HP 1000 Model 16/17
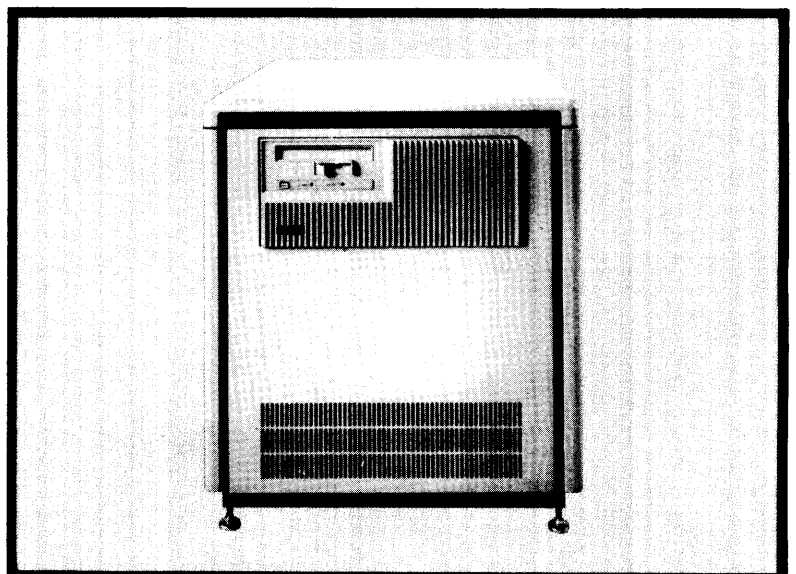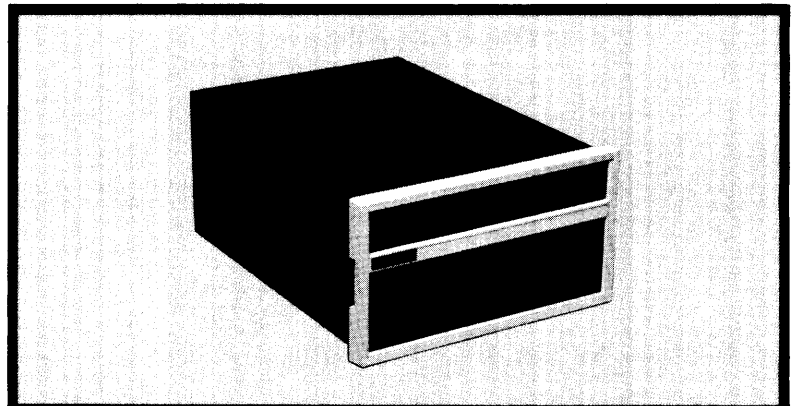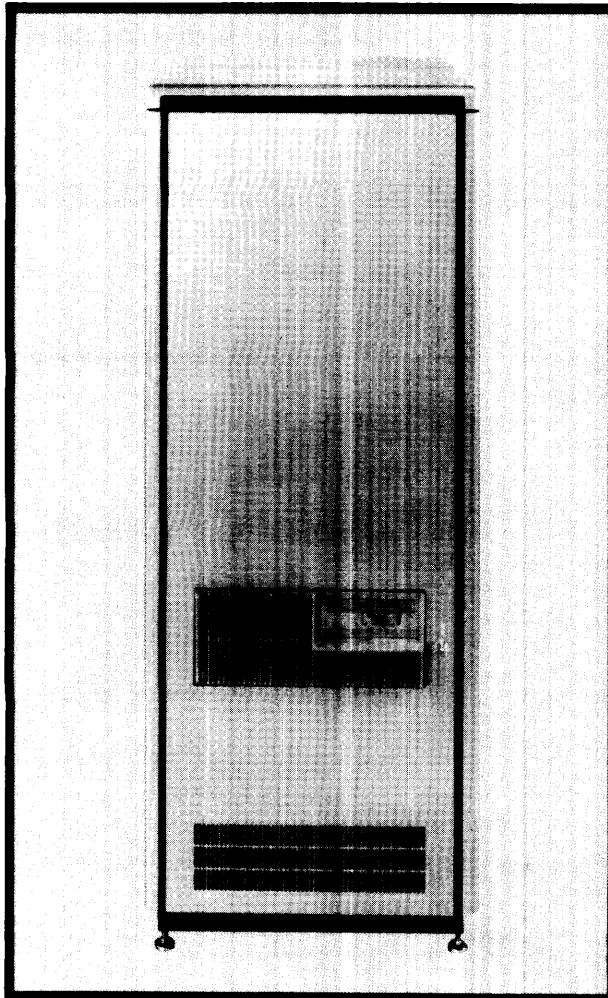# Computer System

Installation and Service Manual

HP 1000 Model 16/17 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**

PRINTING HISTORY

The Printing History below identifies the Edition of this Manual and any Updates that are included. Periodically, Update packages are distributed which contain replacement pages to be merged into the manual, including an updated copy of this Printing History page. Also, the update may contain write-in instructions.

Each reprinting of this manual will incorporate all past Updates, however, no new information will be added. Thus, the reprinted copy will be identical in content to prior printings of the same edition with its user-inserted update information. New editions of this manual will contain new information, as well as all Updates.

To determine what software manual edition and update is compatible with your current software revision code, refer to the appropriate Software Numbering Catalog, Software Product Catalog, or Diagnostic Configurator Manual.

First Edition .... Mar 1982

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.

PREFACE

This manual provides installation and field service instructions for the Hewlett-Packard 1000 Model 16/17 Computer System. The Models 16 and 17 Computer Systems are high technology products and the product design facilitates a module replacement philosophy that minimizes on-site repair time. In addition to this manual, supporting documentation for the Models 16 and 17 Systems is as follows:

a. *HP 1000 A600 Computer Reference Manual,* part no. 02156-90001.

b. *HP 1000 A600 Computer Installation and Service Manual,* part no. 02156-90002.

c. *HP 1000 A700 Computer Reference Manual,* part no. 02137-90001.

d. *HP 1000 A700 Computer Installation and Service Manual,* part no. 02137-90002.

e. *Getting Started With the HP 1000 A-Series Computer System,* part no. 5955-8813.

A list of HP Sales and Service Offices is provided at the back of this manual.

CONTENTS

ILLUSTRATIONS

TABLES

1-1. INTRODUCTION

This section provides instructions that will enable you to install the HP 1000 Model 16/17 Computer System. These systems are based on the following system processor units (SPUs):

SYSTEM MODEL NO.	SPU PRODUCT NO.
16	HP 2196A/B (includes A600 Computer)
17	HP 2197A/B (includes A700 Computer)

The 2196A/2197A includes a tall cabinet; the 2196B/2197B 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 16 System are given in the *HP 1000 A600 Computer Reference Manual,* part no. 02156-90001. Specifications for the Model 17 System are given in the *HP 1000 A700 Computer Reference Manual,* part no. 02137-90001. (Environmental and electrical specifications for the Model 16/17 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.

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.

1-4. CLAIMS PROCEDURE

If the shipment is incomplete or if the equipment is damaged, notify the nearest Hewlett-Packard Sales and Service Office. If damage occurred in transit, notify the carrier also. Hewlett-Packard will arrange for replacement or repair without waiting for settlement of claims against the carrier. In the event of damage in transit, retain the packing container and packaging materials for inspection.

1-5. INSTALLATION PROCEDURE

The installation procedure given in the following paragraphs sets up the Model 16/17 system for checkout with the Primary System software. The plug-in cards shipped in the computer card cage have been installed and tested at the factory. These cards should not be removed from the system nor should any of their switches be reset before the system has been checked out.

1-6. MANUAL UPDATING

Before installing the Model 16/17 system, perform any updating that may be required for the system documentation. Updating instructions (if any) are provided in a supplement supplied with the appropriate document.

