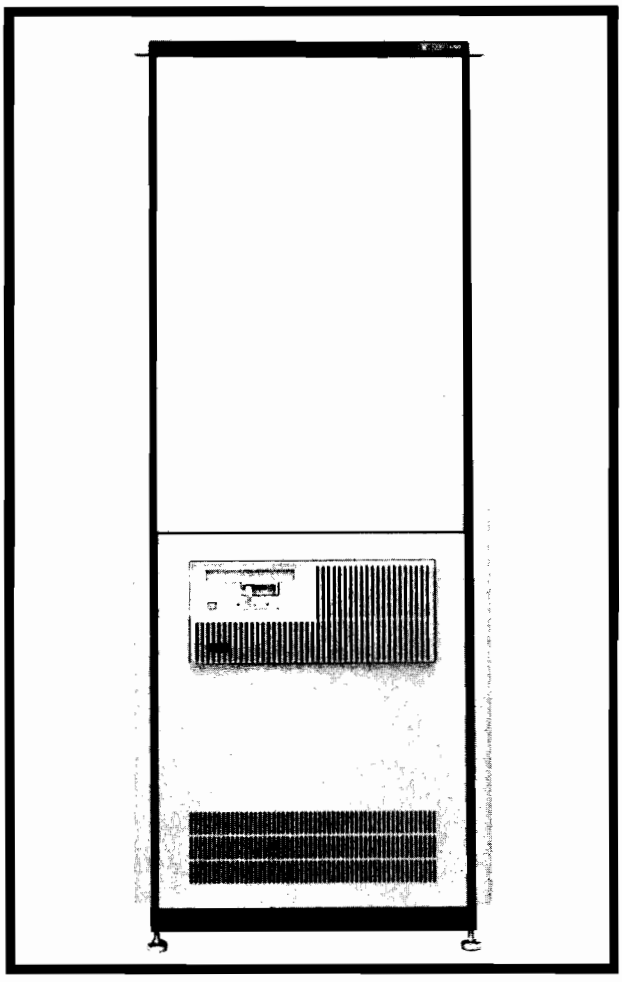
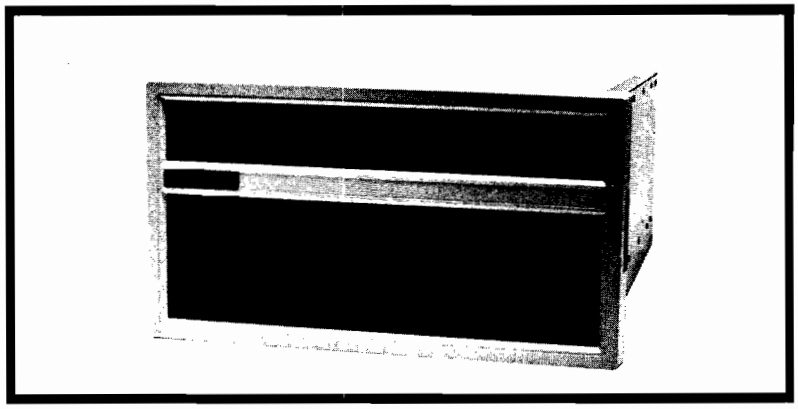
HEWLETT PACKARD

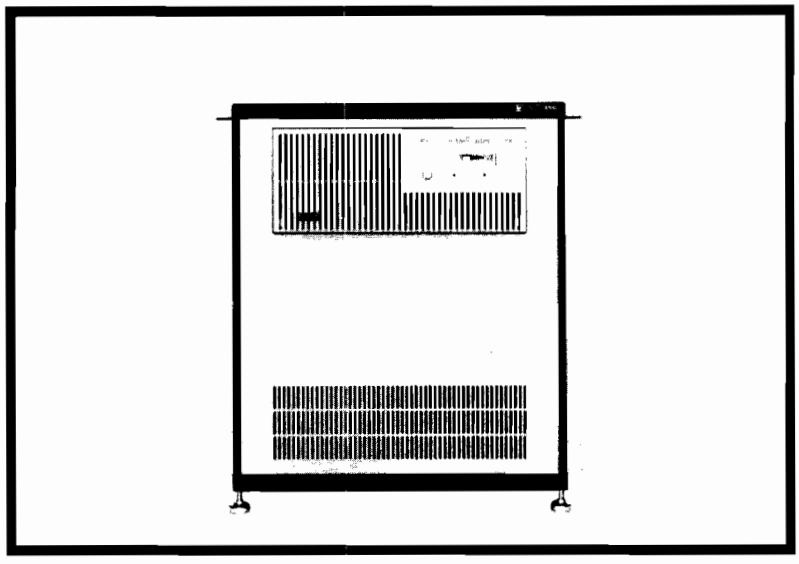
HP 1000 Model 26/27/29 Computer System

Installation and Service Manual

HP 1000 A-Series







MANUAL UPDATE

MANUAL IDENTIFICATION

Title: HP 1000 Model 26/27/29 Computer System Installation and Service Manual

Part Number: 02196-90002

UPDATE IDENTIFICATION

Update Number: 3 (December 1984)

This Packet also Includes:

THIS UPDATE GOES WITH: First Edition (June 1983) with Updates 1 and 2 or Reprint (March 1984)

THE PURPOSE OF THIS MANUAL UPDATE
is to provide new information for your manual to bring it up to date. This is important because it ensures that your manual accurately documents the current version of the product.

THIS UPDATE CONSISTS OF
this cover sheet, a printing history page, all replacement pages, and write-in instructions (if any). Replacement pages are identified by the update number at the bottom of the page. A vertical line (change bar) in the margin indicates new or changed text material. The change bar is not used for typographical or editorial changes that do not affect the text. New pages to be added do not contain change bars.

TO UPDATE YOUR MANUAL
identify the latest Update (if any) already contained in your manual by referring to the Printing History Page (page ii). Incorporate only the Updates from this packet not already included in your manual. Following the instructions on the back of this page, replace existing pages with the Update pages and insert new pages as indicated. If any page is changed in two or more Updates, such as the Printing History Page which is furnished new for each Update, only the latest page will be included in the Update package. Destroy all replaced pages. If "write-in" instructions are included they are listed on the back of this page.

HEWLETT PACKARD

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Cupertino, California 95014

02196-90002
U1284

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HP 1000 Model 26/27/29 Computer System

Installation and Service Manual

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE
STATEMENT

The Federal Communications Commission (in 47 CFR 15.805) has specified that the following notice be brought to the attention of the users of this product.

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply 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.

HEWLETT-PACKARD COMPANY
Data Systems Division
11000 Wolfe Road
Cupertino, California 95014

MANUAL PART NO. 02196-90002
Printed in U.S.A. March 1984
U1284

SAFETY CONSIDERATIONS

GENERAL - This product and relation documentation must be reviewed for familiarization with safety markings and instructions before operation.

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 correctly performed 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 correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

CAUTION

STATIC SENSITIVE DEVICES

Some of the semiconductor devices used in this equipment are susceptible to damage by static discharge. Depending on the magnitude of the charge, device substrates can be punctured or destroyed by contact or mere proximity to a static charge. These charges are generated in numerous ways such as simple contact, separation of materials, and normal motions of persons working with static sensitive devices.

When handling or servicing equipment containing static sensitive devices, adequate precautions must be taken to prevent device damage or destruction. Only those who are thoroughly familiar with industry accepted techniques for handling static sensitive devices should attempt to service the cards with these devices. In all instances, measures must be taken to prevent static charge buildup on work surfaces and persons handling the devices. Cautions are included through this manual where handling and maintenance involve static sensitive devices.

SAFETY EARTH GROUND - This is a safety class I product and is provided with a protective earthing terminal. An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and be secured against any unintended operation.

BEFORE APPLYING POWER - Verify that the product is configured to match the available main power source per the input power configuration instructions provided in this manual.

If this product is to be energized via an auto-transformer (for voltage reduction) make sure the common terminal is connected to the earth terminal of the main power source.

SERVICING

WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged even when disconnected from its power source.

To avoid a fire hazard, only fuses with the required current rating and of the specified type (normal blow, time delay, etc.) are to be used for replacement.

WARNING

EYE HAZARD

Eye protection must be worn when removing or inserting integrated circuits held in place with retaining clips.

