See chapter 8 for detailed information on present and future EISA host adapter card options and chapter 9 for detailed information on future graphics options.

Series 700 Workstation/Server Card FRUs

There are five *unique* and three *shared* card FRUs for Model 720/730 workstations and servers; and three *unique* and three *shared* card FRUs for Model 750 workstations and servers.

Unique Card FRUs for Model 720/730

- Model 720 Processor card (50 MHz. CPU/IPU processor and FPU coprocessor)
- Model 730 Processor card (66 MHz. CPU/IPU processor and FPU coprocessor)
- 2 Megabyte SIMM (memory) card
- Model 720/730 System (core I/O) card
- EISA card adapter (standard on Model 730; optional on Model 720)

Unique Card FRUs for Model 750

- Model 750 System card (66 MHz. CPU/IPU processor and FPU coprocessor with core I/O and EISA adapter)
- 16 Megabyte SIMM (memory) card
- EISA card cage assembly (backplane and L-card)

Shared Card FRUs for Model 720/730/750

- 8 Megabyte SIMM (memory) card (shared by all Series 700)
- VSC Graphics card (shared by all Series 700 workstations only)
- EISA host adapter cards (shared by all Series 700)

Model 720/730 Major Card FRU Descriptions

Precision architecture (PA-RISC) hardware modules are incorporated onto the major card FRUs. Workstation FRUs may contain one module, several modules, or part of a module. For example, the 8 MB SIMM cards are part of the memory module and the VSC Graphics (interface) card is a part of the graphics module.

Figure 7-1 is a simplified block diagram of the major card FRUs that make up Model 720/730 workstations and servers.

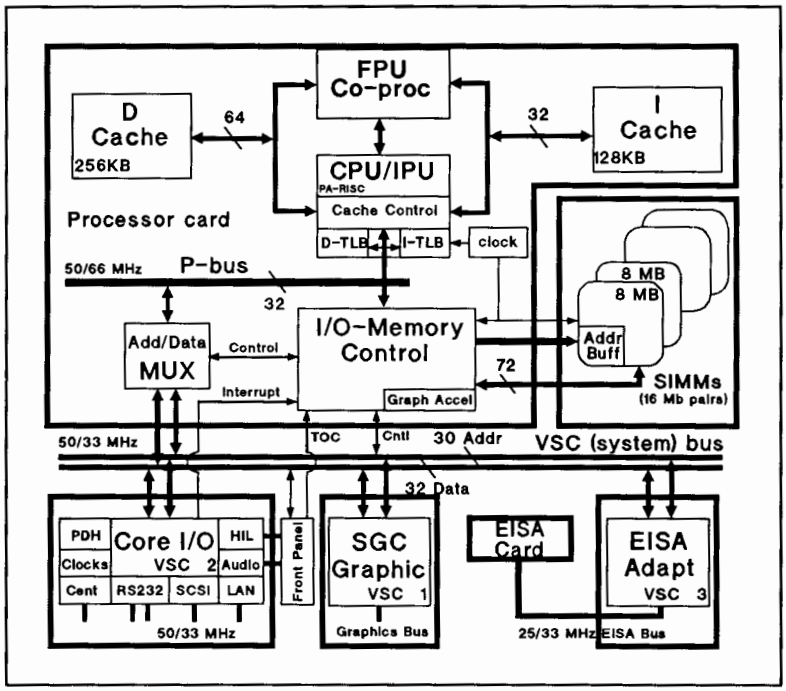

Figure 7-1. Block Diagram of the Model 720/730 Major Card FRUs

Processor Card

The Processor card is made up of three VLSI chips to process instructions, the CPU (IPU processor), FPU (coprocessor), and I/O-Memory Control along with system clock logic, data mux, SRAMs, and connectors for the 8 MB SIMM cards.

CPU (IPU) Chip

This chip implements the enhancements and extensions made to the PA-RISC architecture, supports 50 or 66 Mega-Hertz speed grades, and external cache memory arrays.

Features.

- Contains thirty-two 32-bit general registers
- Uses a 5-stage pipeline (enhanced to calculate branch target addresses earlier)
- Incorporates individual instruction and data TLB logic with (96 entries each)
- Incorporates cache logic to control separate (external) instruction and data SRAM arrays in a direct-mapped (one-way associative) double-word cache line
- Supports two new coprocessor quad-word store instructions that improve hand-coded (Linpack and graphics) benchmarks
- Supports three new instructions that speeds the flow of data to/from the graphics frame buffer and improves z-buffer calculations in the I/O Memory Controller chip

Floating-Point Coprocessor Chip

This chip was designed to operate specifically with the CPU (IPU) chip and the external cache.

Features.

- Provides expansion of the register file to 32 double-word registers
- Able to pack two single-precision values into one double-word register
- Supports multi-op instructions such as Multiply/Add
- Provides a direct path to the external I-CACHE to access instructions
- Provides a direct path to the external D-CACHE to access data words
- Uses a fully pipelined instruction interface compatible with the CPU (IPU)
- Supports fully concurrent (super-scaler fashion) operation of its ALU and MPY logic elements
- Incorporates a 2-entry floating-point operation queue to enhance instruction execution

I/O-Memory Control Chip

This chip controls service requests for memory accesses from the CPU (IPU) chip, the System (core I/O) card and the EISA card adapter. It also manages system arbitration for the VSC (system) bus, external interrupt control, and logic to accelerate graphics functions for color and z-buffer interpolation.

Features.

- Provides a copyout buffer to speed up access to the DRAM memory arrays on the SIMM card pairs: Model 720 = 200 MB per second; Model 730 = 264 MB per second)
- Provides an address queue (four entries) to improve cache flushes and a word write queue for word and sub-word based accesses
- Contains both VSC read and instruction prefetch logic to anticipate the next memory request

Data Mux Chip

This chip is an external part of the I/O-Memory Control chip that connects the (address and data) multiplexed P Bus with the non-multiplexed VSC (system) Bus.

SIMM Cards

The SIMM cards are an external part of the I/O-Memory Control chip. They are installed on the Processor card in dedicated connector pairs (slots 0 through 3). Each SIMM card consists of a Memory Address Buffer chip and a bank of 18 (nibble-wide) DRAM chips.

The Address Buffer chips are always used in pairs. Each pair of buffer chips provide the following features:

- Supports 1, 4, and 16 Megabit (nibble-wide) DRAM chips for 2 MB, 8 MB, and 16 MB SIMM cards respectively.
- Provides the following configuration and control functions through diagnose (store) instruction to the I/O-Memory Control chip:
  - **HPA** (hard physical address) and size initialization (see page 7-13)
  - **SPA** (soft physical address) initialization, enabling, and disabling (see page 7-14)

SGC Graphic Adapter

- Support for one SGC graphic subsystem (internal or external)

EISA Card Adapter

- Support for one EISA host adapter option
- EISA Bus frequency is jumper selectable for 25 MHz. operation for Model 720 systems or 33 MHz. operation for Model 730 systems

System (core I/O) Card

The System (core I/O) card provides competitive, high-performance, low cost I/O subsystems for HP workstations and servers. The card contains a wide variety of industry-standard I/O. Figure 7-2 provides a simplified block-level illustration of the logic supported on the System (core I/O) card.

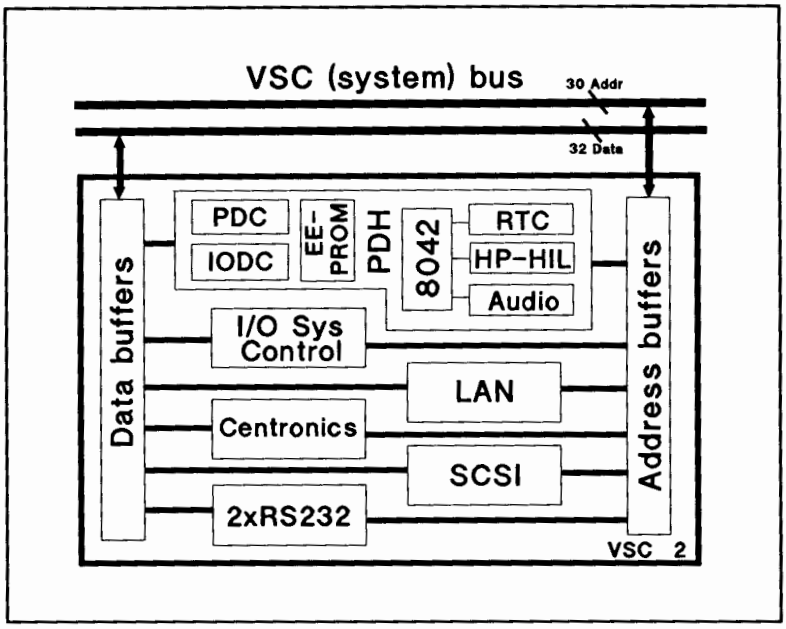

Figure 7-2. Logic Functions on the System (core I/O) Card

Features

- Processor-Dependent Hardware: PDC and IODC EPROMs; Stable Storage EEPROM; audio jack for an external speaker; HP-HIL port for the keyboard; and battery backed up Real-Time Clock
- One parallel (Centronics) port
- Two RS-232 (serial) ports
- One 8-bit data SCSI port (jumper selectable for 50 or 33 Mega-Hertz operation) for up to seven single-ended devices
- One 802.3 LAN port (jumper selectable for ThinLAN or ThickLAN networks)

Model 750 Major Card FRU Descriptions

Precision architecture (PA-RISC) hardware modules are incorporated onto the major card FRUs. Workstation FRUs may contain one module, several modules, or part of a module. For example, the 8 MB SIMM cards are part of the memory module and the VSC Graphics (interface) card is a part of the graphics module.