1-7. TOOLS REQUIRED

No installation tools other than ordinary handtools are required.

1-8. AC POWER CABLE CONNECTION

Connect the system cabinet to an ac power source having the electrical characteristics specified on the rear of the system. To connect a 2196B/2197B System to a 115-Vac power source, simply set the system Power switch to OFF and plug the power cord into the ac source.

To connect a 2196A/2197A System to a 115-Vac power source, or to connect a cabinet that requires 230 Vac to a 230-Vac power source, have an electrician connect the user-supplied power cord to the cabinet's Power Distribution Unit (PDU). Wiring information on the PDU is given in Figures 2-1 and 2-2. The PDU is mounted on the inside of the rear door of the system cabinet. To gain access to the PDU, proceed as follows:

a. Set the system Power switch to OFF.

b. Remove the screws securing the inspection plate of the PDU to the bottom of the cabinet rear door. Remove the plate.

1-9. COMPUTER SELF-TEST AND POWER SUPPLY CHECK

The computer self-test automatically executes every time the computer is powered on. To verify the power supply voltages and the computer self-test operation, proceed as follows:

a. Set the system Power Switch to ON.

b. Perform the computer self-test and the power supply check as instructed in the computer installation and service manual.

c. Set the system Power switch to OFF.

1-10. HP 262X TERMINAL (SYSTEM CONSOLE) INSTALLATION

Except for the cabling information given in this paragraph, all installation information for the HP 262x Terminal is given in the terminal owner's manual. Using the information in that manual, install the terminal. (Figures 1-1 and 1-2 are cabling diagrams of the Model 16/17 systems.) To connect the terminal to the HP 12005 Asynchronous Serial Interface Card in the Model 16/17 system cabinet, proceed as follows:

a. Set the system Power switch to OFF.

b. Open the rear door of the system cabinet and open the computer card cage.

c. Connect the hooded connector of the terminal interconnecting cable to the HP 12005 ASIC Card with the cable extending to the bottom of the card cage.

On the HP 2621, if present, display the configuration screen labels (refer to the terminal owner's manual) and make sure the configuration appears as follows:

Baud Rate	Parity	Duplex	Straps
9600	NONE(0)	FULL	bcgHxz
Handshake	**Hz**	**Start Col**	**Return**
Etx	60	1	cr

NOTE

Make sure the REMOTE function label appears with an asterisk and that the LN MODE and AUTO LF function labels appear without an asterisk. For some installations the "Hz" should be 50 instead of 60. (The 9600 baud rate matches the baud rate set on the 12005 ASIC Card.)

If your terminal is not a 2621, its configuration must be the same as that shown above but the method of displaying and changing the configuration may be different; refer to your terminal owner's manual.
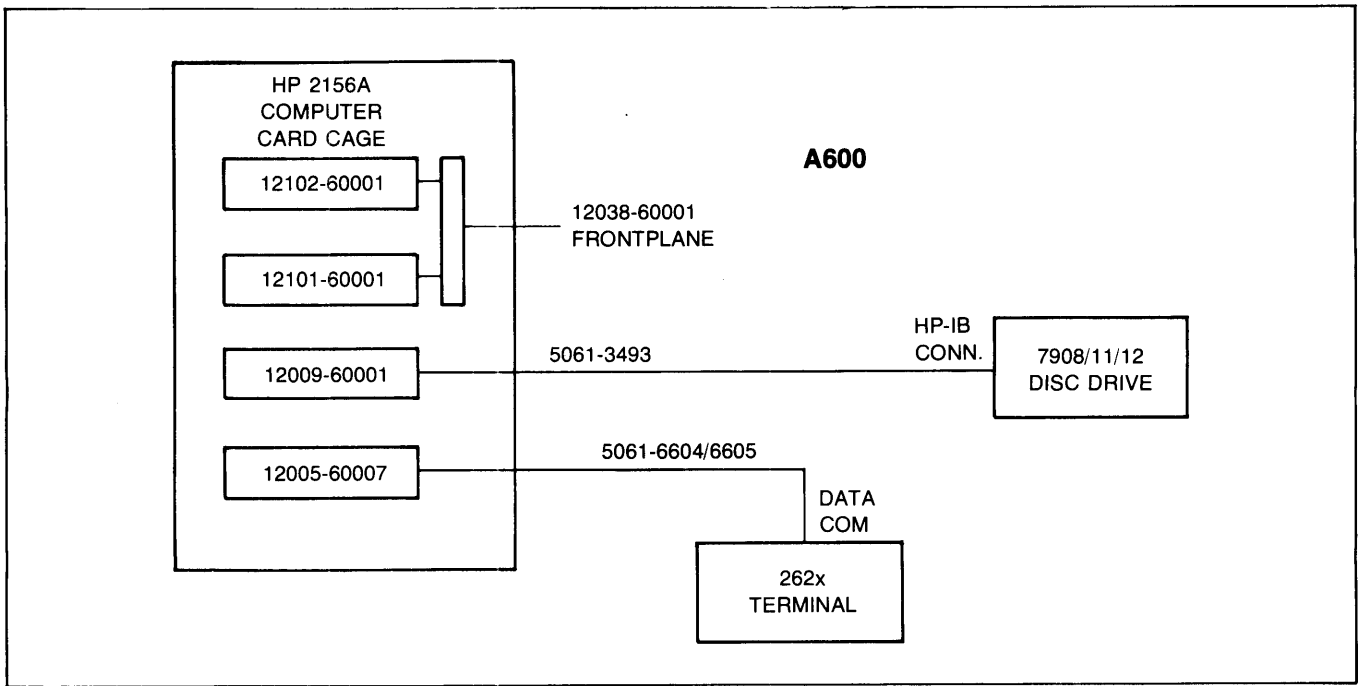
Figure 1-1. System Cabling Diagram (Standard HP 2196A/B)
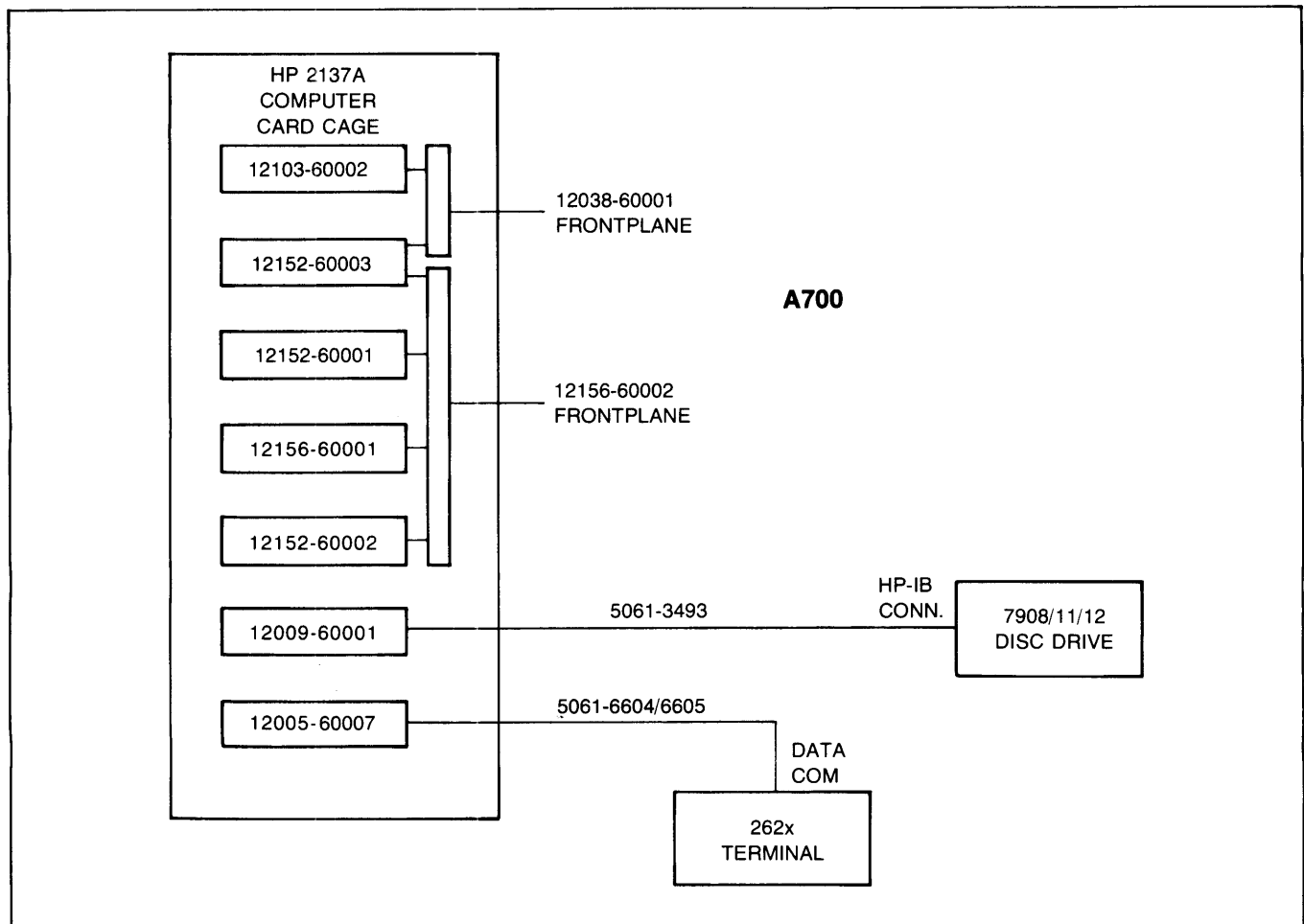
8200-64