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INSTALLATION

SECTION I

1-1. INTRODUCTION

This section provides instructions that will enable you to install the HP 1000 Model 26/27/29 Computer System. These systems are based on the following system processor units (SPUs):

SYSTEM MODEL NO.	SPU PRODUCT NO.
26	HP 2196C/D (includes A600/A600+ Computer)
27	HP 2197C/D (includes A700 Computer)
29	HP 2199C/D (includes A900 Computer)

The HP 2196C/97C/99C includes a tall cabinet; the HP 2196D/97D/99D includes a short cabinet.

Included in this section is information on the following:

a. Unpacking and Inspection
b. Claims Procedure
c. Installation Procedure
d. Performance Verification
e. System Reconfiguration
f. Repacking for Shipment.

Specifications for the Model 26 System are given in the *HP 1000 A600/A600+ Computer Reference Manual,* part no. 02156-90001. Specifications for the Model 27 System are given in the *HP 1000 A700 Computer Reference Manual,* part no. 02137-90001. Specifications for the Model 29 System are given in the *HP 1000 A900 Computer Reference Manual,* part no. 02139-90001. (Environmental and electrical specifications for the Model 26/27/29 Systems are listed at the end of this section.) Site preparation information for the systems is given in the *HP 1000 Computer System Site Preparation Manual,* part no. 02170-90016. The site should be inspected prior to system installation to ensure proper preparation; the customer should correct any deficiencies that are found.

NOTE

The site preparation manual is shipped several weeks before the system, and site preparation must be completed before the system is installed.

Installation service is included in the system purchase price. This service includes supervision of equipment unpacking, inventory, equipment set-up, and system turn-on. The installation service does not include uncrating of equipment, equipment positioning, routing of cables in customer's ducts, adding on non-HP equipment, or programmer training. Also, the customer must provide assistance for the handling or racking of heavy instruments.

1-2. UNPACKING AND INSPECTION

When the shipment arrives, check to ensure the receipt of all containers as specified by the carrier's papers. Inspect each shipping container immediately upon receipt for evidence of mishandling during transit. If any container is damaged or waterstained, request the carrier's agent be present when that container is opened.

Before unpacking any hardware items, open the shipping carton containing manuals. One of the items in this carton is the System Support Log which includes an Installation Record of equipment supplied. Compare this record against the purchase order to verify that the shipment is correct. Move the containers to the installation site and unpack the equipment, using the Installation Record for a detailed inventory of the equipment. Some printed circuit cards are installed in the computer card cage; these can be inventoried during system cabling. As each item is unpacked, inspect it for damage such as dents, cracks, scratches, breaks, etc. Open all doors or panels to look for damaged or missing parts. Check behind the computer front cover to see whether the labels for the 25 kHz and battery backup modules are affixed. Save the original container and packing material if the equipment is to be reshipped.

Check all device serial numbers and inspect all items for damage. If the visual inspection and inventory reveals damaged or missing items follow the claims instructions given in paragraph 1-4.

1-3. UNCRATING CABINETS

Cabinets are shipped in reuseable containers that have the uncrating and unpacking instructions in an envelope on the container; follow those instructions to unpack the cabinet.

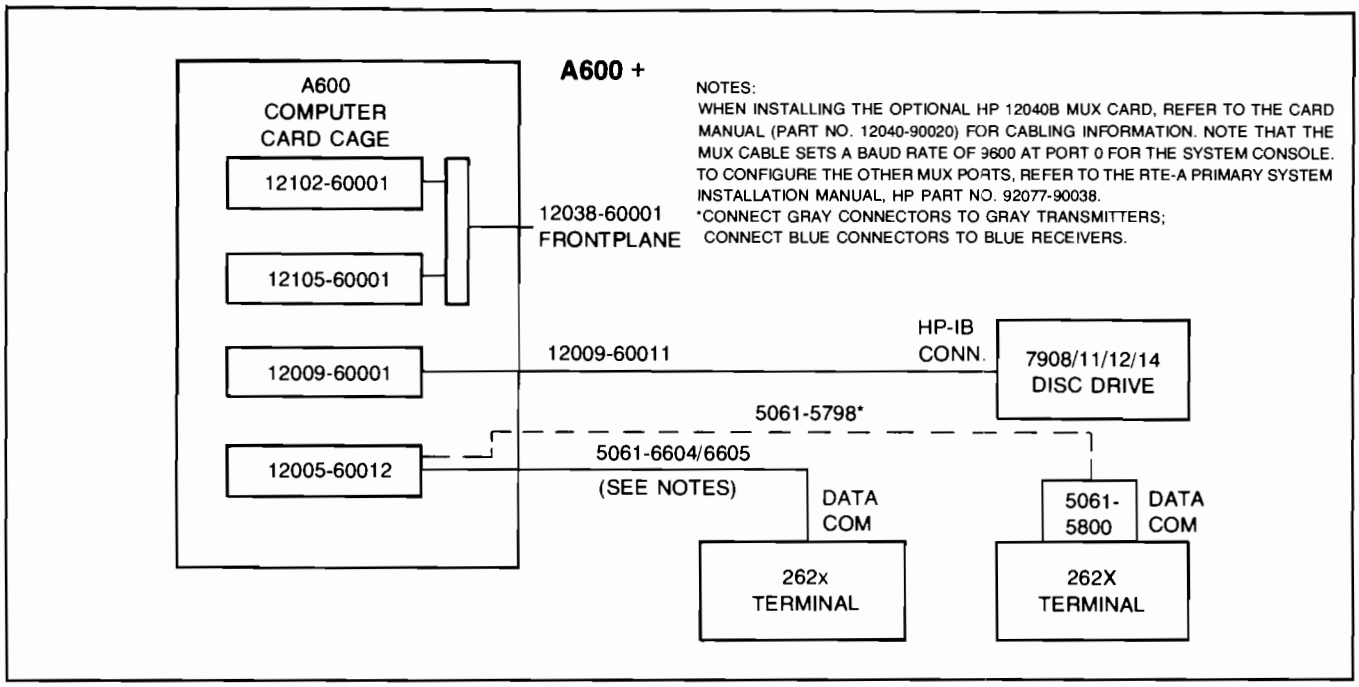

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Figure 1-1. System Cabling Diagram (Standard HP 2196C/D)