Figure 7-3 is a simplified block diagram of the major card FRUs that make up Model 750 workstations and servers.

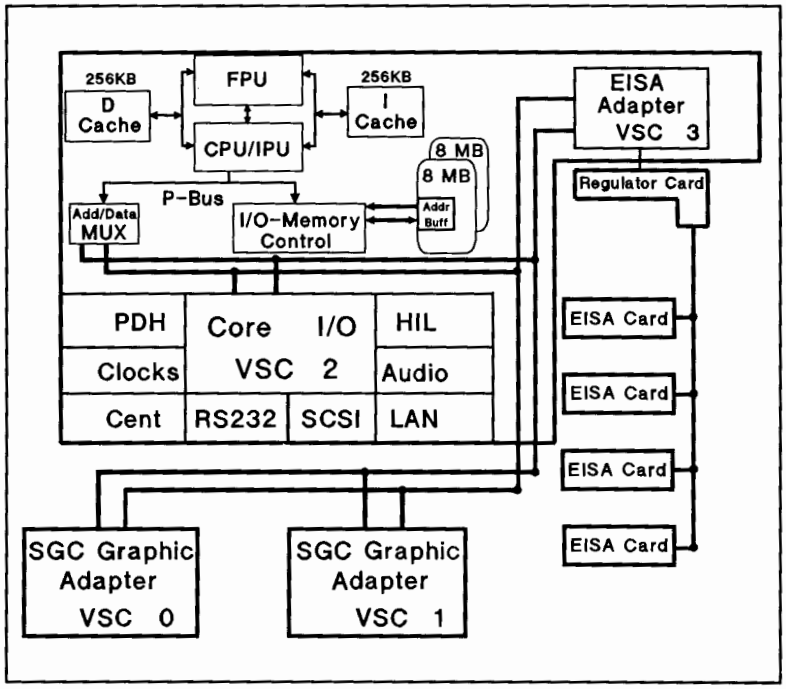

Figure 7-3. Block Diagram of the Model 750 Major Card FRUs

System Card

The processor portion of the **System card** is made up of three VLSI chips to process instructions, the CPU (IPU processor), FPU (coprocessor), and I/O-Memory Control along with system clock logic, data mux, SRAMs, and connectors for the 8 MB SIMM cards.

CPU (IPU) Chip

This chip implements the enhancements and extensions made to the PA-RISC architecture, supports 66 Mega-Hertz speeds, and external cache memory arrays.

Features.

- Contains thirty-two 32-bit general registers
- Uses a 5-stage pipeline (enhanced to calculate branch target addresses earlier)
- Incorporates individual instruction and data TLB logic with (96 entries each)
- Incorporates cache logic to control separate (external) instruction and data SRAM arrays in a direct-mapped (one-way associative) double-word cache line
- Supports two new coprocessor quad-word store instructions that improve hand-coded (Linpack and graphics) benchmarks
- Supports three new instructions that speeds the flow of data to/from the graphics frame buffer and improves z-buffer calculations in the I/O Memory Controller chip

Floating-Point Coprocessor Chip

This chip was designed to operate specifically with the CPU (IPU) chip and the external cache.

Features.

- Provides expansion of the register file to 32 double-word registers
- Able to pack two single-precision values into one double-word register
- Supports multi-op instructions such as Multiply/Add
- Provides a direct path to the external I-CACHE to access instructions
- Provides a direct path to the external D-CACHE to access data words
- Uses a fully pipelined instruction interface compatible with the CPU (IPU)
- Supports fully concurrent (super-scaler fashion) operation of its ALU and MPY logic elements
- Incorporates a 2-entry floating-point operation queue to enhance instruction execution

I/O-Memory Control Chip

This chip controls service requests for memory accesses from the CPU (IPU) chip , the System (core I/O) card and the EISA card adapter. It also manages system arbitration for the VSC (system) bus, external interrupt control, and logic to accelerate graphics functions for color and z-buffer interpolation.

Features.

- Provides a copyout buffer to speed up access to the DRAM memory arrays on the SIMM card pairs: Model 750 = 264 MB per second)
- Provides an address queue (four entries) to improve cache flushes and a word write queue for word and sub-word based accesses
- Contains both VSC read and instruction prefetch logic to anticipate the next memory request

Data Mux Chip

This chip is an external part of the I/O-Memory Control chip that connects the (address and data) multiplexed P Bus with the non-multiplexed VSC (system) Bus.

SIMM Cards

The SIMM cards are an external part of the I/O-Memory Control chip. They are installed on the Processor card in dedicated connector pairs (slots 0 through 11). Each SIMM card consists of a Memory Address Buffer chip and a bank of 18 (nibble-wide) DRAM chips.

The Address Buffer chips are always used in pairs. Each pair of buffer chips provide the following features:

- Supports 1, 4, and 16 Megabit (nibble-wide) DRAM chips for 2 MB, 8 MB, and 16 MB SIMM cards respectively.
- Provides the following configuration and control functions through diagnose (store) instruction to the I/O-Memory Control chip:
  - **HPA** (hard physical address) and size initialization (see page 7-13)
  - **SPA** (soft physical address) initialization, enabling, and disabling (see page 7-14)

SGC Graphic Adapters

- Support for two SGC graphic subsystems (internal or external)

EISA Card Adapter

- Support for four EISA host adapter options
- EISA Bus frequency operates at 33 Mega-Hertz for Model 750 systems

Core I/O Logic

The Core I/O logic on the System card provides competitive, high-performance, low cost I/O subsystems for HP workstations and servers. The card contains a wide variety of industry-standard I/O. Figure 7-4 provides a simplified block-level illustration of the logic supported on the System card.

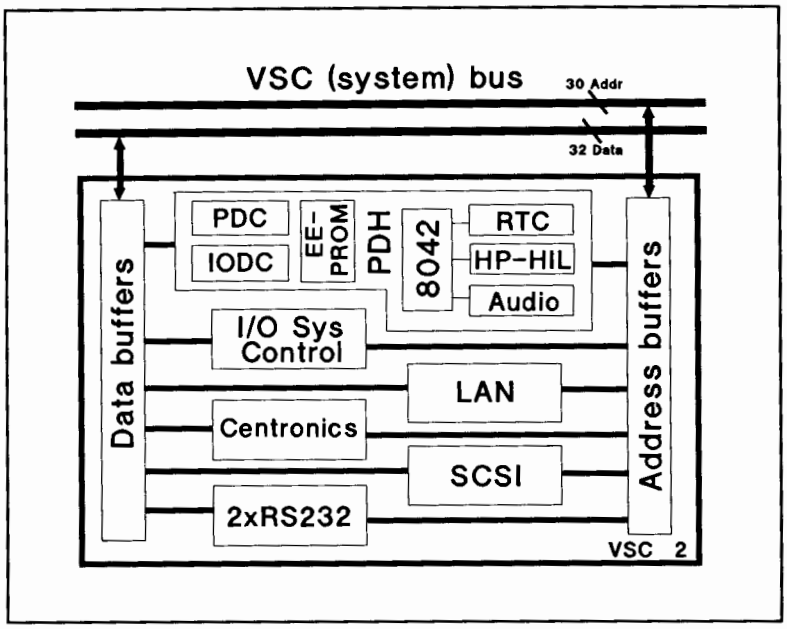

Figure 7-4. Core I/O Logic Functions on the System Card

Features

- Processor-Dependent Hardware: PDC and IODC EPROMs; Stable Storage EEPROM; audio jack for an external speaker; HP-HIL port for the keyboard; and battery backed up Real-Time Clock
- One parallel (Centronics) port
- Two RS-232 (serial) ports
- One 8-bit data SCSI port (33 Mega-Hertz operation only) for up to seven single-ended devices
- One 802.3 LAN port (jumper selectable for ThinLAN or ThickLAN networks)

PA-RISC Modules

PA-RISC modules are hardware entities connected by system buses. Previously, only three basic types of modules have been distinguished in a computer: processor, main memory, and input/output (I/O). In HP Precision Architecture, these basic types were expanded and the following modules have been defined explicitly:

- Native processors, foreign processors, and attached processors
- Main memory
- Bus converters and bus adapters
- Direct (DIO) I/O adapters and Direct Memory Access (DMA) I/O adapters

A **native processor**, or simply processor, conforms completely to Precision Architecture and can execute not only the standard HP Precision Architecture instruction set but also to standard operating system software.