Figure 1-2. System Cabling Diagram (Standard HP 2197A/B)

8200-65

1-11. CS/80 DISC DRIVE INSTALLATION

General information for installing the CS/80 disc drive (HP 7908R/11R/12R) is given in the appropriate disc drive installation manual listed in Table 1-1. Refer to that information and install the disc drive in the system cabinet as follows:

CAUTION

The CS/80 disc drive must be configured for operation with the appropriate line voltage.

a. Set the system Power switch to OFF.

b. Loosen the captive screw securing the right side of the cabinet front door and open the door.

Table 1-1. Disc Drive Installation

DISC DRIVE	INSTALLATION MANUAL PART NO.	HP-IB ADDRESS*
7908R	07908-90902	0
7911R	07911-90902	0
7912R	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/7912R Disc Drive in the cabinet.

c. For the 7911/7912 Drive, install the HP 40024A Cabinet Anti-Tip Legs. Refer to the 40024-90001 instruction sheet for installation procedures.

d. For the 7911/7912 Drive, remove the mounting rails from the cabinet and install the rack-mounting slides. Note that Tinnerman nuts are attached to the cabinet columns for mounting the slides.

WARNING

Each 7911R/7912R Disc Drive weighs 67.3 kilograms (148 pounds); two or more persons are required to lift one.

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 (5061-3493) between the HP-IB connector on the drive and the HP 12009 HP-IB interface card in the computer card cage.

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

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

j. 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.)

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

l. 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 16/17 system has been installed as described in the preceding paragraphs, turn on the system by performing the following steps:

a. Turn on the Power switch on the system console. After about 15 seconds the blinking cursor will appear on the console screen.

b. Turn on the Power switch on the system cabinet. The system computer performs its self-tests within five seconds (depending on the type of cards in the card cage) and enters the VCP mode. The console displays the following:

SOFT ERROR xxxxx xxxxx   (Physical page and offset of soft parity error. This message output only if battery backup failed to sustain memory contents.)

PRETEST ERROR xxxxx xxxxx   (This is output only if there is an error.)

```
HP A-600/700 VCP

Type ? for help

yyyyKB MEMORY  zzzKB ECA

    P 000002 A aaaaaa B bbbbbb
    RW 000000  M 000000  T 177777
>
```

Where: **aaaaaa** = number of I/O Masters detected
by self-test

bbbbbb = revision code of VCP PROM

xxxxxx = octal value of LED display

yyyy = total amount of installed memory

zzz = amount of error correcting
memory installed

> = VCP prompt character

c. Using the tape cartridge loading instructions given in the disc drive manual, insert the tape cartridge labeled "RTE-A.1 Software Pack" into the tape drive of the CS/80 drive. The disc drive automatically begins to condition the cartridge tape. After one to two minutes, the BUSY light goes off.

d. Remove the front panel from the CS/80 disc drive. Arm the disc drive for restoration by momentarily pressing the RESTORE switch. The BUSY light will flicker intermittently.

e. Within five seconds, again press the RESTORE switch to transfer the Primary System from the tape cartridge to the disc. This transfer takes about eight minutes. The BUSY light will remain on during the transfer; a steady flashing indicates a data or hardware fault.

f. After the BUSY light goes off, remove the tape cartridge from the drive by using the instructions given in the disc drive manual. Reinstall the disc drive front panel.

g. Bootup the Primary system by entering the underlined command string shown below, followed by a carriage return.

%BDC0027

Within 10 seconds the console will display the following messages:

```
2048 BLOCKS IN SWAP FILE
BOOT PROCESS COMPLETE
*RTE READY*
```

h. Within 10 seconds the system will display the WELCOM file message (see Figure 1-3).

NOTE

Refer to the HP 1000 Getting Started Manual, part no. 5955-8813, for information on using the Primary System.

```
   @     @     @@@@@@        @    @@@@@@    @@@@@@    @@@@@@
   @     @     @    @        @    @    @    @    @    @    @
   @@@@@@@     @@@@@@        @    @    @    @    @    @    @
   @     @     @             @    @    @    @    @    @    @
   @     @     @             @    @@@@@@    @@@@@@    @@@@@@

     @@@@       @@@@@@    @@@@@@    @@@@@@    @    @@@@@@    @@@@@@
   @     @      @         @        @    @    @    @         @
   @@@@@@@ @@    @@@@@@    @@@@@@    @@@@@@    @    @@@@@@    @@@@@@
   @     @           @    @        @    @    @    @              @
   @     @      @@@@@@    @@@@@@    @    @    @    @@@@@@    @@@@@@

  *********************************************************************
  *                                                                   *
  *                                                                   *
  *            FOR AN INTRODUCTION TO THIS SYSTEM, TYPE:              *
  *                                                                   *
  *                            HELLO                                  *
  *                                                                   *
  *********************************************************************

  ::
FMGR :
```
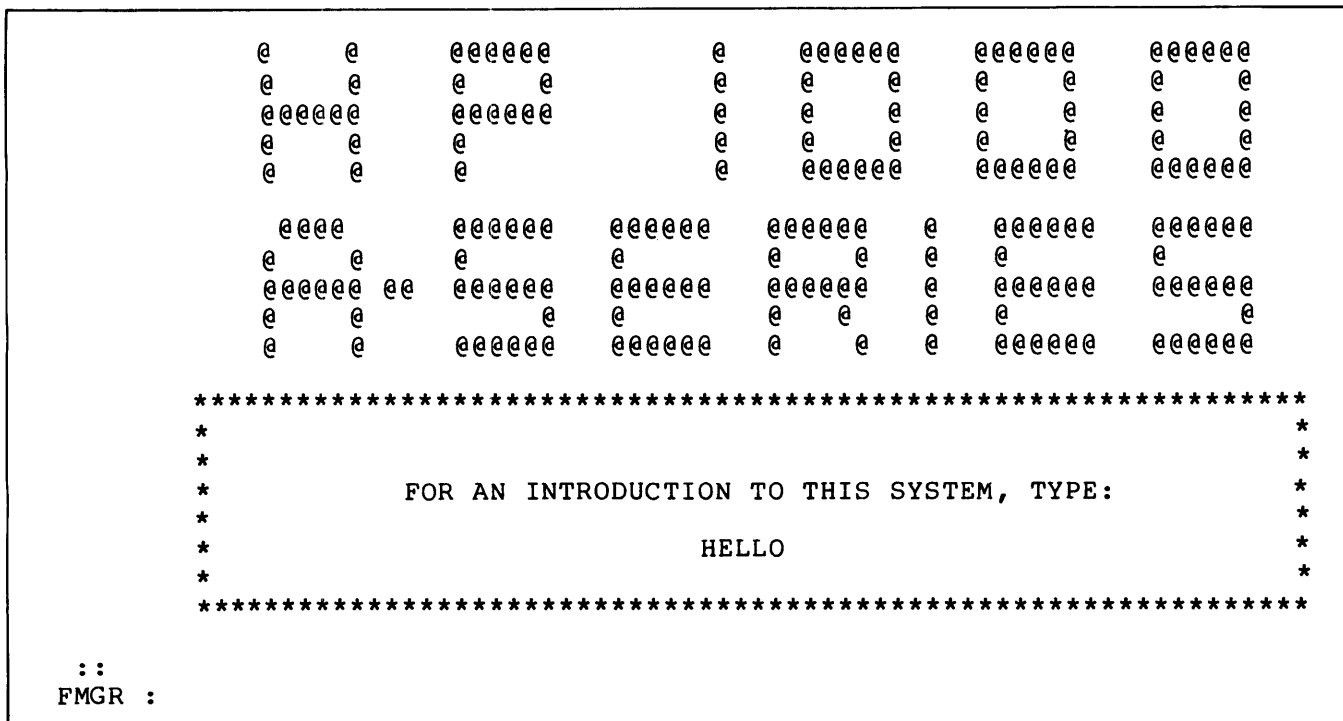
Figure 1-3. Typical WELCOM File Message