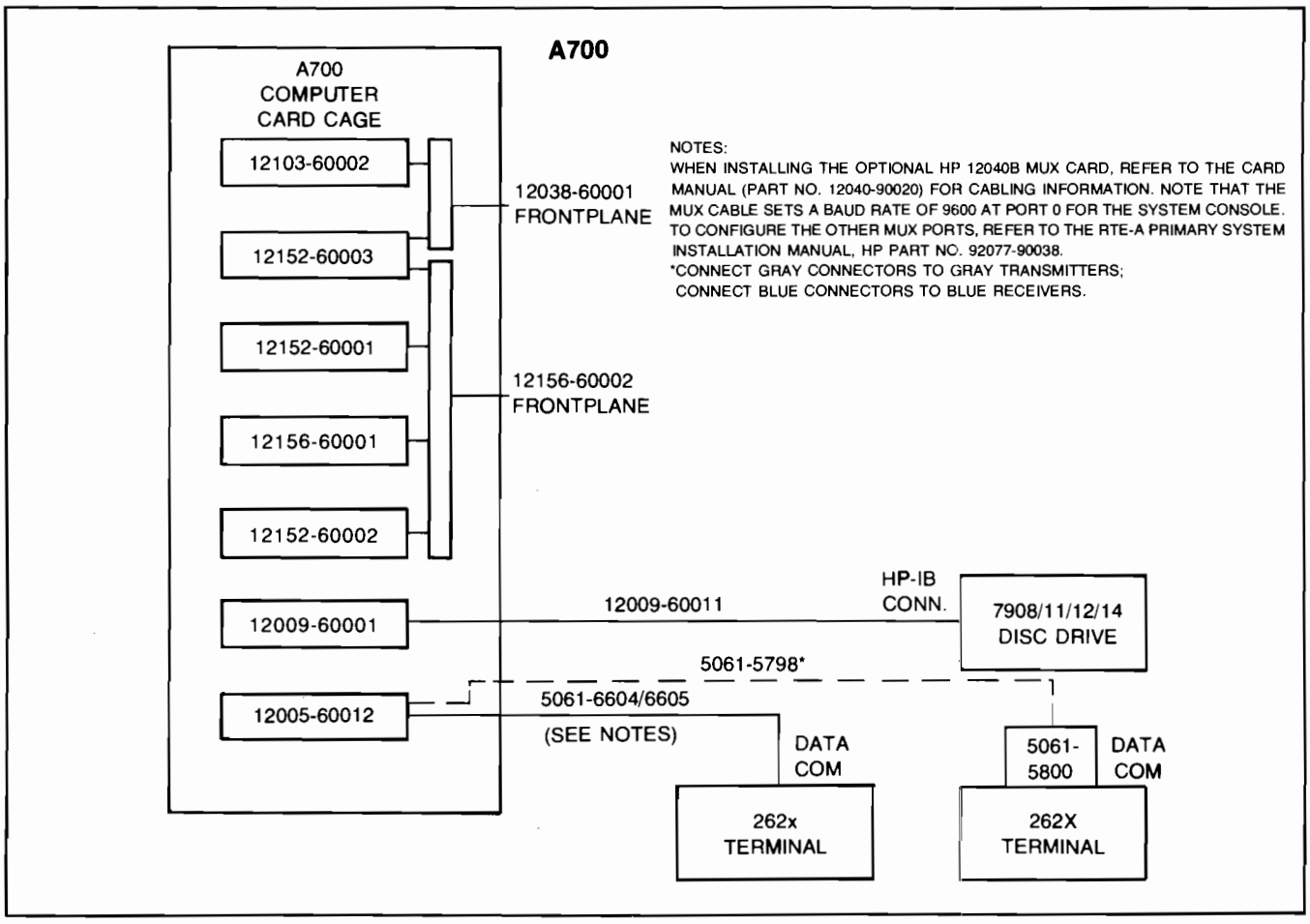

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Figure 1-2. System Cabling Diagram (Standard HP 2197C/D)

Table 1-1. Disc Drive Installation

HP DISC DRIVE	INSTALLATION MANUAL PART NO.	HP-IB ADDRESS*
7908R	07908-90902	0
7911R/12R/14R	07912-90902	0

* HP-IB address required for operation with the Primary System.

WARNING

To prevent the cabinet from tipping over, you must install the cabinet anti-tip legs before installing the 7911R/12R/14R Disc Drive in the cabinet.

c. For the 7911R/12R/14R Drive, install the HP 40024A Cabinet Anti-Tip Legs. Refer to the 40024-90001 instruction sheet for installation procedures.

d. For the 7911R/12R/14R Drive, remove the mounting rails from the cabinet and install the rack-mounting slides as described in the disc drive installation manual. Use the mounting holes and Tinnerman nuts located immediately above those used for the mounting rails.

WARNING

Each 7911R/12R Disc Drive weighs 67.3 kilograms (148 pounds), and each 7914R Disc Drive weighs 85.3 kilograms (188 pounds); two or more persons are required to lift one of these disc drives.

e. Install the drive in the system cabinet.

f. Open the rear door of the cabinet and set the disc drive's HP-IB Address switch to 0. (This address is required for operation of the disc drive with the Primary System.)

g. Connect the disc drive interface cable (12009-60006) between the HP-IB connector on the drive and the HP 12009 HP-IB interface card in the computer card cage.

h. Connect the lug from the hooded cable-connector to the ground bus that extends across the card cage.

i. Connect the drive power cord between the drive and a power receptacle on the PDU. Tighten the retaining clamp.

j. Set the ~LINE switch on the rear of the disc drive to 1 (ON).

k. Set the cabinet Power switch to ON and ensure that the drive (and tape unit) passes its self-test. (Refer to the disc drive manual.)

l. Close the card cage covers and secure them in place.

m. Close and secure the cabinet front and rear doors. (The terminal interconnecting cable must pass under the rear door.)

1-12. SYSTEM TURN-ON AND BOOTUP

After the Model 26/27/29 system has been installed as described in the preceding paragraphs, turn on the system, following the instructions given in the RTE-A Primary System Installation Manual. Within 10 seconds the system will display the WELCOM file message (see Figure 1-4).

1-13. SYSTEM VERIFICATION

To verify proper operation of the Model 26/27/29 System, run the system functional test (FTEST) as described in the RTE-A Primary System Installation Manual. For a more thorough test of the system, run the Kernel and I/O diagnostics in the HP 24612A Diagnostic Package. FTEST should be run when the system is initially installed and when peripheral devices are added to the system.

1-14. PRIMARY SYSTEM BACKUP

A backup copy of the Primary System tape cartridge should be created on a formatted (certified) CS/80 tape cartridge and left with the System Manager. To format a new tape cartridge and copy the Primary System, proceed as follows:

a. Using the tape cartridge loading instructions given in the CS/80 disc drive manual, insert a new tape cartridge (part no. 9164-0156) into the tape drive of the CS/80 drive.

b. Run the FORMC utility program by entering the following command sequence:

```
RU,FORMC:IH,1,FO,24
```

The FORMC program will format the tape in about 27 minutes. (For more information on FORMC, refer to the *RTE-A Utilities Manual,* part no. 92077-90004.)

d. 12156-60001. *HP 2197C/D only.* Rocker switches 1 through 6 (000UJF) are set to enable the Jump Table overlay and the floating-point/SIS/VIS ROMs. The switches are OOOOCC; where O = open, and C = closed. Switches 7 and 8 are not used and may be open or closed.

NOTE

The 12156-60001 rocker switch settings *must* be as given above in order for the computer floating point instructions to be processed by the floating point hardware.

e. 12201-60001. *HP 2199C/D only.* Sequencer card switches U0204S1-S5 are all closed.

f. 12202-60001. *HP 2199C/D only.* Data path card switches U0101S1-S8 (BOOT SEL and M) are set to cause the computer to execute the VCP routine after the self-tests execute. (U0101 switches are OCCCCCCO; where O = open and C = closed.)

g. 12009-60010. Switches U16 and U1 are set for the HP-IB card to function as HP-IB system controller with high-speed data transfers and select code 27 octal. (U16 switches are all closed (down). U1 switches are OCCOCOOO; where O = open (up) and C = closed.) (The load resistors are installed on the 12009 Card).

h. 12005-60012. Switches U21S1-S8 provide 9600 baud operation with one stop bit and odd parity. (U21 switches are OOOOCCCX; where O = open (up), C = closed, and X = don't care.) Switches U1S1-S8 provide VCP interfacing and select code 20 octal. (U1S1-S8 are CCCOCCCC.)

i. 5061-3427 (HP 12040B, Optional). Switches U1S1-S8 provide VCP interfacing and select code 23 octal. U1 switches are COCOCCOO; where O = open (up) and C = closed.

Tables 1-2, 1-3, and 1-4 summarize the factory settings of the plug-in card switches in the 2196C/D, 2197C/D, and 2199C/D, respectively. For complete information on the interface cards' switches, refer to the appropriate interface card reference manuals. Refer to the computer installation and service manual for information on the switches mounted on the following cards:

a. Processor card (A600/A600+ only).
b. Memory controller card (A600/A600+ only).
c. Processor frontplane (A700 only).
d. Data path card (A900 only).
e. Sequencer card (A900 only).

1-17. BATTERY BACKUP SWITCH

The battery BACKUP switch is a two-position switch mounted on the rear of the system computer. When the system is shipped from the factory this switch is set to the DISABLE position, which prevents the optional battery pack from sustaining computer memory. Refer to the computer installation and service manual for a description of the BACKUP switch.

1-18. INTERFACE CARD SWITCHES

Assign each I/O interface card to be installed in the computer a unique select code by appropriately setting the select code switches on the interface cards. Refer to the interface card reference manuals for select code switch information and for information on any other card switches that must be set.

Table 1-2. Summary of Factory Switch Settings (HP 2196C/D)

CARD	SWITCH SETTINGS
Memory Controller 12102-60001 12102-60002 12110	 Switch S1 = BAT Switch S1 = BAT Switch S1 = BAT
Processor 12105-60001	U1 switches = OCCCCCCO*
HP-IB Interface 12009-60001	U16S1-S8 = all closed (down) U1 switches = OCCOCOOO*
Async. Serial Interface 12005-60012	U21 switches = OOOOCCCX* U1 switches = CCCOCCCC*
12040B MUX Card 5061-3427 (optional)	U1 switches = COCOCCOO

* O = open (up); C = closed (down); X = don't care.