A **foreign processor** module has its own instruction set and therefore, does not execute the standard instruction set.

An **attached processor** can execute the standard instruction set but may not conform fully to HP Precision Architecture. An attached processor may be oriented towards a particular type of processing, such as a front-end I/O processor or an array processor.

Memory modules contain all the instructions and data needed to execute programs. They are accessed by native processors and DMA adapter modules.

DMA I/O adapters can directly access the memory modules. A DMA I/O adapter can fetch commands from the memory, transfer data to or from the memory, and post status words in the memory. DMA I/O adapters are used to move large blocks of information into or out of the computer without incurring continual processor overhead.

Direct I/O adapters provide the simplest form of I/O interface to devices. They are used in low-data-rate, low-cost applications and real-time control applications. Although a direct I/O adapter can generate interrupts to the processor, it cannot access the main memory module directly.

Both **bus converters and bus adapters** connect two buses and perform protocol conversion. A **bus converter** connects two system buses. It is used to connect a high-speed system bus to a slower-speed system bus or to extend the length of a system bus by buffering the signals. A **bus adapter**, however, connects a foreign bus to a system bus so that *foreign I/O modules*, designed for other computer systems, can be migrated and used in HP Precision Architecture systems.

System buses, which connect the architecture-defined modules, meet the bus standards of HP Precision Architecture. The bus that connects and can only connect to foreign I/O modules is called a foreign bus.

A foreign I/O module does not conform to HP Precision Architecture. Foreign I/O modules are allowed to be used in HP Precision Architecture systems. Due to the presence of foreign I/O modules, DMA I/O adapters and direct I/O adapters, which conform to HP Precision Architecture, are classified as native I/O modules.

Series 700 Workstation Module Descriptions

The native processor module shown in Figure 7-5 actually consists of the CPU (IPU), external I-cache and D-cache, and FPU coprocessor chips. Likewise, the memory module consists of the logic on the I/O-memory control chip and the dynamic random-access memory chips (DRAMs) on the SIMM cards. Both the processor and memory modules are grouped into the same *box* because they are on the processor card FRU and share a common connection to the VSC (system) bus.

The core I/O functions (LAN, SCSI, Centronics, RS-232, HP-HIL, and sound) are treated as individual *native DMA or Direct adapter modules*. All of these modules reside on the same card FRU and share a common connection to the VSC (system) bus.

The Direct (graphics) modules, graphics0 and graphics1, contain high-speed computational logic and control functions that drives the graphics monitors (not shown). Graphics data and commands are transferred from the processor over the VSC (system) bus to the graphics subsystems. Mouse and keyboard functions for both graphics subsystems are controlled by the Direct (HP-HIL) module that resides on the System (core I/O) card FRU for Model 720/730 workstations and on the System card for Model 750 workstations.

Optional EISA cards are *foreign I/O modules* that function as DMA adapter modules. EISA card options connect directly to a *foreign* (EISA) bus that connects to the VSC (system) bus through a Bus Adapter module on the EISA adapter card assembly.

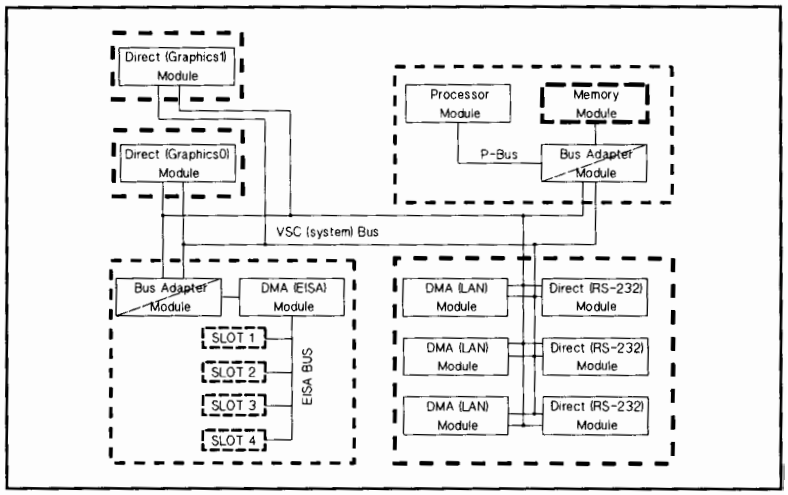

Figure 7-5. Module Configuration for Series 700 Workstations

Virtual Address Range

All PA-RISC systems provide either 48 or 64 bits of virtual address space. This addressing scheme provides 48 physical bits of absolute address space for Level 1 processors and 64 physical bits of absolute address space for Level 2 processors. The entire 48/64 bits of the address space are considered virtual addresses.

Note Series 700 workstations and servers support Level 1 (48 physical bits) of virtual address space.

The virtual address space in HP Precision Architecture systems is actually divided into two distinct areas: the physical address range and the virtual address range. See Figure 7-6.

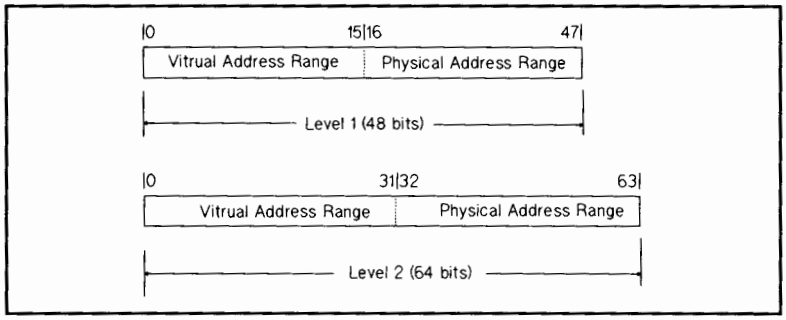

Figure 7-6. Partitions in the Virtual Address Space

In a virtual addressing scheme, each program is thought of as residing in a hypothetical "virtual memory." Each program is allocated its own space (range of addresses) within the upper bounds (bits 0 - 15 or 0 - 31) of the virtual address range. Virtual addresses must be mapped into the lower bounds (bits 16 - 47 or 32 - 63 of the physical address range) to get them into main memory.

Address Translation

Address translation logic in the PA-RISC processor module translates all 48-bit virtual addresses provided by the O/S to 32-bit physical address range of PA-RISC (memory and I/O) modules. Hence, for every cache or memory access, virtual addresses are translated to physical addresses by TLB logic in the CPU (IPU).

For this purpose, the processor provides an instruction TLB, referred to as **I-TLB**, for accessing a block of instructions from the I-CACHE and a data TLB, referred to as **D-TLB**, for accessing and storing a block of data to/from the D-CACHE.

Hardware logic within the CPU (IPU) chip initiates a branch to a trap handler in the HP-UX kernel for (I or D) TLB-misses; guest address errors within a I-TLB or D_TLB entry will force a **LPMC** interruption.

Physical Address Range

The last 32 bits of the virtual address space is called the physical address range. The physical address range is further divided into two distinct areas: the memory address range and the I/O address range.

Addresses within the I/O address range (X'F0000000 - FFFFFFFF) are accessible by LOAD/STORE instructions executed by the processor module. Addresses within the Memory address range (X'0 - EFFFFFFF) are accessible by the cache controller in the processor or by individual DMA I/O adapter modules. See Figure 7-7.

The system bus is assigned a bus address space of 256 Kilobytes within the *Fixed Address Space* to accommodate up to 64 modules. This is known as the hard physical address (HPA) range (X'FFF80000 - FFFBFFFF).

A bus's address range may be extended by assigning additional 256 Kilobyte ranges within the *Available I/O Space* (X'F0000000 - FFF7FFFF).

All native I/O modules on the system bus must also respond to addresses within the *Broadcast Address Space* (X'FFFC0000 - FFFFFFFF).

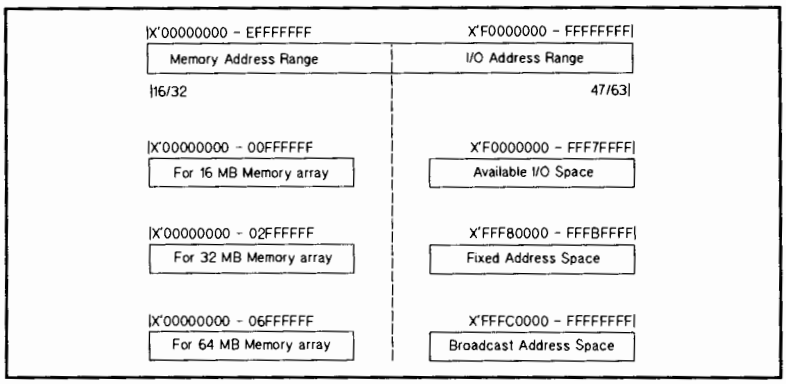

Figure 7-7. Address Partitions in the Physical Address Range

Note

Memory modules are unique in that their registers respond to addresses within the Fixed Address Space (X'FFF80000 - FFFBFFFF) and their arrays respond to soft physical addresses (SPA) in the Memory Address range (X'00000000 - EFFFFFFF).