1-13. SYSTEM VERIFICATION

To verify proper operation of the Model 16/17 System, run the system functional test (FTEST) as described in Appendix A of this 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.1 Utilities Manual*, part no. 92077-90004.)

c. Press and hold the SAVE switch on the drive until the BUSY light begins to flicker. Then release the switch and momentarily press it again within three seconds; this starts the backup process. The backup completes in about eight minutes; the BUSY light remains on during the backup process.

1-15. SYSTEM RECONFIGURATION

The plug-in cards in the computer card cage have small switches that must be set as appropriate for a particular system configuration. If the system is to be reconfigured, check with the System Manager to determine the proper settings for the switches. (If hardware changes require the reassignment of select codes, or the addition or deletion of interfaces or devices, a new system must be generated.) For information on HP-IB address switches of the disc drive, refer to the appropriate disc drive documentation.

NOTE

The system should be installed and checked out as described in preceding paragraphs before it is reconfigured or any new interface cards are added to it.

1-16. FACTORY SETTINGS FOR PLUG-IN CARD SWITCHES

The factory settings of the switches on the plug-in cards in the computer card cage enable system operation with the Primary System. These switch settings are as follows:

a. 12102-60001 or 12102-60002. *HP 2196A/B only.* Memory controller card switch S1 is set to BAT.

b. 12101-60001. *HP 2196A/B only.* Processor card switches U1S1-S8 (BOOT SEL and M) are set to cause the computer to execute the VCP routine after the self-tests execute. (U1 switches are OCCCCCCO; where O = open (up) and C = closed.)

c. Frontplane. *HP 2197A/B only.* Switches BOOT SEL and M are set to cause the computer to execute the VCP routine after the self-tests execute. (Switches are OCCCCCCO; where O = open and C = closed.)

NOTE

For the 2197A/B, frontplane switches SLFTST *must* all be closed (down) in order to prevent degraded computer performance.

d. 12156-60001. *HP 2197A/B 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 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. 12009-60001. Switches U16 and U1 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).

f. 12005-60007. Switches U21S1-S8 provide 9600 baud operation with one stop bit and odd parity. (U21 switches are OOOOCCOC; where O = open (up) and C = closed.) Switches U1S1-S8 provide VCP interfacing and select code 20 octal. (U1S1-S8 are CCCOCCCC.)

Tables 1-2 and 1-3 summarize the factory settings of the plug-in card switches in the 2196A/B and 2197A/B, 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:

Table 1-2. Summary of Factory Switch Settings
(HP 2196A/B)

CARD	SWITCH SETTINGS
Memory Controller 12102-60001 12102-60002	Switch S1 = BAT Switch S1 = BAT
Processor 12101-60001	U1 switches = OCCCCCCO*
HP-IB Interface 12009-60001	U16S1-S8 = all closed (down) U1 switches = OCCOCOOO*
Async. Serial Interface 12005-60007	U21 switches = OOOOCCOC* U1 switches = CCCOCCCC*
*O = open (up); C = closed (down)	

Table 1-3. Summary of Factory Switch Settings
(HP 2196A/B)

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 12005-60007	U21 switches = OOOOCCOC* U1 switches = CCCOCCCC*
*O = open (up); C = closed (down)	

a. Processor card (A600 only).

b. Memory controller card (A600 only).

c. Processor frontplane (A700 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 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.

If an external device is to be interfaced as a Virtual Control Panel (VCP), refer to the device's interface card manual eor VCP interfacing information. Note that only one VCP can be configured into the system. (Normally, the system console is 'he VCP.)

1-19. I/O PRIORITY ASSIGNMENT

Each peripheral device in the system must be connected to the computer system through an interface card installed in the card cage. A priority chain connects all interface cards in series to prioritize simultaneous interrupt requests from two or more peripherals. The priority of an interface card is determined by the slot that the card occupies, with the I/O slot nearest the processor card having the highest priority and slot 20 having the lowest priority. (See Figures 1-4 and 1-5.) Interrupts from a higher priority device inhibit lower priority interrupts by breaking the priority chain. (Note that correct computer operation requires that there not be any vacant slots between plug-in cards.) From the standpoint of system response time, it is more efficient to assign the higher priorities to high-speed peripheral devices.

Refer to the individual interface card documentation for installation details concerning card switches and priority considerations. Then consult the System Manager to establish I/O device priority and install the interface cards accordingly.