Table 1-3. Summary of Factory Switch Settings (HP 2197C/D)

CARD	SWITCH SETTINGS
Frontplane 12156-60002	BOOT SEL & M = OCCCCCCO* SLFTST = all closed (down)
Floating Point 12156-60001	000UJF = OOOOCC*
HP-IB Interface 12009-60001	U16S1-S8 = all closed (down) U1 switches = OCCOCOOO*
Async. Serial Interface 12005-60012	U21 switches = OOOOCCCX* U1 switches = CCCOCCCC*
12040B MUX Card 5061-3427 (optional)	U1 switches = COCOCCOO

* O = open (up); C = closed (down); X = don't care.

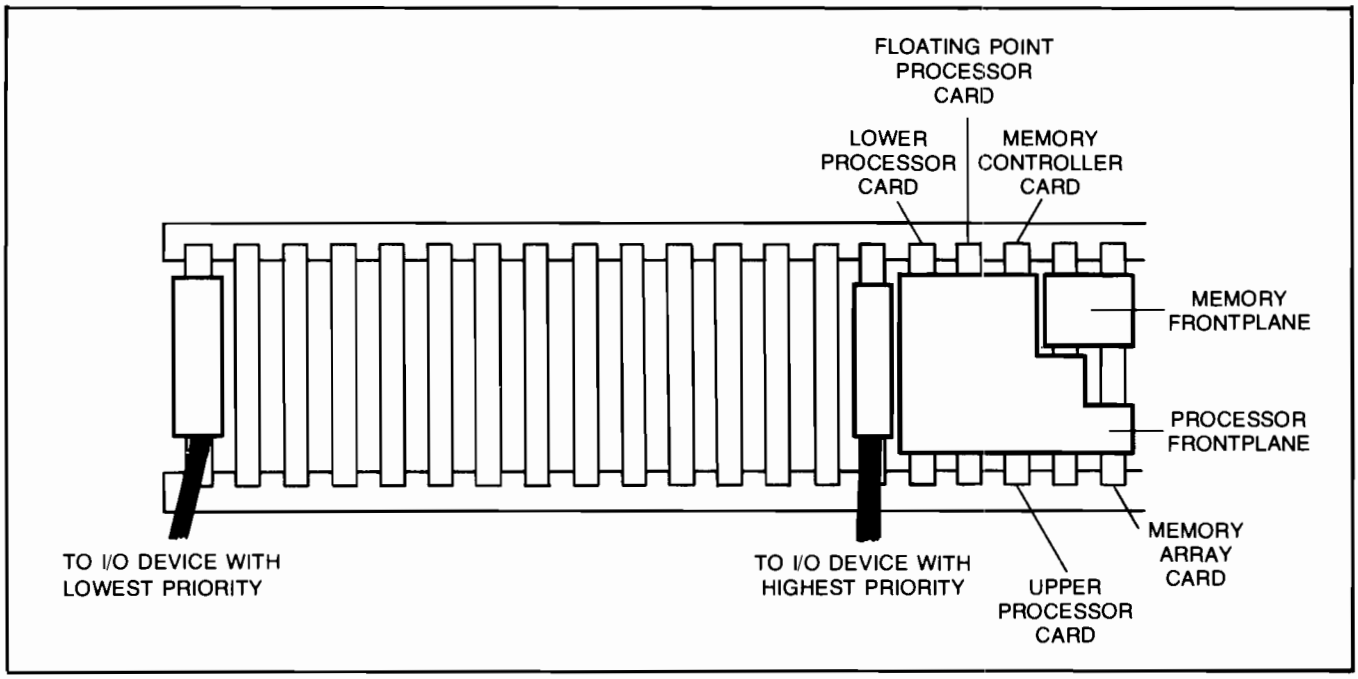

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Figure 1-6. System Cards and I/O Priority Assignments (Standard 2197C/D)

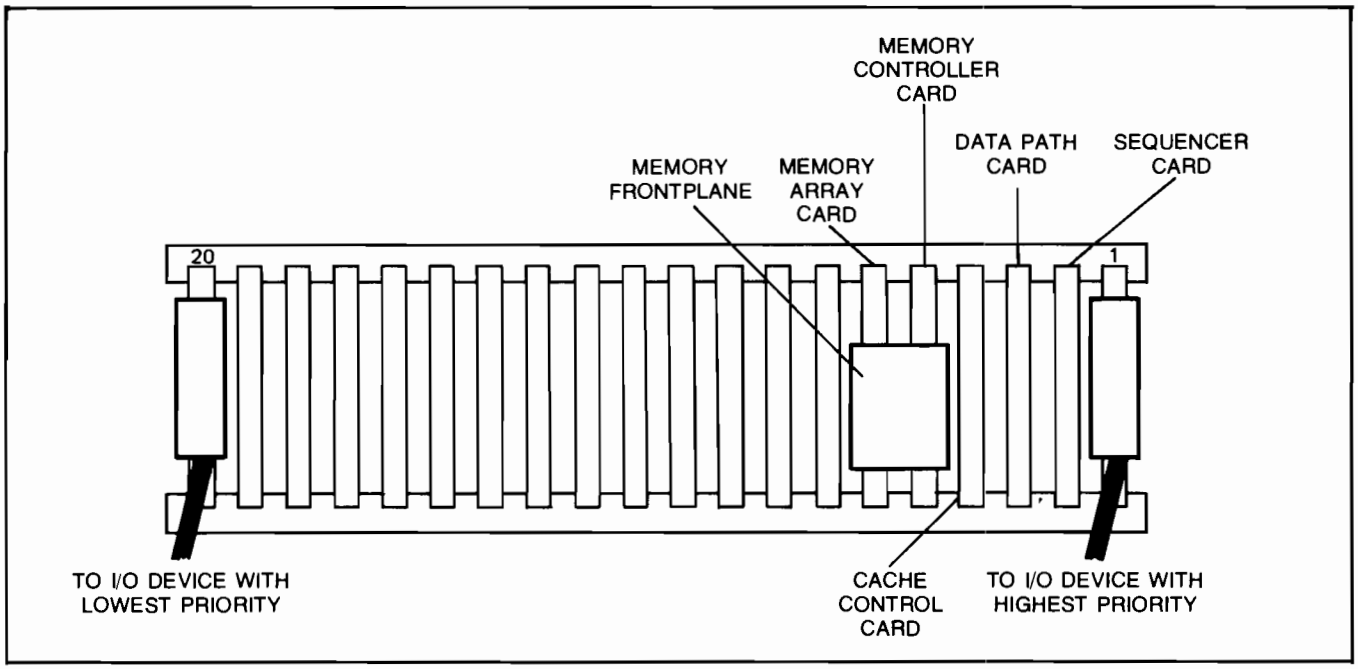

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Figure 1-7. System Cards and I/O Priority Assignments (Standard 2199C/D)

1-20. MEMORY CONFIGURATIONS

There are several memory configurations available for the system computers. For information regarding the memory configurations, refer to the computer installation and service manual.

1-21. INTERFACE CABLING

CAUTION

When connecting cables to the plug-in cards in the card cage, be sure to connect each cable to its appropriate card.