Each native I/O module has control registers that must also respond to addresses within the *Broadcast Address Space* (not shown).

Address Range Partitions for Workstation Modules

Instruction and data words stored in cache and main memory fall within a 32-bit physical address range called the memory address range. The memory address range consists of both (RAM and disk) memory. All physical addresses outside the range of RAM memory fall into the range of (hard/soft) disk memory.

Status/control/data registers on each native I/O module responds to a *unique* 4 Kilobyte address range within either the *Available I/O Space* (X'F0000000 - FFF7FFFF) or the *Fixed Address Space* (X'FFF80000 - FFFBFFFF). See Figure 7-8.

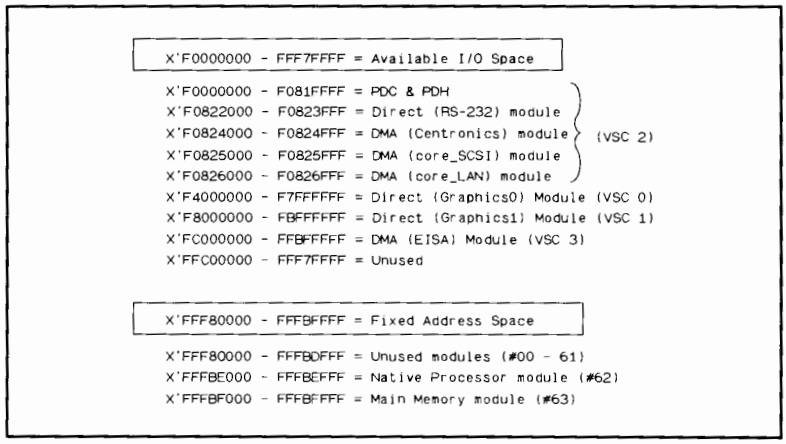

Figure 7-8. I/O Address Range Partitions for Modules

Inter-Module Operations

Operations between modules is accomplished by the "requesting" module asserting a 32-bit physical address onto the VSC (system) bus. The module that "responds" to this address will decode additional signal lines to determine the size (in bytes) and type (read or write) of the operation.

The processor and DMA adapter modules "request" operations with other modules. DMA adapter modules request operations to transfer blocks of data into or out of memory modules. Cache control logic, in the processor module, requests operations to fetch instructions or data from main memory or flush data to main memory. The CPU (IPU) executes LOAD and STORE instructions to transfer informat ion between registers in the CPU (IPU) and registers in the target module.

Summary of Workstation Module Errors

Hardware logic within each module detect both *hard* (unrecoverable) and *soft* (recoverable) errors. Recoverable errors force a low-priority machine check (LPMC) interruption; unrecoverable errors force a high-priority machine check (HPMC) interruption. Diagnostic programs relate HPMCs to a specific *FRU or component*; the HP-UX kernel relates HPMCs to a *module*.

Unrecoverable hardware errors detected by a memory or I/O module will halt the operation to prevent data corruption. The exception to this is the processor module. The processor module is forced to branch to the HPMC handler in PDC when a high-priority machine check is detected.

High-priority machine checks or simply HPMCs, invoke a routine in PDC that attempts to save the state of the system in a reserved area of main memory, if possible, before dumping the contents of main memory to a swap area on the system disk.

The following *hard* error types may force a HPMC interruption:

- D-cache parity errors
- Multi-bit memory parity errors
- Processor address errors
- Transfer of control

D-CACHE parity errors force an HPMC interruption when a parity error is detected in the processor module while reading data cache tags or flushing data cache entries to main memory.

Note that *I-CACHE parity errors* are *correctable* and force a LPMC interruption to fetch the cache line from memory and log the error.

Multi-bit memory parity errors force a HPMC interruption when two or more bits are in error while sending a cache line to the processor module or during DMA read operations to DMA I/O modules or fetching an I/D-cache line (32 words).

Note that *single-bit parity errors* are *correctable* and force a LPMC interruption to log the address and syndrome word.

Processor address errors force an HPMC interruption when the target (responder module) does not respond to a Load or Store instruction. (A target module may not respond because of an error detected from a previous operation.)

Note that *VSC (system) bus timeouts or illegal accesses* force an LPMC interruption during DMA read/write operations. The "requester" or the "responder" (DMA I/O module) is not logged.

Transfer of control is not an error but rather a mechanism used to gain control of *hung* system. Pushing the **TOC** switch on the front panel will force an HPMC interruption that will attempt to save system state and dump the contents of main memory to the swap area on the system disk.

Module Error Reporting/Logging

Troubleshooting HPMCs involves examining the error information reported or logged after identifying the module(s) that forced the HPMC interruption. After each HPMC interruption, the HPMC handler in PDC saves the state of the CPU (IPU) registers both in **PIM** and **Stable Storage** before passing control back to the O/S.

The HPMC handler in the O/S kernel examines PIM to determine the extent of the error and whether recovery is possible. If recovery is not possible, a minimum amount of information related to the HPMC is displayed on the console device. This message is referred to as the HP-UX Kernel Tombstone.

HP-UX Kernel Tombstone Message

Figure 7-9 is an example of an HP-UX Kernel Tombstone message caused by pressing the TOC switch:

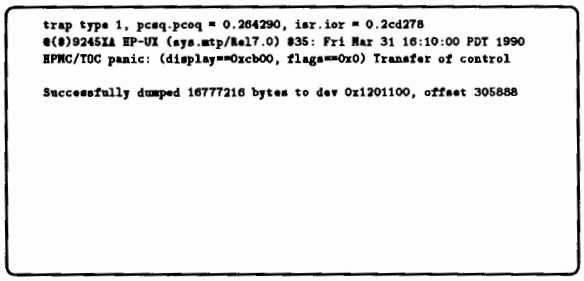

Figure 7-9. Transfer of Control

The top line identifies the trap type as "1" (group 1 interruptions have the highest priority); the virtual address (space and offset queues) of the program counter; and the physical address (space and offset) of the last instruction.

The second line is a timestamp containing date, time, and O/S version.

The third line from the top identifies the above tombstone message as either a TOC or a HPMC panic. The SPU operational status code displayed for a TOC is 0xcb00; HPMCs will display "0xb000."

The last line indicates the byte address and offset on the system disk where 16 Megabytes of main memory were successfully dumped.

HPMC Caused by a Data Cache Parity Error

An HPMC interruption is forced when a data cache parity error is detected during a Load instruction to the memory address space or during a data cache flush operation.

Figure 7-10 is an example of the HPMC error information retrieved from Stable Storage by the PIM_INFO command during the Boot Administration environment.

```
CPU State          = 0x9e000004
Cache Check        = 0x40000000
TLB Check          = 0x00000000
Bus Check          = 0x00000000
Assists Check      = 0x00000000
Assist State       = 0x00000000
System Responder Address = 0x00000000
System Requester Address = 0x00000000
System Controller Status = 0x00000nnn

BOOT_ADMIN>
```

Figure 7-10. Processor Module Error (data cache parity)

The value in the CPU State word indicates that register values and addresses stored in Stable Storage at the time of the HPMC were saved.

The value in the Cache Check word identifies that logic in the processor module detected a (data) cache parity error. *Ignore the value in the System Controller Status word.*

- For Model 720/730: The failed processor module is on the Processor card.
- For Model 750: The failed processor module is on the System card.

HPMC Caused by a Multi-Bit Memory Parity Error

An HPMC interruption is forced when a multi-bit memory parity error is detected during a "DMA read" operation or fetching an I/D-cache line (32 bytes).