1-20. MEMORY SUBSYSTEMS

There are several types of memory subsystems available for the computer. For information regarding the memory subsystems, refer to the computer installation and service manual.
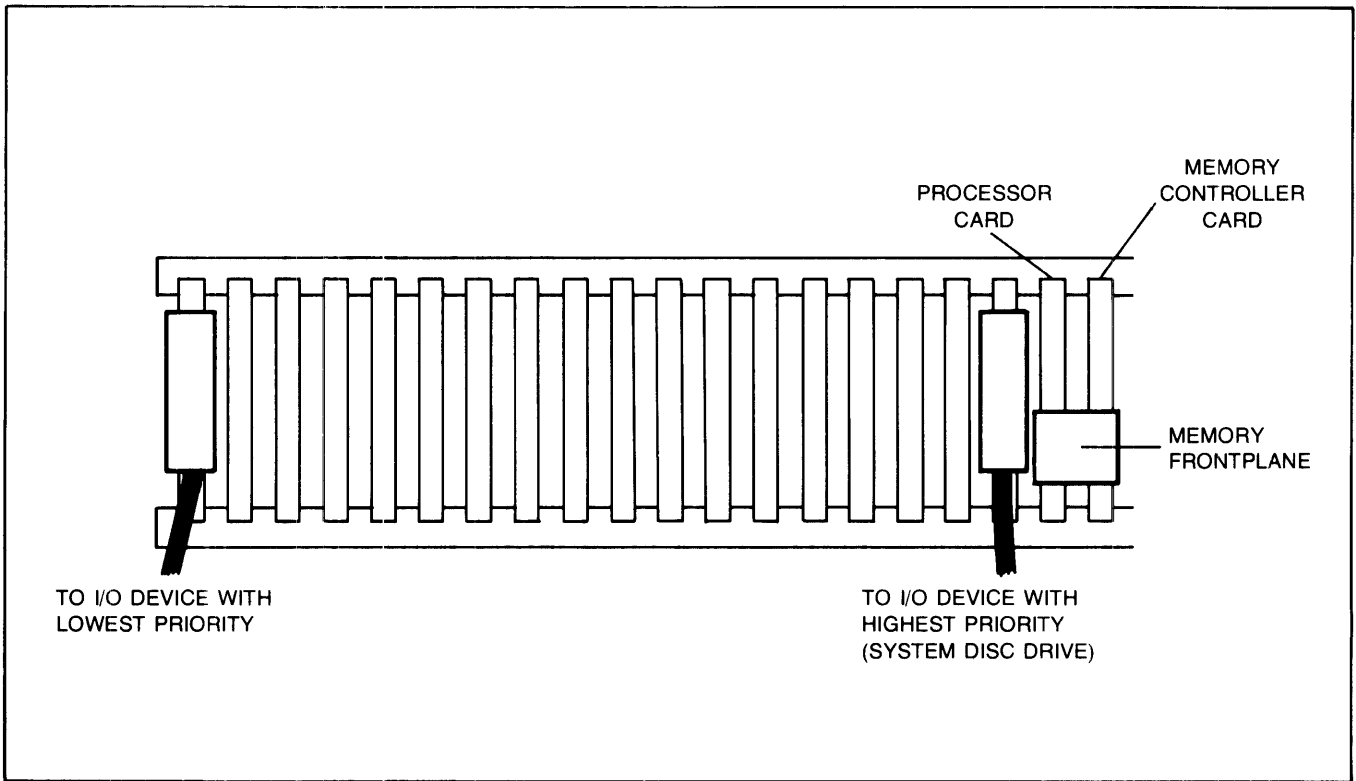
8200-33

Figure 1-4. System Cards and I/O Priority Assignments (Standard 2196A/B)
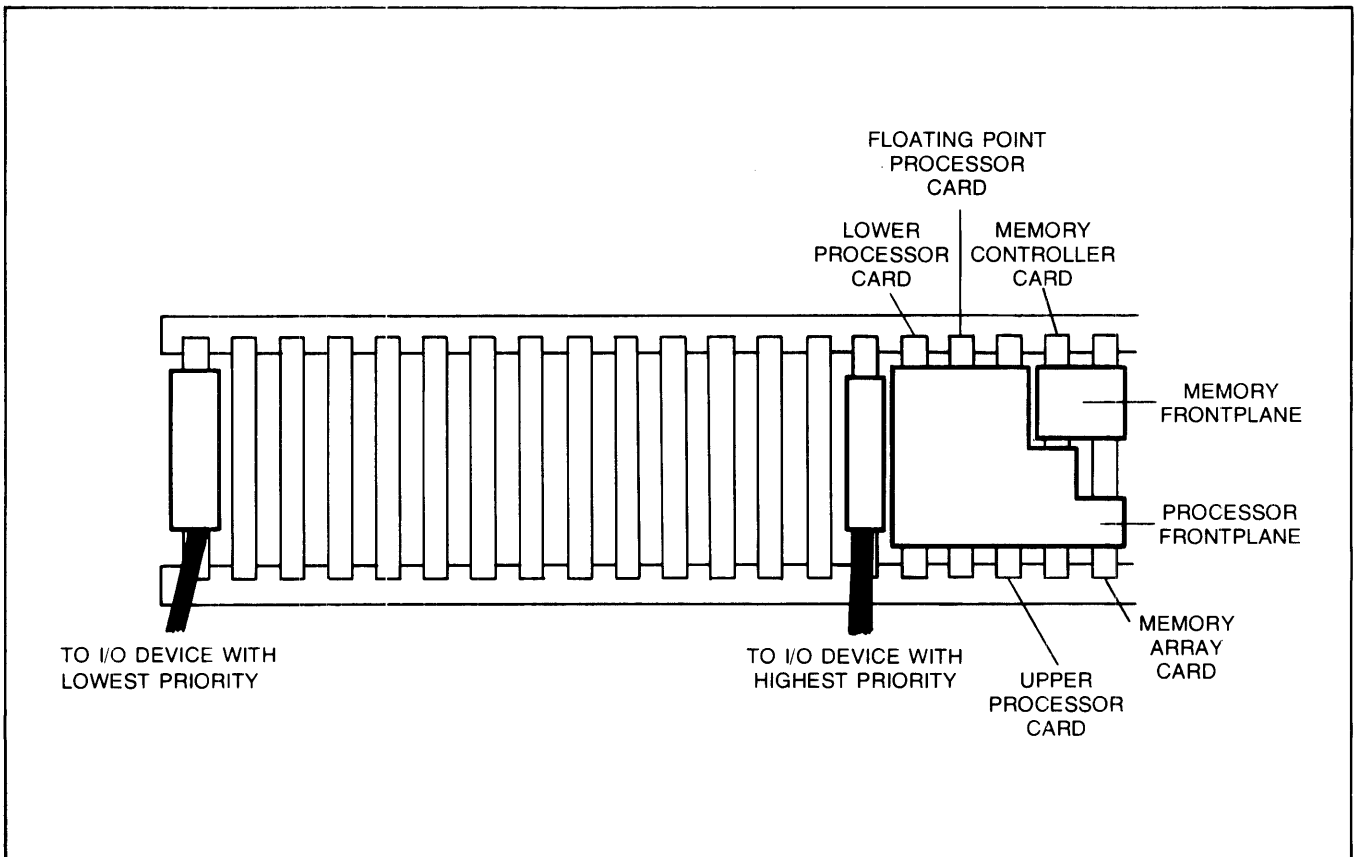
8200-63

Figure 1-5. System Cards and I/O Priority Assignments (Standard 2197A/B)

1-21. INTERFACE CABLING

<div style="text-align: center;">

CAUTION

</div>

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

Cable requirements to interconnect interface cards and
associated peripherals are specified in the appropriate
interface documentation. After all interface cables have
been assembled, set the computer ~LINE switch to OFF
and open the card cage covers. Install the hooded connec-
tor of each cable onto the edge connector of the appropriate
interface card, with the cable extending to the bottom of
the card cage. Connect the other end of each cable to the
appropriate peripheral device. Close and secure the card
cage covers and set the ~LINE switch to ON. Close and
secure the cabinet rear door, with the cables passing under
the door.

The reconfigured system can be checked out by executing
the FTEST program (as described in Appendix A) and the
appropriate diagnostics.

1-22. REPACKING FOR SHIPMENT

Repacking of the Model 16/17 system cabinet requires the
use of the original container and packing material. If the
container is not available, consult your local Hewlett-
Packard Sales and Service Office to obtain a container or
instructions for fabricating an acceptable alternate. Be-
fore shipment, the cabinet should have a tag identifying
the owner and stating the service or repair to be ac-
complished. Include the system model number and full
serial number.

To package the system, proceed as follows:

a. Place the ramp on the front of the container base.

b. Thread the leveling feet into the cabinet to allow
freedom of movement of the cabinet.

c. Position the system at the ramp with the rear of the
cabinet facing the container base.

d. Carefully roll the system onto the container base via
the ramp.

e. Reinstall the upper front of the container base.

f. Place padding on top of the system. Place the ramp on
top of the padding and secure in place with tie wrap
material.

g. For the 720-mm cabinet, place the container over the
cabinet and secure the container to the base with two
straps.

h. For the 1613-mm cabinet, wrap the container around
the cabinet and secure it with four crimp fasteners.
Place the container top cover on the container and
secure the container to the base with two straps.

i. Mark the container "FRAGILE".