Table 1-5. System Electrical and Environmental Specifications (Continued)

Power Requirements:	Requires at least 20-ampere grounded power receptacle for 115 VAC operation, or at least 10-ampere grounded power receptacle for 230 VAC operation (option 015). The HP 2196C/97C/99C requires split-phase power; the HP 2196D/97D/99D requires single-phase power. An additional receptacle is required for the system console.
Maximum Current Required:	HP 2196C/97C/99C: 16 amperes per phase HP 2196D/97D/99D: 16 amperes
Ventilation:	Perforations in the HP 2196D/97D/99D cabinet and in the lower part of the HP 2196C/97C/99C cabinet facilitate front-to-rear ventilation driven by the fans in the computer and system disc. Four 120 CFM fans at the top rear of the HP 2196C/97C/99C cabinet draw in air through a filter at the bottom rear of the upper section, providing bottom-to-top airflow of approximately 11.3 cm per minute (400 CFM). The actual value of air flow depends upon the configuration of user equipment racked in the upper section of the cabinet.
PHYSICAL CHARACTERISTICS	
Dimensions	
Height:	Model 26/27/29 (HP 2196C/97C/99C): 1613 mm (63.4 in) Model 26/27/29 (HP 2196D/97D/99D): 720 mm (28.3 in)
Width:	634 mm (25 in)
Depth:	813 mm (32 in)
ENVIRONMENTAL SPECIFICATIONS	
Temperature	
Operating (SPU only):	0° to 55°C (32° to 131°F) up to 3.1 km (10,000 ft); 0° to 45°C (32° to 113°F) up to 4.6 km (15,000 ft).
Operating (79xxR Disc):	0° to 40°C (50° to 104°F), rate of change $<$10°C (18°F) per hour.
Non-operating:	−40° to 60°C (−40° to 140°F)
Relative Humidity	
SPU only:	5% to 95% with maximum wet bulb temperature not to exceed 25.6°C (78.1°F), excluding all conditions which cause condensation.
7908R/11R/12R/14R Disc:	20% to 80% non-condensing.
Altitude	
Operating:	To 4.6 km (15,000 ft)
Non-operating:	To 15.3 km (50,000 ft)
Vibration and Shock:	HP 1000 A-Series products are type tested for normal shipping and handling shock and vibration. (Contact factory for review of any application that requires operation under continuous vibration).

SERVICE

SECTION II

2-1. INTRODUCTION

This section includes preventive maintenance, troubleshooting information for isolating malfunctions to the assembly level, and procedures for removing and replacing various assemblies of the Model 26/27/29 Computer System. The system is designed to operate over a wide range of conditions. However, to reduce costly down time, a maintenance agreement is advisable. (HP Maintenance Agreements are available for those who desire to contract for this service.) Personnel in charge of the system should become familiar with the hardware and software to be able to quickly place it back in operation.

2-2. ELECTRICAL SAFETY

Before proceeding with any maintenance or service on the system which requires physical contact with electrical or electronic components, be sure that either power is removed or that safety precautions are followed to protect against shock. Heed all "WARNING" signs on equipment. All service work must be done by qualified personnel.

2-3. CUSTOMER MAINTENANCE

WARNING

High voltages are present in the system equipment. Always disconnect power before performing any maintenance. Failure to do this could result in serious injury.

The customer should set up maintenance schedules according to the quality of the environment in which the system is operating. A system in a clean and air-conditioned atmosphere requires much less care than one which is located in an atmosphere with an unusual amount of dust, smoke, moisture, or other foreign matter. The user should consult the installation/service manuals for the system disc drive and peripherals for the procedures required for a preventive maintenance schedule. For the system cabinet, perform the following steps as often as necessary:

a. Clean cabinet exterior and interior.
b. Check ventilating fans for proper operation.

The ventilating fans in the system cabinet (HP 2196C/97C/99C) have sealed bearings and require no lubrication. The air filters in the computer and the cabinet should be cleaned periodically to ensure that the equipment remains free of dust. Clean the cabinet filter by removing it and vacuuming its intake surface.

2-4. TROUBLESHOOTING

The following paragraphs provide information for troubleshooting the system. To troubleshoot the disc drive, refer to the the appropriate disc drive service manual.

System malfunctions can be isolated to the assembly level by sequentially performing the following tests:

a. Computer power supply check.
b. Computer self-test.
c. Peripheral self-test.
d. FTEST program (RTE-A Primary System Installation Manual).
e. Diagnostics (paragraph 2-9).

When a malfunction is encountered, replace the assembly indicated in the test procedure. After the malfunction is corrected, contact your nearest Hewlett-Packard Sales and Service Office for instructions regarding shipment of the defective assembly.

2-5. COMPUTER POWER SUPPLY CHECK

Verify the computer power supply operation by using the power supply test procedure given in the computer installation and service manual.

2-6. SELF-TESTS

Execute the self-tests for the computer and the system peripherals. Self-test information is given in the computer installation and service manual and in the appropriate manuals for the peripherals. When troubleshooting the system, make sure that the terminal configuration is correct. (Refer to paragraph 1-10.)

2-13. REPLACEMENT. Replace the computer by reversing the removal procedure.

2-14. DISC DRIVE

2-15. REMOVAL. Remove the disc drive from the system cabinet as follows:

WARNING

To prevent the cabinet from tipping over, you must install the cabinet anti-tip legs before removing the HP 7911R/12R/14R Disc Drive from the cabinet.

a. For the 7911R/12R/14R Drive, install the HP 40024A Cabinet Anti-Tip Legs. Refer to the 40024-90001 instruction sheet for installation procedures.

b. Set the system Power switch to OFF.

c. Open the rear door of the system cabinet and disconnect the disc drive power cord from the disc drive.

d. Disconnect the HP-IB cable from the rear of the disc drive.

e. Open the lower front door of the system cabinet.

f. Remove the front panel of the disc drive by grasping it firmly and pulling.

g. Remove the four screws securing the disc drive in the cabinet.

h. For the HP 7908R Drive, remove the drive by sliding it out of the cabinet.

WARNING

Each 7911R/12R Disc Drive weighs 67.3 kilograms (148 pounds), and each 7914R Disc Drive weighs 85.3 kilograms (188 pounds); two or more persons are required to lift one of these disc drives.

i. For the 7911R/12R/14R Drive, pull the drive out of the cabinet. Following the instructions given in the disc drive manual, disengage the drive from its slides and set it on a sturdy work bench or table.

2-16. REPLACEMENT. Replace the disc drive by reversing the removal procedure.

2-17. CABINET FANS (HP 2196C/97C/99C)

2-18. REMOVAL. Remove a cabinet fan from the HP 2196C/97C/99C (1613 mm) cabinet as follows:

a. Set the system Power switch to OFF.

b. Open the rear door of the system cabinet.

c. Disconnect the fan power cable from the fan assembly.

d. Remove the four screws securing the fan assembly. Remove the assembly and place it on a workbench.

e. Remove the inside fan cover and four fan guards by removing the 16 screws, 16 nuts, and 16 washers securing the cover and guards.

f. Disconnect power cord from defective fan and remove fan.

CAUTION

When installing a fan, be sure to orient the fan so that the direction of air flow is *out* of the cabinet. Air flow direction is indicated on the fan.

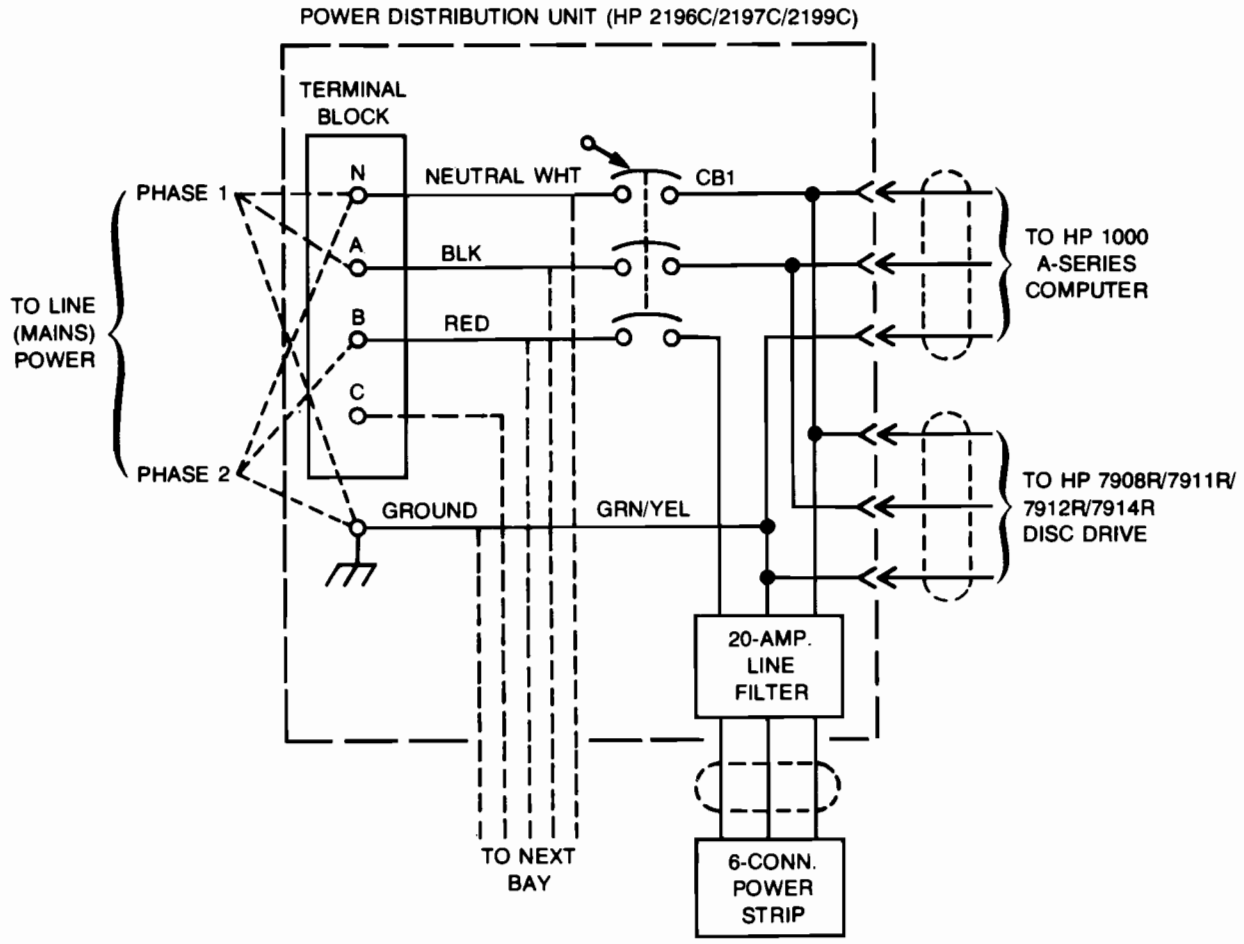
2-19. REPLACEMENT. Replace the cabinet fan by reversing the removal procedure.