Figure 7-11 is an example of the HPMC error information retrieved from Stable Storage by the PIM_INFO command during the Boot Administration environment.

```
CPU State          = 0x9e000004
Cache Check        = 0x00000000
TLB Check          = 0x00000000
Bus Check          = 0x00210004
Assists Check      = 0x00000000
Assist State       = 0x00000000
System Responder Address = 0x09f9400c
System Requester Address = 0x00000000
System Controller Status = 0x00000nnn

BOOT_ADMIN>
```

Figure 7-11. Multi-Bit Memory Parity Error

The values in the Bus Check and System Requester Address words identifies that a multi-bit memory parity error was detected by logic in the memory module. *Ignore the value in the System Controller Status word.*

The System Responder Address contains the **SPA** of the faulty SIMM card pairs. In this example, the **SPA** value in the System Responder Address word was allocated to slots 0 (A/B) for 160 MB systems and to slots 1 (A/B) for 192 MB systems. **See the row marked with arrows in the matrix below.**

```
            |<------------------------ Model 750 ---------------------->|
            |<---------- Model 720/730 ------------>|                    |
  8 MB SIMM| 16 | 16 | 32 | 32 | 48 | 48 | 64 | 64 | 80 | 80 | 96 | 96 |
==========|====|====|====|====|====|====|====|====|====|====|====|====|
0x00nnnnnn| 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 4A | 4B | 5A | 5B |
0x01nnnnnn| -- | -- | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 4A | 4B |
0x02nnnnnn| -- | -- | -- | -- | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B |
0x03nnnnnn| -- | -- | -- | -- | -- | -- | 0A | 0B | 1A | 1B | 2A | 2B |
0x04nnnnnn| -- | -- | -- | -- | -- | -- | -- | -- | 0A | 0B | 1A | 1B |
0x05nnnnnn| -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0A | 0B |
            |<------------------------ Model 750 ---------------------->|
16 MB SIMM| 32 | 32 | 64 | 64 | 96 | 96 |128 |128 |160 |160 |192 |192 |
==========|====|====|====|====|====|====|====|====|====|====|====|====|
0x00nnnnnn| 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 4A | 4B | 5A | 5B |
0x02nnnnnn| -- | -- | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B | 4A | 4B |
0x04nnnnnn| -- | -- | -- | -- | 0A | 0B | 1A | 1B | 2A | 2B | 3A | 3B |
0x06nnnnnn| -- | -- | -- | -- | -- | -- | 0A | 0B | 1A | 1B | 2A | 2B |
->0x08nnnnnn| -- | -- | -- | -- | -- | -- | -- | -- | 0A | 0B | 1A | 1B |<-
0x0annnnnn| -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0A | 0B |
```

HPMC Caused by a Processor Address Error

An HPMC interruption is forced when a Processor Address error is detected by logic in the processor module while executing a "load or store" instruction to/from a register in the target module.

Figure 7-12 is an example of the HPMC error information retrieved from Stable Storage by the PIM_INFO command during the Boot Administration environment.

```
CPU State          = 0x9e000004
Cache Check        = 0x00000000
TLB Check          = 0x00000000
Bus Check          = 0x00310007
Assists Check      = 0x00000000
Assist State       = 0x00000000
System Responder Address = 0xf800nnnn
System Requester Address = 0xfffbe000
System Controller Status = 0x00000nnn

BOOT_ADMIN>
```

Figure 7-12. Process Address Error (failed Load/Store operation)

The value in the CPU State word indicates that register values and addresses stored in Stable Storage at the time of the HPMC were saved.

The values in the Bus Check and System Requester Address words identifies that a Processor Address error was detected by logic in the processor module. The value in the System Requester Address word is the hard physical address or **HPA** of the processor module. *Ignore the value in the System Controller Status word.*

In this example, the value in the System Responder Address word is 0xf800nnnn, which falls within the range of addresses within the Available I/O Space (0xf8000000 to 0xfbffffff) of the Direct (graphics1) module in slot 2 of Model 720/730 and 750 systems. (See Figure 7-8.)

```
System Responder Address values within the range 0xf0820000–0xf0ffffff
involve the core I/O modules (LAN, SCSI, HIL, or Centronics ports) on the
System (core I/O) card for Model 720/730 systems or on the System card for
Model 750 systems.

System Responder Address values within the range 0xf4000000–0xf7ffffff
involve the  Direct (graphics0) module (internal or interface card) in slot 1
of Model 750 systems.

System Responder Address values within the range 0xfc000000–0xffbfffff
involve the (LAN, SCSI, or HP-IB module) on the EISA card adapter of Model
720/730 and 750 systems.
```

8

EISA Interface and Networking Options

EISA Host Adapter Card Options

This chapter provides a description of the supported EISA host adapter card options supported by Series 700 systems. Information on future EISA host adapter options will be supplied by the Roseville Networks Division (RND).

HP 25525A EISA SCSI-2 (Differential) Host Adapter

The HP 25525A EISA SCSI-2 Host Adapter provides Series 700 systems with an optional high-speed differential SCSI bus. Complies with X3.131-1990 SCSI-2 standards.

All devices connected to this SCSI bus *must use differential (balanced) signals* as defined by the SCSI-2 specification. "Differential SCSI" provides the signal quality needed to operate in the *fast mode* as defined by SCSI-2 features in chapter 2 of this document. In addition, differential SCSI allows SCSI bus lengths of up to 25 meters.

Note

Never mix differential and single-ended SCSI devices on a SCSI bus. The HP 25525A Host Adapter supports devices with differential signals only.

HP 25525A Features

- Provides a 50-pin high-density (female) connector for 8-bit parallel data transfers over the SCSI bus up to 25 meters (includes any internal lengths in all devices).
- Supports synchronous transfer rates up to 10.0 Megabytes per second; asynchronous transfer rates up to 5.0 Megabytes per second.
- Provides boot support of Series 700 systems.
- Connects up to seven devices using HP-UX version 8.05 or higher.
- Provides pre-installed SCSI bus termination resistors. An external terminator assembly is provided with this product for terminating the other end of the SCSI bus.
- Supplies termination power (TERMPWR) to the SCSI bus, and is designed with a self-resetting electronic fuse to protect card circuitry.
- Configured through software; there are no hardware switches or jumpers to set. (See "Host Adapter Settings" below.)

Host Adapter Settings

The following card settings are enabled/disabled by the **eisa_config(1M)** utility program and the **HWP0C80.CFG** configuration file provided with HP-UX version 8.05:

- Boot ROM - the boot ROM must be enabled in order to boot from any device on the differential SCSI bus; default setting is enabled.
- SCSI address (ID) - the host adapter's id may be set from 0 to 7; default setting is 7.
- Parity-checking - all devices on the SCI bus must have the same parity-checking capability; default setting is enabled.

Note

Due to a limitation in HP-UX version 8.05, only the first three HP 25525A EISA SCSI-2 Host Adapter cards can have their Boot ROM's enabled when four HP 25525A host adapter cards are installed in a Model 750 system.

HP 25525A EISA SCSI-2 (Differential) Host Adapter, continued

HP 25525A Specifications

Classification	Standard supported by the 25525A Host Adapter
Environmental	Same as the A1094 and A1095 System Unit: see chapter 1 for A1094 specifications or chapter 1a for A1095 specifications.
Regulatory	EMI (conducted and radiated): ■ Same as the A1094 and A1095 System Unit: see chapter 1 for A1094 specifications or chapter 1a for A1095 specifications. ■ CISPR-22 Class A (in Europe)
Physical	Net weight = 184 grams (6.5 ounces) 213 mm (8.4 inches) long, 114 mm (4.5 inches) width, 15 mm (0.6 inches) thick
Electrical	15.3 Watts typical @ +5 Volts DC 0.06 Watts typical @ +12 Volts DC

Supported Devices

Refer to chapter 2 of this document for a list of the supported devices.

Differential SCSI Cabling Example

Figure 8-1 demonstrates the SCSI extension and peripheral cables used to configure three SCSI devices to the HP 25525A Host Adapter. See chapter 2 for a description of the differential cables.

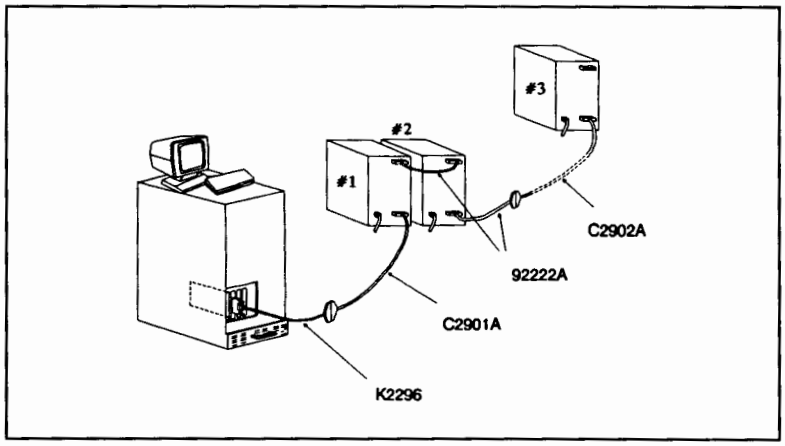

Figure 8-1. Differential SCSI Cabling Example

HP 25560A EISA HP-IB Host Adapter

The HP 25560A EISA HP-IB card provides Series 700 systems with an optional connection to HP-IB peripheral devices. Complies with IEEE-488-1978 and supplement IEEE-488A-1980 standards.

Note

The HP 25560A EISA HP-IB host adapter does NOT provide boot support on Series 700 systems.