Repacking instructions for the system accessories are
contained in the installation and service manuals for the
accessories.

Table 1-4. System Electrical and Environmental Specifications

ELECTRICAL SPECIFICATIONS

Standard Line Voltage and Line Frequency

Line Voltage (With 7908R):	88-127V (115V nominal).
Line Voltage (With 7911R or 7912R):	90-105V (100V nominal) or 108-126V (120V nominal).
Line Frequency:	With 7908R: 47.5 to 66 Hz. With 7911/12R: 54 to 66 Hz.

Option 015 Line Voltage and Line Frequency

Line Voltage (With 7908R):	187-253V (230V nominal).
Line Voltage (With 7911R or 7912R):	198-231V (220V nominal) or 216-252V (240V nominal).

Table 1-4. System Electrical and Environmental Specification (Continued)

Line Frequency:	With 7908R: 47.5 to 66 Hz. With 7911/12R: 48 to 55 Hz.
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 2196A/2197A requires split-phase power; the 2196B/2197B requires single-phase power. An additional receptacle is required for the system console.
Maximum Current Required:	2196A/2197A: 16 Amperes per phase. 2196B/2197B: 16 Amperes.
Maximum Power Dissipation in Upper Section of 2196A/2197A Cabinet:	250 Watts.

PHYSICAL CHARACTERISTICS

Dimensions

Height:	Model 16/17 (2196A/2197A): 1613 mm (63.4 in). Model 16/17 (2196B/2197B): 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 for 7908R <10°C (18°F) per hour; for 7911/12R <20°C (36°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 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 A600/A700 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.)

2-1. INTRODUCTION

This section includes customer maintenance, troubleshooting information for isolating malfunctions to the assembly level, and procedures for removing and replacing various assemblies of the Model 16/17 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.

Customer maintenance schedules should be set up 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 (2196A/97A) have sealed bearings and require no lubrication. The air filters in the computer and the 2196A/97A cabinet should be cleaned monthly to ensure that the equipment remains free of dust.

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 (Appendix A).

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.)

NOTE

You *must* check the HP-IB interface card for the correct select code and the disc drive for the correct HP-IB address! An incorrect select code or HP-IB address will *not* be detected by either the computer's or the disc drive's self-test! Similarly, if a disc drive is replaced, you must correctly set the new drive's HP-IB address!

2-7. MEMORY CARD LEDS

Memory parity status is indicated by a green LED on the front of each memory card. When the LEDs are lit, a memory parity error has not occurred; when an LED is off, a parity error has occurred. A parity error indication (LED off) can be cleared by cycling the computer ~LINE switch, or entering the %T or %P command on the VCP, or pressing the RESET switch on the frontplane. Frequently recurring parity errors can be eliminated by replacing the memory card having the error.

The eight red LEDs on error correcting memory cards identify the faulty memory chip for single-bit errors. Refer to the A700 computer installation and service manual for details.

2-8. FTEST PROGRAM

The FTEST program should be run when the computer self-test fails to detect a suspected system malfunction. FTEST is described in Appendix A.

2-9. DIAGNOSTICS

The diagnostics in the HP 24612A and 24398B Diagnostic Packages should be used for testing when the various self-tests and the FTEST program cannot detect a system malfunction. The processor and memory diagnostic in the 24612A package tests the processor card, the memory, and the I/O Master on each I/O card. Interface diagnostics test the individual interface cards. The 24398B package provides diagnostics for hard disc drives and magnetic tape units. The HP 24613A Diagnostic Package (not supplied with the system) provides diagnostics for measurement and control interfaces. Instructions for running the diagnostics are given in operating manuals included in the diagnostic packages. For the Model 16/17 system, the HP 24612A and 24398B diagnostic software is included on the same CS/80 tape cartridge as the Primary System, and the diagnostic manuals are supplied with the system.

2-10. UNIT REMOVAL AND REPLACEMENT

WARNING

Hazardous voltages are present inside the system cabinet. Heed all WARNING — HAZARDOUS VOLTAGE labels.

CAUTION

All contents of memory will be lost when the mains (line) and battery voltages are both off. Therefore, before proceeding, ensure that any contents of memory to be saved are stored on another medium for later retrieval.

The following paragraphs describe procedures for removing and replacing the computer, the disc drive, and the cabinet fans. (Refer to Section III for illustrations of the Model 16/17 systems.)

2-11. COMPUTER

2-12. REMOVAL. Remove the computer from the cabinet as follows:

a. Set the system Power switch to OFF.

b. Open the rear door of the system cabinet and disconnect the computer power cord from the PDU.

c. Open the computer card cage covers and disconnect all interface cables from the I/O cards in the card cage. Close the cage covers.

d. Open the front door of the system cabinet.

e. Remove the front cover of the computer by grasping it firmly and pulling.

f. Remove the four screws securing the computer in the cabinet. Remove the computer by sliding it out of the cabinet.

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 7911R/7912R Disc Drive from the cabinet.

a. For the 7911/7912 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 PDU.

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

e. Open the 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 7908 Drive, remove the drive by sliding it out of the cabinet.

WARNING

Each 7911R/7912R Disc Drive weighs 67.3 kilograms (148 pounds); two or more persons are required to lift one.

i. For the 7911/7912 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 2196A/2197A)

2-18. REMOVAL. Remove a cabinet fan from the HP 2196A/2197A (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 cabinet power strip.

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

e. Remove the fan by removing the four screws securing the fan to the fan assembly and by disconnecting the fan power cord from the fan.

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

2-20. 115/230 VAC RECONFIGURATION (2196B/2197B ONLY)

CAUTION

The following 115/230 Vac reconfiguration procedure applies *only* to the HP 2196B/2197B System and *not* to the HP 2196A/2197A System. If is necessary to reconfigure a 2196A/2197A 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 2196B/2197B System (i.e., 720 millimeter cabinet) to operate from the alternative ac power source (115 Vac or 230 Vac). Wiring information on the Power Distribution Unit (PDU) in the system cabinet is given in Figures 2-1 and 2-2. To convert the system to 115- or 230-Vac operation, proceed as follows:

WARNING

System reconfiguration for operation from 115 or 230 Vac line voltage must be done only by qualified personnel. Before changing from 115 Vac to 230 Vac configuration, or vice versa, set the Power switch on the rear of the system cabinet to OFF and disconnect the power cord from the power source. Failure to observe this precaution may result in serious injury.

a. Set the Power switch on the rear of the cabinet to OFF and disconnect the power cord from the power source.

b. On the cabinet rear door, remove the screws securing the inspection plate of the PDU and remove the plate.

c. Loosen the captive screw securing the right side of the cabinet rear door and open the door.

d. Install the appropriate system power cord. For 230-Vac operation an electrician must install a user-supplied power cord.

e. Using the procedure given in paragraph 2-11, remove the computer from the system cabinet.

f. Perform the computer 115/230-Vac reconfiguration procedure given in the computer installation and service manual.

g. For the 7908R Disc Drive, remove the drive from the system cabinet by using the procedure given in paragraph 2-14.

WARNING

To prevent the cabinet from tipping over, you must install the cabinet anti-tip legs before sliding the 7911R/7912R Disc Drive out of the cabinet.

h. For the 7911R/7912R Drive, install the HP 40024A Cabinet Anti-Tip Legs. Refer to the 40024-90001 instruction sheet for installation procedures. Slide the drive out of the cabinet.

i. Perform the disc drive line voltage reconfiguration procedure given in the disc drive installation manual.