2-20. 115/230 VAC RECONFIGURATION (HP 2196D/97D/99D ONLY)

CAUTION

The following 115/230 Vac reconfiguration procedure applies *only* to the HP 2196D/97D/99D System and *not* to the HP 2196C/97C/99C System. If is necessary to reconfigure a 2196C/97C/99C System, contact the nearest Hewlett-Packard Sales and Service Office listed in the rear of this manual.

This paragraph provides procedures for reconfiguring the HP 2196D/97D/99D System (i.e., 720 millimeter cabinet) to operate from the alternative ac power source (115 Vac



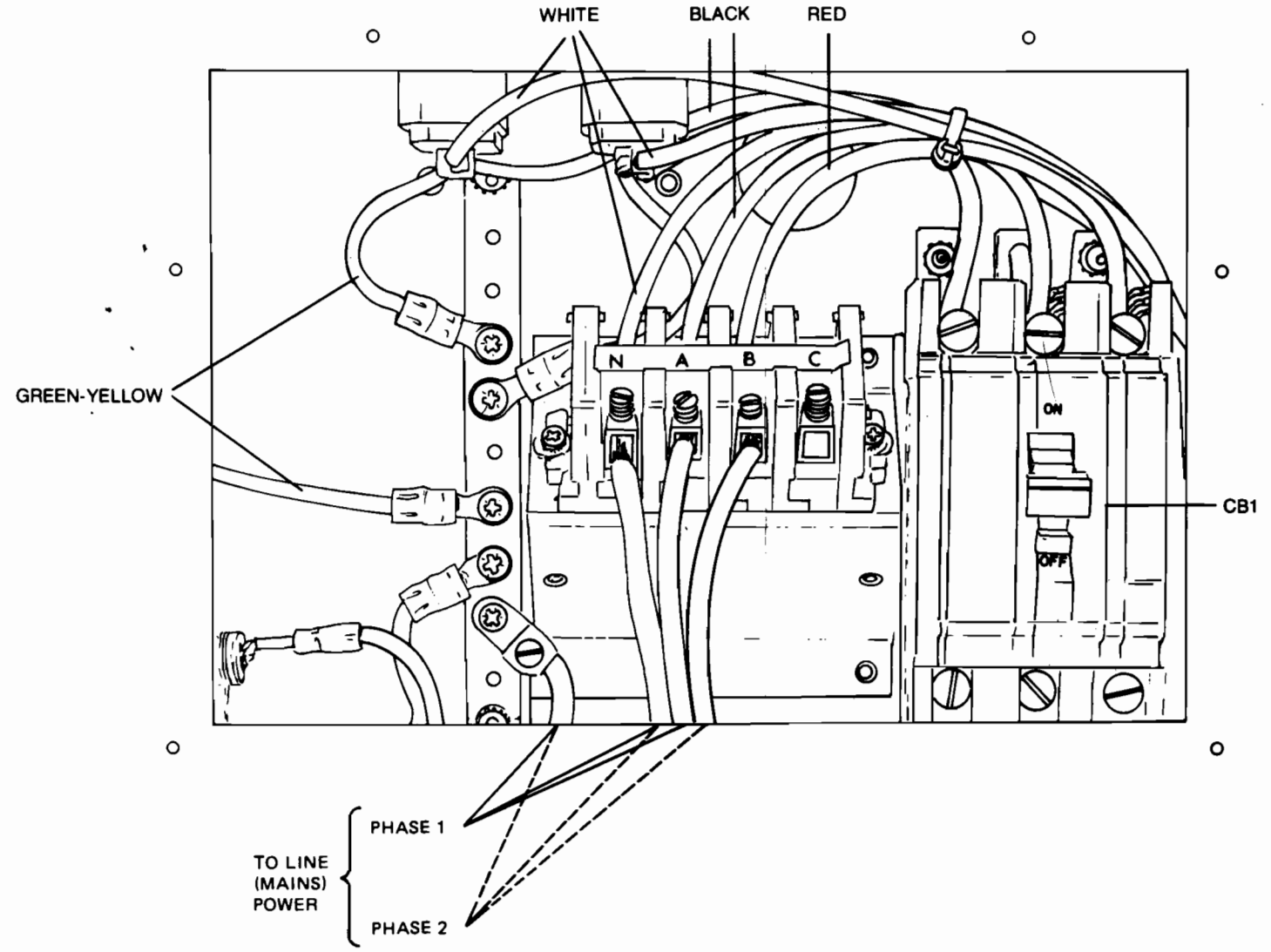


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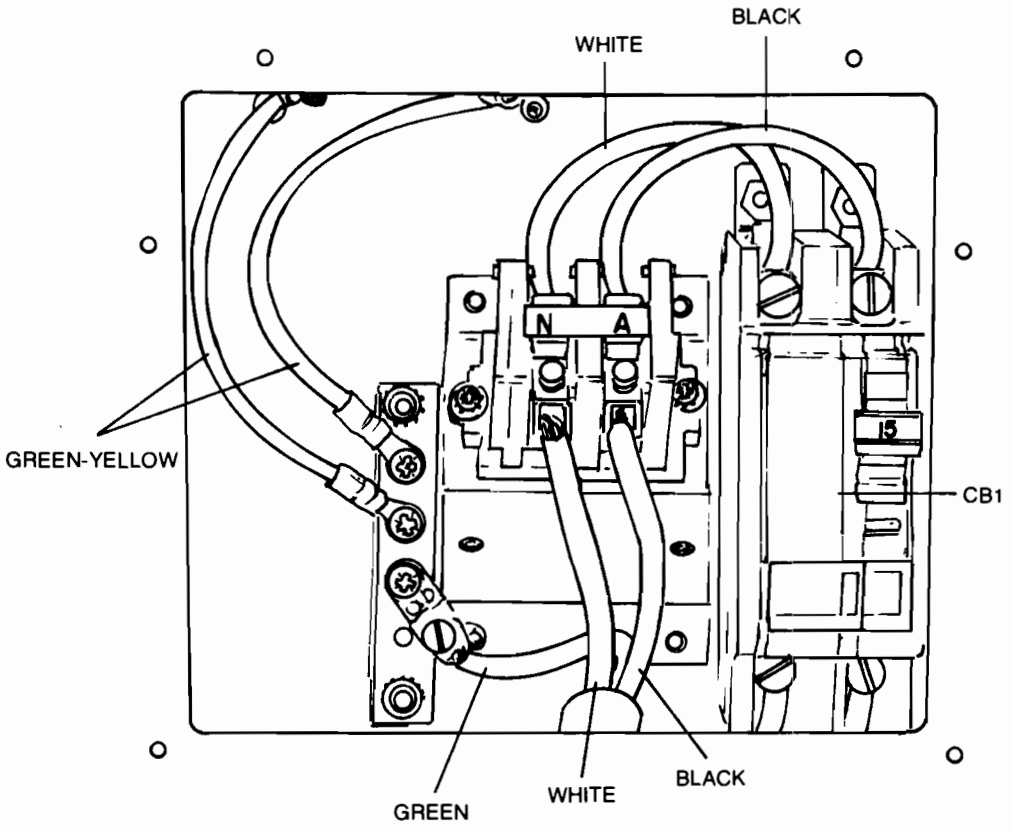
Figure 2-1. HP 2196C/2197C/2199C Wiring Diagrams