HP 25560A Features

- Provides a 24-pin (male/female) connector for 16-bit parallel data transfers over the HP-Interface Bus up to 15 meters (includes any internal lengths in all devices).
- A burst transfer rate of 1 Megabytes per second during high-speed operation; 500 Megabytes per second during slow/medium-speed operation
- Connects up to 14 HP-IB peripheral devices using HP-UX 8.05 or higher
- Provides a removable resistor pack for up to seven equivalent device loads
- Configured through software; there are no hardware switches or jumpers to set. (See "Host Adapter Settings" below.)

Host Adapter Settings

The following card settings are enabled/disabled by the **eisa_config(1M)** utility program and the **HWP0C70.CFG** configuration file provided with HP-UX version 8.05:

- System Controller - the host adapter can be enabled or disabled as the HP-IB system controller to assume control of the bus at any time; default setting is enabled.
- HP-IB address (ID) - the host adapter's id may be set from 0 to 30; default setting is 30.
- HP-IB speed - the host adapter can be configured for high or slow/medium speed operation; default setting is for high-speed operation.
- DMA channel - the host adapter must operate on the EISA bus through one of seven DMA channels: 0, 1, 2, 3, 5, 6, or 7. The initial setting is not known until dynamically set by the system during power-on.
- Interrupt level - each interrupt level is unique and defines the interrupt priority on the EISA bus. For the EISA LAN adapter, the interrupt level can be one of the following: 9, 10, 11, 12, 15, 3, 4, or 5. The initial setting is not known until dynamically set by the system during power-on.
- Boot ROM - there is no boot ROM installed on the host adapter; default setting is not enabled.

HP 25560A EISA HP-IB Host Adapter, continued

HP 25560A Specifications

Classification	Standard supported by the 25560A Host Adapter
Environmental	Same as the A1094 and A1095 System Unit: see chapter 1 for A1094 specifications or chapter 1a for A1095 specifications.
Regulatory	EMI (conducted and radiated): ■ Same as the A1094 and A1095 System Unit: see chapter 1 for A1094 specifications or chapter 1a for A1095 specifications. ■ CISPR-22 Class A (in Europe)
Physical	Net weight = 173 grams (6.1 ounces) 213 mm (8.4 inches) long, 114 mm (4.5 inches) width, 15 mm (0.6 inches) thick
Electrical	15.3 Watts typical @ +5 Volts DC

Supported Devices

Refer to chapter 2 of this document for a list of the supported devices.

The selection of high or slow/medium-speed operation depends on both the number and performance characteristics of attached devices. In some circumstances, slow/medium-speed devices may be attached to the same bus as high-speed devices provided that requirements for high-speed operation are met. However, performance may decrease. In general, mixing high-speed and slow/medium-speed devices on the same bus is not recommended.

HP 25567A EISA LAN Adapter

The HP 25567A EISA LAN card provides Series 700 systems with an optional 32-bit, burst-mode, bus-mastering LAN connection. Complies with IEEE 802.3 and Ethernet revision 2 standards.

Note The HP 25567A EISA LAN adapter does NOT provide boot support on Series 700 systems.

HP 25567A Features

- Implements CSMA/CD protocol for network access using HP-UX 8.05 or higher
- Two built-in connectors:
  - a 15-pin AUI connector to attach an external transceiver
  - a BNC-type connector to attach to ThinLAN cabling
- A burst transfer rate of 10 Megabits per second
- C2 level security
- Configured through software; there are no hardware switches or jumpers to set. (See "Host Adapter Settings" below.)

Host Adapter Settings

The only configurable parameter (setting) is for the "interrupt level." Each interrupt level is unique and defines the interrupt priority on the EISA bus. For the EISA LAN adapter, the interrupt level can be one of the following: 10, 11, 12, 3, 4, 5, or 7. The initial setting is not known until dynamically set by the system during power-on.

Use the **eisa_config(1M)** utility program and the **HWP0C50.CFG** configuration file provided with HP-UX version 8.05 to change the card's interrupt level setting.

HP 25567A Specifications

Classification	Standard supported by the 25567A Host Adapter
Environmental	Same as the A1094 and A1095 System Unit: see chapter 1 for A1094 specifications or chapter 1a for A1095 specifications.
Regulatory	EMI (conducted and radiated): ■ Same as the A1094 and A1095 System Unit: see chapter 1 for A1094 specifications or chapter 1a for A1095 specifications. ■ CISPR-22 Class A (in Europe)
Physical	Net weight = 210 grams (7.4 ounces) 213 mm (8.4 inches) long, 114 mm (4.5 inches) width, 15 mm (0.6 inches) thick
Electrical	20 Watts typical @ +5 Volts DC 12 Watts typical @ +12 Volts DC

9

SGC Graphic Cards and Monitor Options

SGC Graphic Card Options

This chapter provides a description of the supported SGC graphics subsystem options supported by Series 700 systems. Future graphics information will be supplied by the User Interface Technology Division (UTD), formerly the Graphics Technology Division (GTD) or the Workstation Systems Division (WSY), formerly the Apollo Systems Division (ASY).

SGC Graphics (interface) Cards

Figure 9-1 contains an illustration of an **SGC Graphics (interface) card**. The SGC Graphics (interface) cards provide the connection between an external Graphics Unit and the VSC (system) Bus. They plug directly into the VSC backplane assembly to access the VSC (system) Bus signals and DC power from the power supply in the A1094 or A1095 System Unit cabinet.

The external graphics subsystem connects to the connector on the SGC Graphics (interface) card.

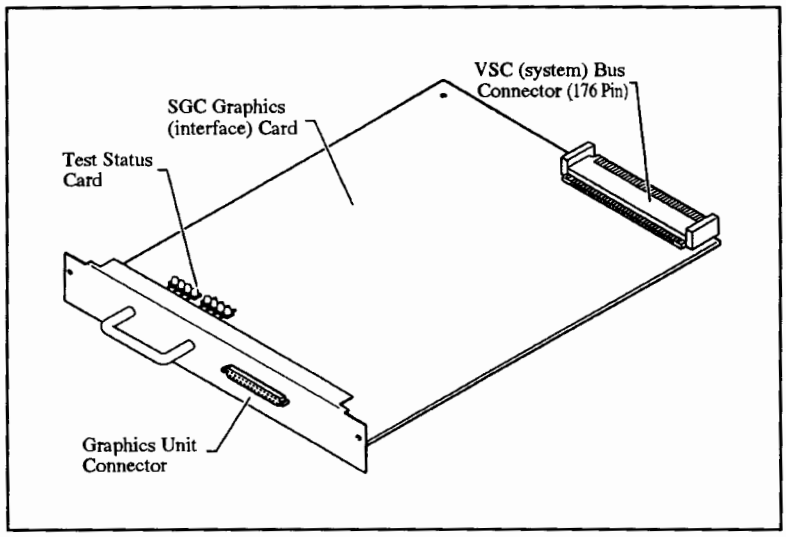

Figure 9-1. SGC Graphics (interface) Card

Features

- The PVRX version supports the HP 98705B graphics subsystem; the TVRX version supports the HP 98765A/98766A graphics subsystems.
- Both versions have the same form factor as DIO-II boards; use version uses a different graphics cable.
- Both versions provide a Standard Text Interface ROM to convert ASCII characters (from the HP-HIL keyboard) to pixel images on the monitor.
- Both versions provide Test/Status LEDs (visible through holes in the bulkhead) to display graphics subsystem status. Refer to the appropriate service documentation (CE Handbook for HP 98705B or HP 98765/66A) for description of LED codes.

Graphic Subsystems

HP 98705B

A 3D color solids and rendering graphics subsystem contained in an external cabinet that uses a SGC Graphics (PVRX) card to communicate with the System Unit.

Features

- Requires the HP 98705-66582 PVRX Graphics (interface) card
- frame buffer design allowing double buffering and color map per window
- upward compatible feature set from SRX and TSRX
- hardware support to enhance realism (radiosity) and accelerate interactivity (ray-tracing)
- 16-bit Z buffer
- Support for HP 98754A 19 inch High-Resolution (1280 x 1024 bit-mapped display) Color Monitor, 60 Hertz

List of HP 98705B Graphics Subsystem Manuals

- *HP 98705A, B, or C Installation Guide* (PN 98705-90600)
- *HP 98705A, B, or C Graphics Processor Hardware Support Manual* (PN 98705-90030)
- *HP 98705A, B, or C CE Handbook* (PN 98705-90039)

HP 98765A/98766A

Both offer advanced 3D color solids and rendering graphics subsystems contained in an external cabinet that uses a SGC Graphics (TVRX) card to communicate with the System Unit. The HP 98765A provides a two transform graphics engine; the HP 98766A provides a four transform graphics engine.