When the system is reconfigured, the voltage rating tag on the rear of the system cabinet must be removed and replaced with one that shows the appropriate voltage selection.

2-21. POWER DISTRIBUTION DIAGRAMS

Figure 2-1 is the power distribution and wiring diagrams for the HP 2196A/2197A System, and Figure 2-2 is the power distribution and wiring diagrams for the HP 2196B/2197B System.

POWER DISTRIBUTION UNIT (HP 2196A/2197A)

TERMINAL BLOCK

PHASE 1

TO LINE (MAINS) POWER

PHASE 2

N — NEUTRAL WHT — CB1
A — BLK
B — RED
C
GROUND — GRN/YEL

TO HP 2137A/ 2156A COMPUTER

TO HP 7908R/ 7911R/7912R DISC DRIVE

TO NEXT BAY

20-AMP. LINE FILTER

6-CONN. POWER STRIP

WHITE   BLACK   RED

GREEN-YELLOW

N   A   B   C

ON

OFF

CB1

8200-69

Figure 2-1. HP 2196A/2197A Wiring Diagrams

2-5/2-6

8200-70
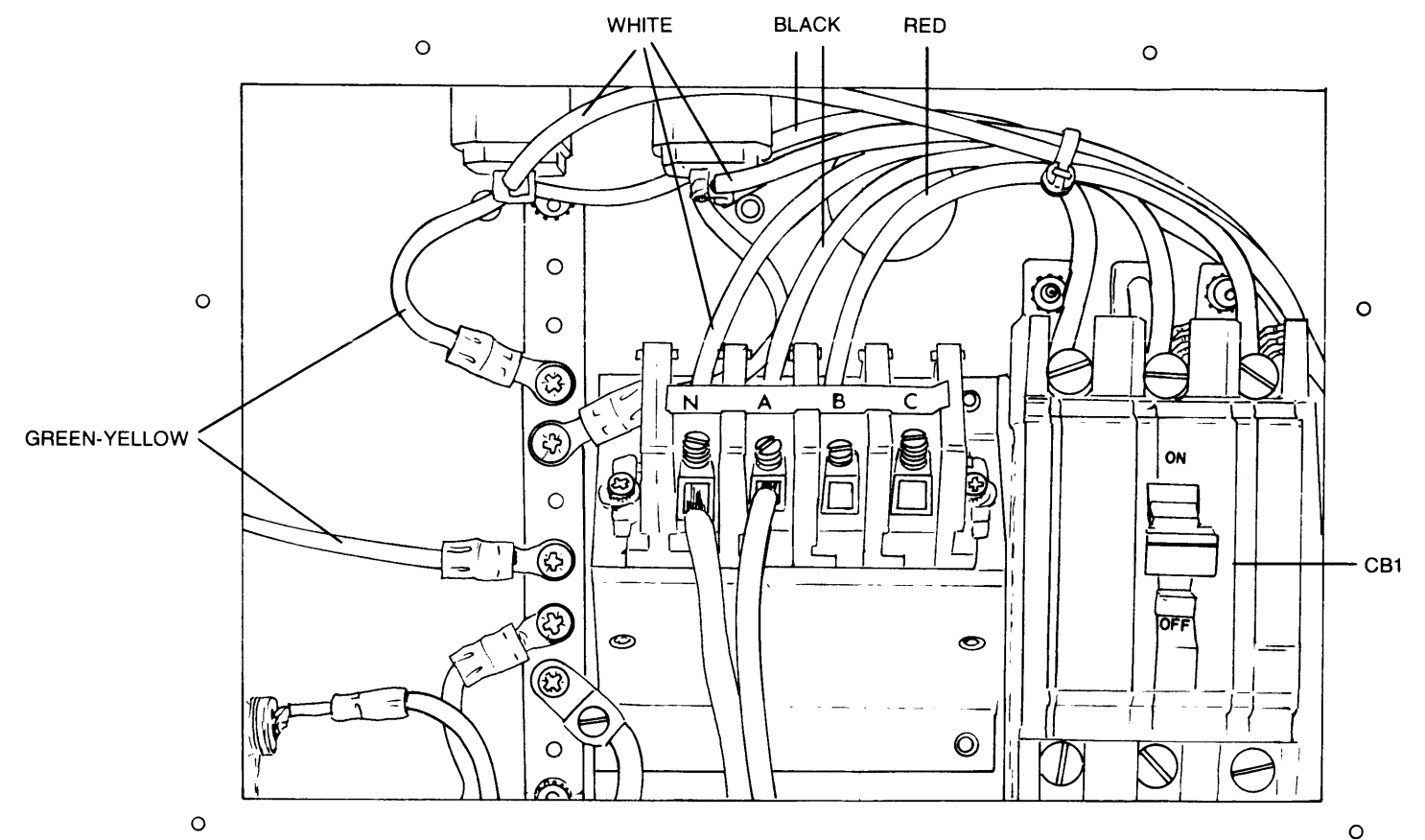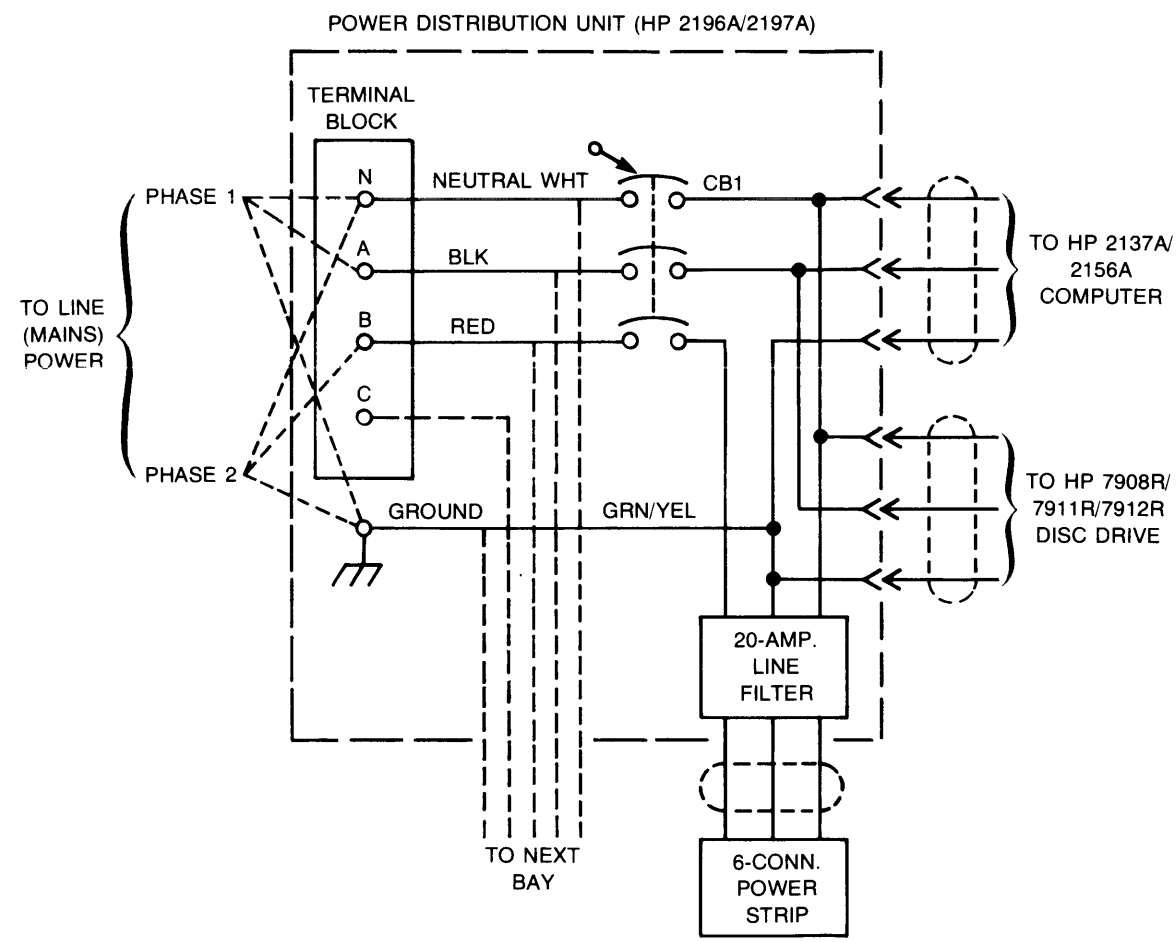
Figure 2-2. HP 2196B/2197B Wiring Diagrams

3-1. INTRODUCTION

This section provides information on field-replaceable parts of the system. Replaceable system assemblies are listed in Tables 3-1 and 3-2. Figures 3-1 and 3-2 are illustrations of the Model 16 and 17 Systems.