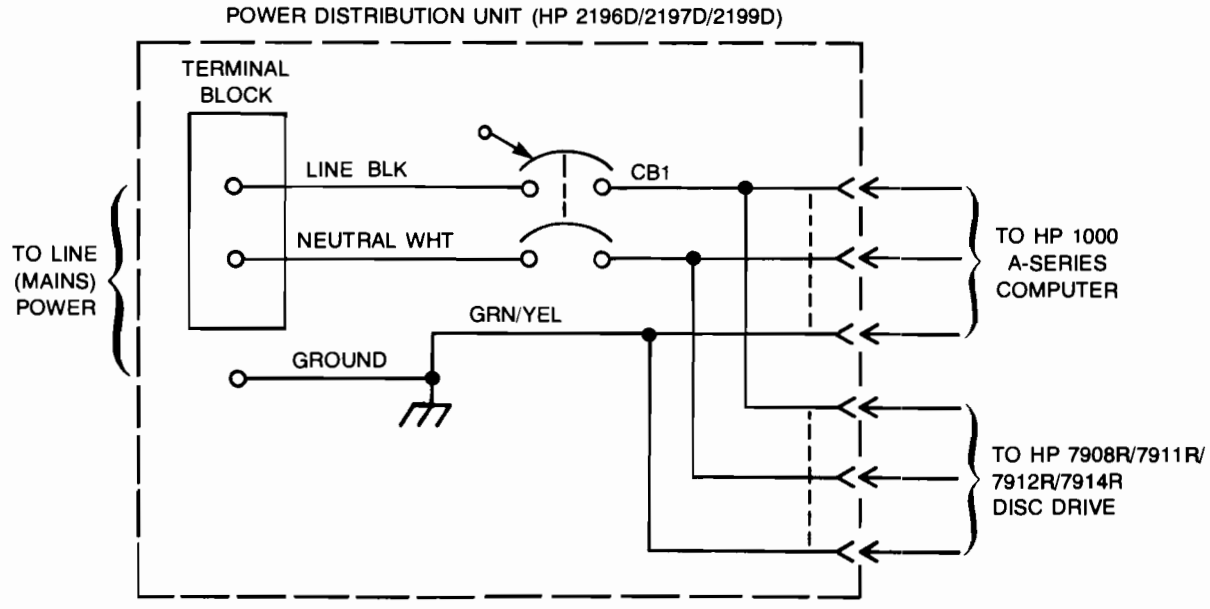


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Figure 2-2. HP 2196D/2197D/2199D Wiring Diagrams

REPLACEABLE PARTS

SECTION III

3-1. INTRODUCTION

This section provides information on field-replaceable parts of the system. Replaceable system assemblies are listed in Tables 3-1 through 3-3. Figures 3-1 and 3-2 are front and rear views of the Model 26, 27 and 29 Systems.

For parts lists of individual units (computer, subsystem, or interface), refer to the applicable installation and service manuals.

Table 3-1. Replaceable Parts (HP 2196C/D)

DESCRIPTION	HP PART NO.
Processor Card	12105-60001*
128k Byte Memory Controller Card	12102-60001*
512k Byte Memory Controller Card	12102-60002*
512k Byte EC Memory Cont. Card*	12110-60001
1024k Byte EC Memory Cont. Card*	12110-60002
128k Byte Memory Array Card	12103-60001
512k Byte Memory Array Card	12103-60003
1024k Byte Memory Array Card	12103-60004
512k Byte EC Memory Array Card	12111-60001
1024k Byte EC Memory Array Card	12111-60002
2048k Byte EC Memory Array Card	12111-60003
Frontplane for 1 Memory Array Card	12038-60001
Frontplane for 2 Memory Array Card	12038-60002
Frontplane for 3 Memory Array Card	12038-60003
Frontplane for 4 Memory Array Card	12038-60004
HP-IB Interface Card	12009-60010
Asynchronous Serial Interface Card	12005-60012
Cable, HP-IB Interface	12009-60011
Cable, ASIC Interface	5061-6604
Cable, ASIC Interface	5061-6605
Cable, Fiber Optic	5061-5798
Converter, ASIC Fiber Optic	5061-5800
Fan, Cabinet	3160-0315
Air Filter, Cabinet	3150-0421

* PROM chips are not included; refer to the computer installation and service manual for chip part numbers.

3-2. ORDERING INFORMATION

To order replaceable parts, address the order to the nearest Hewlett-Packard Sales and Service Office listed at the back of this manual. The following information should be included in the order for each replaceable part:

a. Complete model number and serial number.
b. Hewlett-Packard part number for each part.
c. Complete description of each part.

3-3. REPAIR ALTERNATIVES

Many defective system assemblies (e. g., power supply, processor card, etc.) can be exchanged for an operative assembly. For the cost and other details of the exchange program, contact your nearest HP Sales and Service Office.

If desired, you can arrange for Hewlett-Packard to repair any defective system assembly. Contact your HP Sales and Service Office for details.

Table 3-2. Replaceable Parts (HP 2197C/D)

DESCRIPTION	HP PART NO.
Upper Processor Card	12152-60001
Lower Processor Card	12152-60002*
Memory Controller Card	12152-60003*
3-Connector Processor Frontplane	12156-60002
Floating Point Processor Card	12156-60001*
128k Byte Memory Array Card	12103-60001
256k Byte Memory Array Card	12103-60002
512k Byte Memory Array Card	12103-60003
1024k Byte Memory Array Card	12103-60004
512k Byte Error Corr. Memory Card	12104-60001
512k Byte EC Memory Array Card	12111-60001
1024k Byte EC Memory Array Card	12111-60002
2048k Byte EC Memory Array Card	12111-60003
Frontplane for 1 Memory Array Card	12038-60001
Frontplane for 2 Memory Array Card	12038-60002
Frontplane for 3 Memory Array Card	12038-60003
Frontplane for 4 Memory Array Card	12038-60004
HP-IB Interface Card	12009-60010
Asynchronous Serial Interface Card	12005-60012
Cable, HP-IB Interface	12009-60011
Cable, ASIC Interface	5061-6604
Cable, ASIC Interface	5061-6605
Cable, Fiber Optic	5061-5798
Converter, ASIC Fiber Optic	5061-5800
Fan, Cabinet	3160-0315
Air Filter, Cabinet	3150-0421

* PROM/SOS chips are not included; refer to the computer installation and service manual for chip part numbers.

Table 3-3. Replaceable Parts (HP 2199C/D)

DESCRIPTION	HP PART NO.
Sequencer Card	12201-60001*
Data Path Card	12202-60001*
Cache Control Card	12203-60011*
Memory Controller Card	12204-60001
768k Byte Memory Array Card	12220-60001
3M Byte Memory Array Card	12221-60001
Frontplane for 1 Memory Array Card	12222-60001
Frontplane for 2 Memory Array Cards	12222-60002
Frontplane for 3 Memory Array Cards	12222-60003
Frontplane for 4 Memory Array Cards	12222-60004
Frontplane for 5 Memory Array Cards	12222-60005
Frontplane for 6 Memory Array Cards	12222-60006
Frontplane for 7 Memory Array Cards	12222-60007
Frontplane for 8 Memory Array Cards	12222-60008
HP-IB Interface Card	12009-60010
Asynchronous Serial Interface Card	12005-60012
Cable, HP-IB Interface	12009-60013
Cable, ASIC Interface	5061-6604
Cable, ASIC Interface	5061-6605
Cable, Fiber Optic	5061-5798
Converter, ASIC Fiber Optic	5061-5800
Fan, Cabinet	3160-0315
Air Filter, Cabinet	3150-0421

* PROM/SOS chips are not included; refer to the computer installation and service manual for chip part number.