Features

- Both versions require the HP 98765-66584 TVRX Graphics (interface) card
- Both use a frame buffer design allowing double buffering (12/12), 24 color planes, and 4 overlay planes
- Both provide hardware support to enhance realism (radiosity) and accelerate interactivity (ray-tracing)
- Both provide 24-bit Z buffers
- Both provide support for HP A1097A/B 19 inch High-Resolution (1280 x 1024 bit-mapped display) Color Monitors, 72 Hertz (A1097A for northern hemisphere; A1097B for southern hemisphere)

List of HP 98765A/66A Graphics Subsystem Manuals

- *HP 98735/6 and 98765/6 Graphics Display Controller Installation and Configuration Guide* (PN 98735-90010)
- *HP 98735/6 and 98765/6 Graphics Display Controller Hardware Support Manual* (PN 98735-90031)
- *HP 98735/6 and 98765/6 Graphics Display Controller CE Handbook* (PN 98735-90040)

Internal SGC Graphics Cards

Figure 9-2 contains a simplified illustration of an **internal SGC Graphics card**. There are two versions: a grayscale card and an 8-bit pseudo-color card. Both cards plug directly into the VSC backplane assembly to access the VSC (system) Bus signals and DC power from the power supply in the A1094 or A1095 System Unit cabinet.

A monochrome graphics monitor connects directly into the frontplane of the internal SGC Graphics (grayscale) card; a color graphics monitor connects directly into the frontplane of the internal SGC Graphics (color) card. The HP-HIL Keyboard for either monitor plugs directly into an HIL keyboard connector on the frontplane of the System (core I/O) card for Model 720/730 systems (or the System card for Model 750 systems).

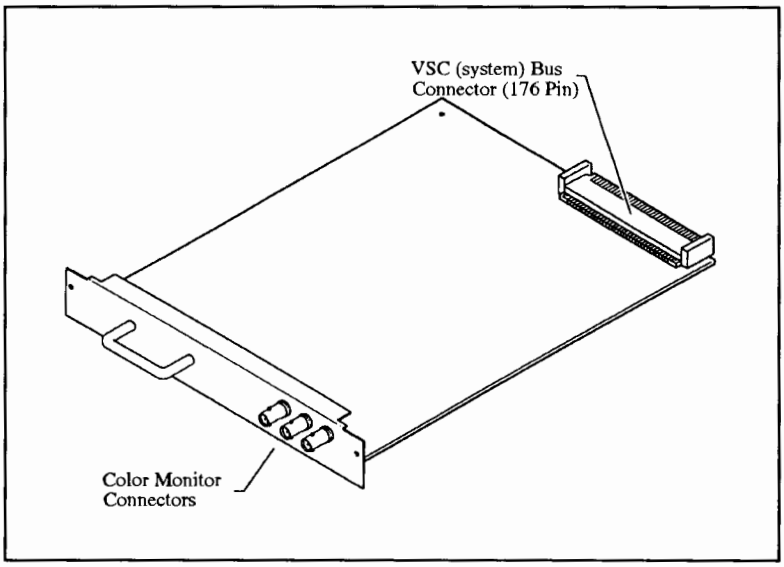

Figure 9-2. Internal CRX Color Graphics Card

Features

- Both versions provide over 1 million vectors per second through tightly coupled graphics and CPU/Memory logic.
- Both versions have the same form factor as DIO-II boards.
- Both versions provide a Standard Text Interface ROM to convert ASCII characters (from the HP-HIL keyboard) to pixel images on the monitor.

SGC Graphics Card Options

GRX Grayscale Graphics Card (HP A1924A)

An internal SGC graphics card that provides outstanding X window performance.

Features

- 8 monoplanes, double buffered; 256 levels of gray
- Accelerated raster operations (up to 8,044 X.11 vectors per second)
- Hardware writeable cursor
- Support for HP 98774A 19 inch High-Resolution (1280 x 1024 bit-mapped display) Monochrome Monitor, 72 Hertz

CRX Color Graphics Card (HP A1659A)

An internal SGC graphics card that processes 1.11 million 3D color vectors per second through the Model 720 Processor card (1.15 million through the Model 730 Processor card).

Features

- 8 color planes, double buffered; 256 location color look up table
- Accelerated raster operations (up to 8,044 X.11 vectors per second on Model 720; up to 9,500 X.11 vectors per second on Model 730)
- Hardware writeable cursor
- Support for HP A1097A/B 19 inch High-Resolution (1280 x 1024 bit-mapped display) Color Monitor, 72 Hertz (A1097A for northern hemisphere; A1097B for southern hemisphere)

Note

Both GRX and CRX graphics cards require *libddgcrx.a* in "/usr/lib" for correct graphics operation.

10

Service Notes

Tab only . . .

This chapter is provided for owner to file future service notes (SN).

Glossary

anti-aliasing
A operation that smooths the jagged (aliased) lines or edges of a polygon by partially shading the colors of the pixels on either side of the line or edge.

autoboot
A command in the Boot Admin. mode used to toggle the on/off state of the autoboot flag in stable storage. *See also autoboot flag.*

autoboot flag
A flag in stable storage that, when set, will initialize and test the boot path logic at power up. When the autosearch flag is also set, will search for a bootable device and launch the O/S without user intervention.

autosearch
A command in the Boot Admin. mode used to toggle the on/off state of the autosearch flag in stable storage. *See also autosearch flag.*

autosearch flag
A flag in stable storage that, when set, will search for a bootable device in a specific order. (See page 4-8.)

bit-mapped display
A raster-scan display that stores pixel information in a frame buffer. *See also raster-scan display.*

Boot Admin. environment
The first environment established after power on. This environment provides user commands to list, modify, or examine boot parameters, devices, etc.

boot device
Any of the following peripherals that contains a copy of the ISL program that can be loaded into main memory: (local or remote) disk, DAT tape, or CD-ROM device.

boot path errors
Those errors detected by the hardware or firmware while attempting to locate and test the boot device. *See also boot device.*

cooling fan tray assembly
Used to prolong the life of the A1095 System Unit logic components by exhausting the warmer (internal) air through vent holes located at the rear of the cabinet.

console device
Any of the following peripherals that can display information: graphics monitor on workstations or RS-232 terminal on servers.

console path errors
Those errors detected by the hardware or firmware while attempting to locate and test the console device. *See also console device.*

data cache (D-CACHE)
The D-CACHE on the Processor card is organized as a "1-set" virtually-indexed, physically-tagged, parity-protected cache. The control logic resides within the CPU chip while the tag and data SRAMs are mounted on the under side of the Processor card.

dithering
A shading technique of blending different colors to form another color, thereby increasing the apparent number of colors on the screen.

double-buffering
A method of dividing the available frame buffer so that half the planes are used to draw the next picture while the second half displays the current picture. Thus, the user does not see the system drawing the next image; he only sees it once it is completely drawn.

D-TLB
The D-TLB on the Processor card is used to translate 48-bit *virtual* addresses into 32-bit *physical* addresses. The D-TLB logic consists of 96 (data word) entries that reside within the CPU chip. *See also I-TLB.*

EISA Card Adapter assembly
The EISA card adapter assembly is used to mount EISA card options in the system unit cabinet. The EISA Bus frequency is jumper selectable for 25 MHz. operation for Model 720 systems or 33 MHz. operation for Model 730 and 750 systems.

EISA Card Cage assembly
This assembly is used to house the four EISA host adapter cards supported by the A1095 System Unit cabinet.

embedded device
A peripheral device mounted within a cabinet for access to power, signals, and cooling air.

fastsize
A byte value, expressed with two hexadecimal digits, used to control the size of memory tested during selftest. A small numeric value reduces the amount of memory to test which, in turn, reduces the time to boot the ISL program into memory. The fastsize value is maintained in stable storage and may be changed during the Boot or ISL program environments.

frame buffer
Memory used for storing the pixels in a picture for screen refresh. *See also pixel.*

Front Panel LED Display
A logic card connected to the VSC backplane that displays the operational state of the A1095 System Unit.

FRU Adding
Implies installing a FRU where no previous FRU was installed. Example: to add an optional EISA card or increase main memory capacity.

FRU Changing
Implies changing the functionality of the FRU. Example: to change 802.3 LAN types between thin or thick cables.

FRU Replacing
Implies removing a FRU and installing another FRU of the same type. Example: to replace a bad FRU to resolve a hardware problem.

FRU Transferring
Implies installing the replaceable components from one FRU to another FRU of the same type. Example: to transfer the functionality from one FRU to another.

FRU Updating
Implies removing a component of a FRU and installing another version of the component. Example: to change PDC or IODC EPROM versions to correct bugs or enhance functionality.