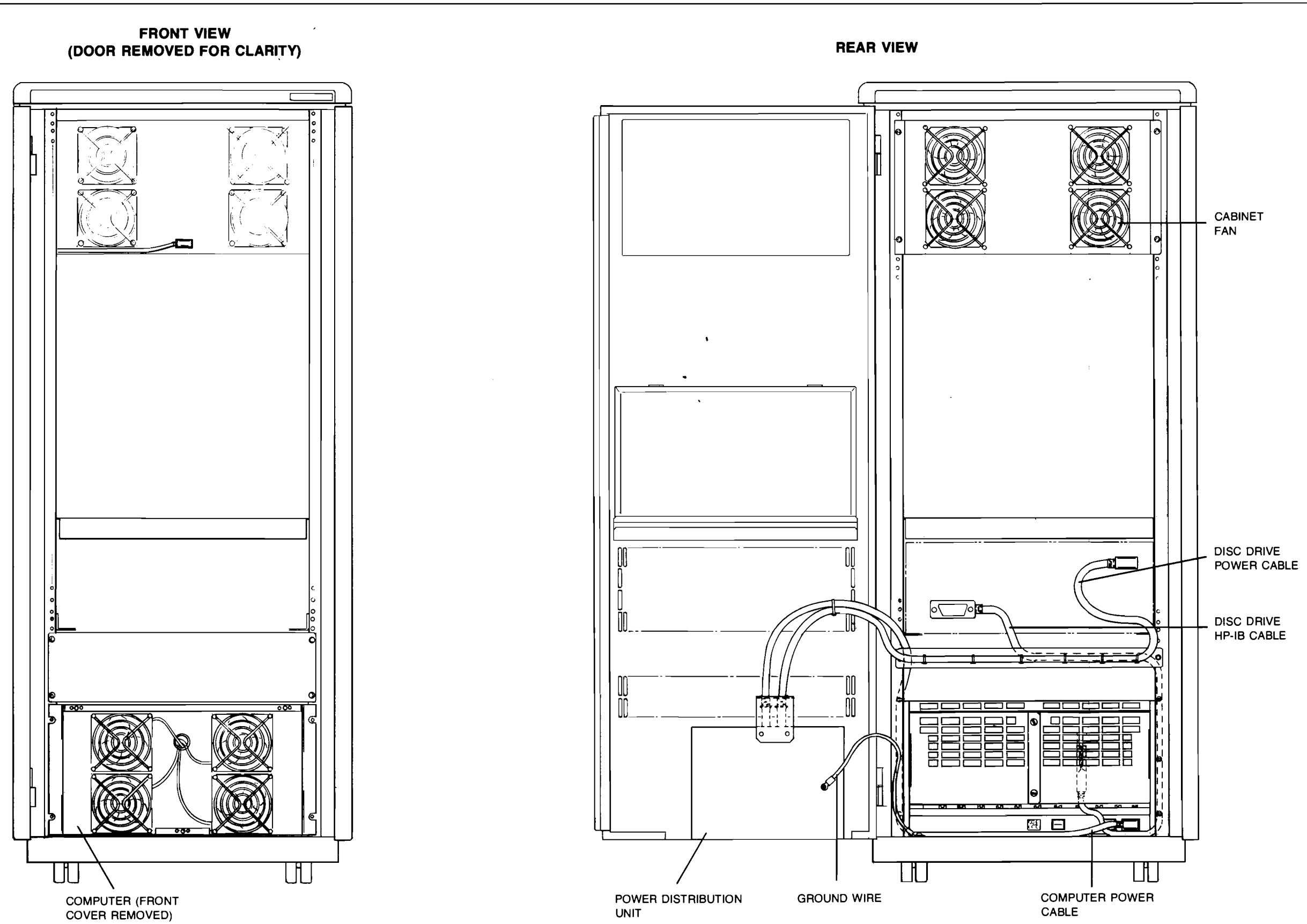

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Figure 3-1. HP 1000 Model 26/27/29 (HP 2196C/2197C/2199C)

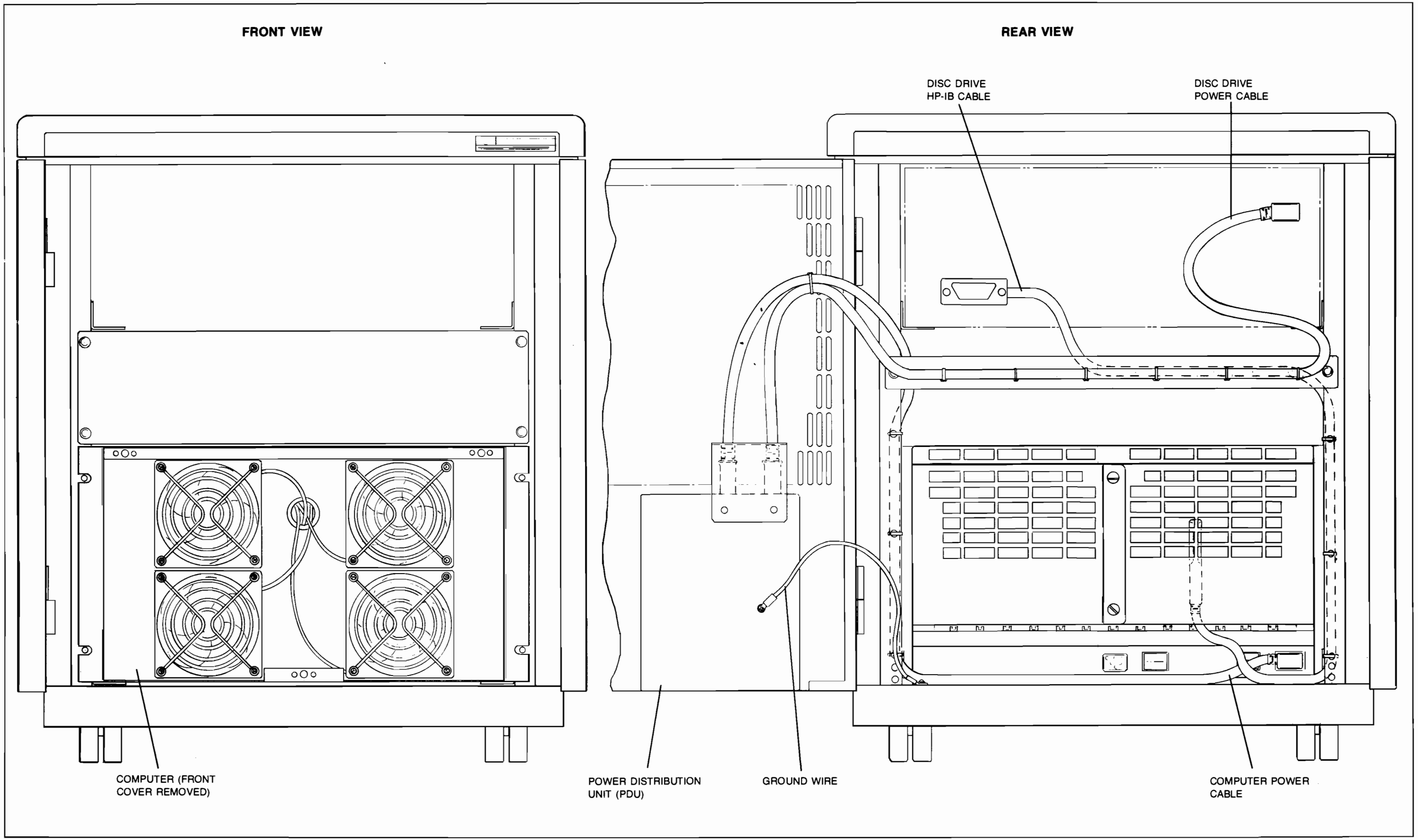

Figure 3-2. HP 1000 Model 26/27/29 (HP 2196D/2197D/2199D)