FRU Upgrading
Implies removing a FRU and installing another version of the same FRU type. Example: to change fixed disk units to increase capacity.

hard boot
Initialize and test the processor, memory (with writes and reads), and I/O device paths prior to the loading and execution of the ISL program on the boot device. *See also soft boot.* description

HPA
Hard physical address (HPA) is a unique range of consecutive (word) addresses assigned to each PA-RISC module for the purpose of addressing registers associated with each PA-RISC module. HPA addresses are in the I/O address range from 0xF0000000 to 0xFFFFFFFF. *See also HPA.*

HPMC
A high-priority machine check is the highest priority interruption (group 1 of 5) triggered when an unrecoverable fault such as a data cache parity error is detected. When a HPMC occurs, PDC routines write the current state of the CPU (general registers, space registers, etc.) into a portion of main memory for examination by the O/S. The O/S determines whether the error condition is recoverable or not. If not, the entire contents of main memory is dumped to the swap area on the system disk for later analysis. *See also LPMC.*

instruction cache (I-CACHE)
The I-CACHE on the Processor card is organized as a "1-set" virtually-indexed, physically-tagged, parity-protected cache. The control logic resides within the CPU chip while the tag and data SRAMs are mounted on the under side of the Processor card.

internal CRX Graphics (color) card
An 8-bit pseudo-color graphics card that mounts within the system unit cabinet. *See also internal GRX Graphics (grayscale) card.*

internal GRX Graphics (grayscale) card
A grayscale graphics card that mounts within the system unit cabinet. *See also internal CRX Graphics (color) card.*

internal SGC Graphics card
An entry-level graphics card that mounts within the system unit cabinet. *See also internal CRX Color Graphics card and GRX Graphics (grayscale) card.*

IODC
IODC (input/output-dependent code) provides identification information and software (ENTRY_INIT and ENTRY_IO routines) for PA-RISC modules. IODC routines are located on a single EEPROM on the System (core I/O) card. IODC is accessed during the BOOT_ADMIN environment to initialize, test, and communicate with a boot device through the SCSI port, EISA adapter, or LAN port. *See also PDC.*

IPL
The initial program loader (IPL) is a boot routine stored in PDC. This routine loads the ISL program into main memory from the *selected* boot device. *See also PDC.*

ISL environment
The second environment established after BOOT_ADMIN. ISL is an (optionally) interactive environment which PDC loads from a boot device. This environment provides user commands to list and execute diagnostic and utility programs on the boot device in an offline environment.

I-TLB
The I-TLB on the Processor card is used to translate 48-bit *virtual* addresses into 32-bit *physical* addresses. The I-TLB logic consists of 96 (instruction word) entries that reside within the CPU chip. *See also D-TLB.*

LED Display card
The LED Display card in the system unit cabinet contains all of the front panel LEDs, the TOC switch, and the Service switch. *See also the Switch card.*

LPMC
A (low-priority machine check) is a lower priority interruption (group 2) triggered when a recoverable error such as an instruction cache parity error is detected. When a LPMC occurs, PDC routines correct and log the condition and continue program execution without delay.

main memory
Name given to the portion of virtual memory made up of dynamic RAMs. *See also virtual memory.*

operating system (OS or O/S)
Refers to the HP-UX or OSF operating system software on Hewlett-Packard computer systems.

O/S environment
The (HP-UX or OSF) environment launched by the boot process. This *online* (multi-tasking/multi-user) environment controls the scheduling and execution of all application programs and user sessions.

O/S kernel
The portion of the operating system that resides in main memory.

O/S loading errors
Those errors detected by the hardware or firmware while attempting to load the O/S kernel into main memory.

O/S unrecoverable errors
Those errors detected by the hardware while the operating system is executing that may cause data corruption if operation continues.

PA-RISC modules
Basic hardware elements connected by system buses that make up PA-RISC systems: processors, memory, I/O adapters, bus converters and adapters.

P-Bus
This is a multiplexed (32-bit) address/data bus between the CPU chip and the I/O Memory Control chip on the Processor card.

PDC
PDC (processor-dependent code) is a series of entry-points located within the EEPROM on the System (core I/O) card that are used by the CPU to provide a uniform, architected context in which to perform processor-dependent operations. PDC is accessed during the BOOT_ADMIN, ISL, and HP-UX environments. *See also IODC.*

PIM
Processor internal memory (PIM) is a reserved area in main memory that is used to store error information from HPMC, LPMC, and TOC interruptions.

pixel
The smallest element of a display surface that can be independently assigned a color. A blending of the words picture and element.

Power Supply assembly
The Power Supply assembly provides all of the DC power to the logic components in the system unit cabinet. DC power is distributed through the VSC backplane assembly. *See also VSC Backplane assembly.*

Processor card
The Processor card contains all of the logic for the CPU, coprocessor, caches, and memory modules for PA-RISC systems.

PDC
Processor-dependent code is a collection of instructions (routines) that execute all of the architected functions for a specific PA-RISC processor. PDC routines are located on a single EEPROM on the System (core I/O) card. *See also IODC.*

radiosity
A process in which the visibility of any portion of a surface of an object is accessed (pre-processed) relative to every other surface. It is a model which provides photorealistic images.

raster-scan display
A CRT display device that scans each horizontal line on the display sequentially, turning pixels on and off to form a picture. *See also bit-mapped display.*

ray tracing
A global illumination model which takes into consideration not only the direct light sources but also the reflected, and transmitted light in a scene. Ray tracing approximates the scene by tracing rays from the eye through each pixel and into the environment, which provides photorealistic images.

Regulator card
The Regulator card contains the voltage regulator logic for the EISA card cage. This card provides an indirect connection between the EISA backplane and the VSC backplane.

SCSI Device Tray assembly
The SCSI Device Tray assembly is used to mount 3.5 inch embedded peripherals into the system unit cabinet. *See also embedded device*

SCSI Device Slots
The A1095 System Unit cabinet provides three compartments to house up to four SCSI devices.

selftest errors
Those errors detected by the hardware or the firmware while attempting to test the logic functions in the system unit.

SGC Graphics (interface) card
The SGC Graphics (interface) card contains bus adapter logic to pass information between the VSC (system) bus in the system unit cabinet and an external graphics unit.

SIMM cards
The 2 MB, 8 MB, and the 16 MB SIMM (single in-line memory module) cards contain the dynamic RAMs that make up the main memory arrays for workstations and servers. They are located in slots 0 - 3 on the Processor card for Model 720/730 systems and in slots 0 - 11 on the System card for Model 750 systems.

soft boot
Initialize and test the processor, memory (without writes), and I/O device paths prior to the loading and execution of the ISL program on the boot device. *See also TOC.*

SPA
Soft physical address (SPA) is a range of consecutive (word) addresses assigned to each SIMM card pair for the purpose of building up main memory. The SIMM card pairs are initialized in a top down fashion. The SIMM card pairs in the highest slot numbers respond to an SPA range from 0x00000000 to 0x01FFFFFF; the SIMM card pairs in the next highest slot number are assigned an SPA range from 0x02000000 to 0x03FFFFFF and so on for SIMM card pairs installed. SPA addresses for the SIMM card pairs are in the memory address range from 0x00000000 to 0xEFFFFFFF. *See also HPA.*

stable storage
Non-volatile (EEPROM) memory associated with each PA-RISC processor module whose contents must not be lost under any conditions. Stable storage contains critical file system and system initialization information.

Switch card
The Switch card in the system unit cabinet contains the front panel power switch and distributes DC power from the VSC backplane assembly to the LED card and the SCSI device tray assembly. *See also the LED card.*

System card
The System card contains all of the logic for the processor, memory, and standard I/O modules supported by Model 750 workstations and servers. *See List of Supported Devices in chapter 2.*

System (core I/O) card
The System (core I/O) card contains all of the logic for the standard I/O modules supported by Model 720/730 workstations and servers. *See List of Supported Devices in chapter 1.*

System Unit cabinet
The System Unit cabinet houses all of the SPU (system processing unit) components for workstations and servers.

TOC
A transfer of control operation is performed as a result of a user manually depressing the TOC switch or programmatically by the O/S to save processor state and other information; and transfer control to the O/S, if possible, for later analysis. *See also HPMC.*

TOC switch
Depressing the TOC switch on the front panel forces a HPMC interruption in the processor that branches to the TOC routine in PDC regardless of the code the processor is currently executing. *See also TOC.*

transformation
Rotation, scaling, and translation of a graphical object.

virtual memory
The total amount of memory addressable by a system. PA-RISC systems support either 48 or 64 bits of virtual memory composed of both (expensive) RAM memory and (inexpensive) disk memory.

VSC Backplane assembly
The VSC Backplane assembly distributes the VSC (system) bus signals and DC power to the logic components in the System Unit cabinet. The VSC backplane assembly is mounted to the VSC backplane/tan module in the System Unit cabinet.

VSC (system) Bus
This bus is the main bus used by all hardware modules to interface with each other. It is a non-multiplexed bus with separate paths for (30-bit) physical addresses and (32-bit) data words. This bus is a *super set* of the HP-SGC bus developed for HP graphics subsytems shared with Series 400 workstations. *See also P-Bus.*

workstation turn-on errors
Those errors detected by the hardware while attempting to power-up or reset the system unit.

z-buffer
The memory available to store the depth information of a pixel to be used for hidden-surface removal. *See also z-buffering.*

z-buffering
A hidden surface removal technique in which objects are scan-converted to pixel data and depth values are then inserted into a pixel array and a depth array. Where the object's pixel depth is less than that of the currently stored pixel/depth pair, the new data is written in, replacing the old.

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