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

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

Most 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.

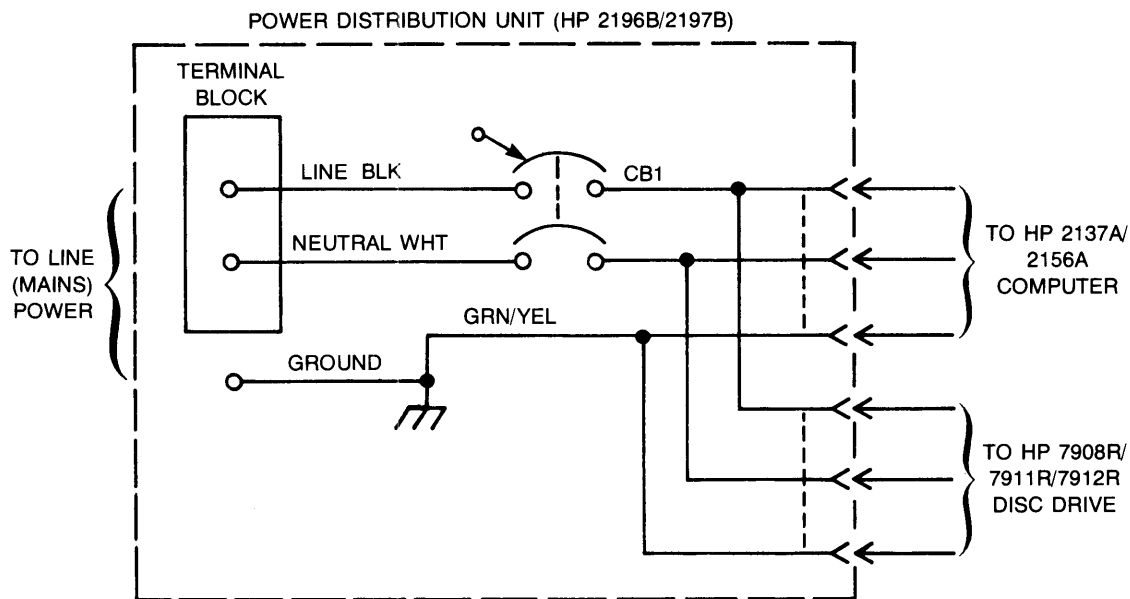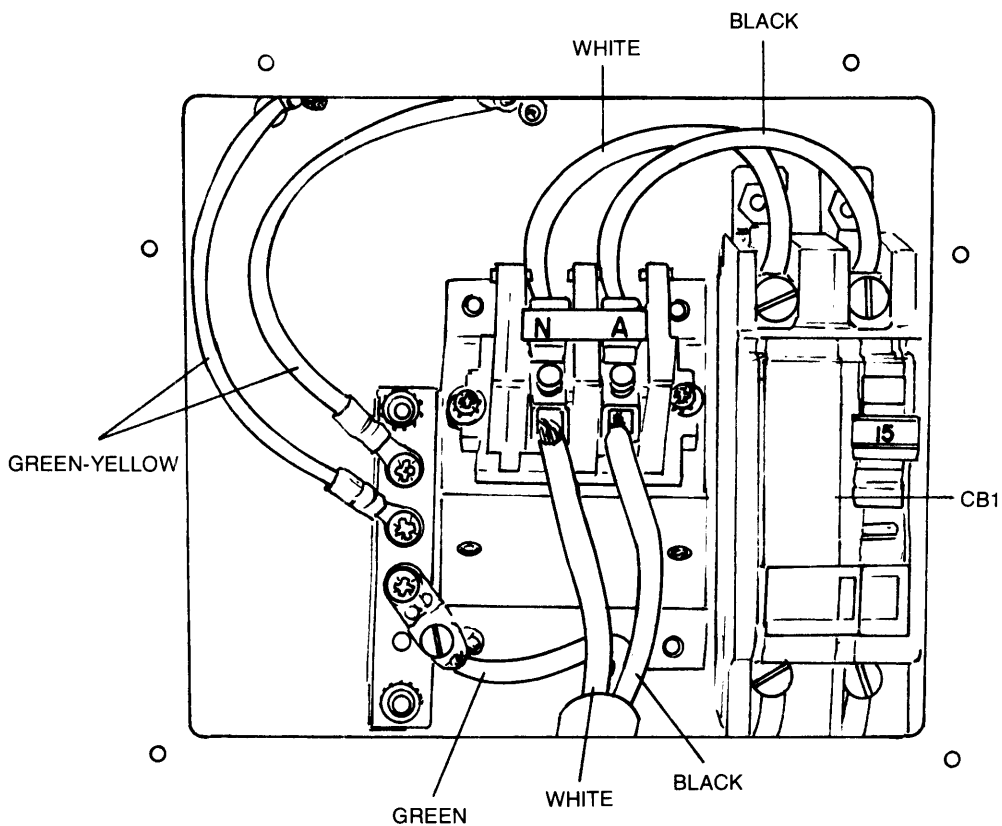Table 3-1. Replaceable Parts (HP 2196A/B)

FIG. & INDEX NO.	DESCRIPTION	HP PART NO.
—	Processor Card	12101-60001*
—	128k Byte Memory Controller Card	12102-60001*
—	512k Byte Memory Controller Card	12102-60002*
—	128k Byte Memory Array Card	12103-60001
—	512k Byte Memory Array Card	12103-60003
—	1024k Byte Memory Array Card	12103-60004
—	2-Connector Memory Frontplane	12038-60001
—	3-Connector Memory Frontplane	12038-60002
—	4-Connector Memory Frontplane	12038-60003
—	5-Connector Memory Frontplane	12038-60004
—	HP-IB Interface Card	12009-60001
—	Asynchronous Serial Interface Card	12005-60007
—	Cable, HP-IB Interface	5061-3493
—	Fan, Cabinet	3160-0315

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

Table 3-2. Replaceable Parts (HP 2197A/B)

FIG. & INDEX NO.	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
—	2-Connector Memory Frontplane	12038-60001
—	3-Connector Memory Frontplane	12038-60002
—	4-Connector Memory Frontplane	12038-60003
—	5-Connector Memory Frontplane	12038-60004
—	HP-IB Interface Card	12009-60001
—	Asynchronous Serial Interface Card	12005-60007
—	Cable, HP-IB Interface	5061-3493
—	Fan, Cabinet	3160-0315

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

FRONT VIEW
(DOOR REMOVED FOR CLARITY)

REAR VIEW

CABINET
FAN

DISC DRIVE
POWER CABLE

DISC DRIVE
HP-IB CABLE

COMPUTER (FRONT
COVER REMOVED)

POWER DISTRIBUTION
UNIT

GROUND WIRE

COMPUTER POWER
CABLE

Figure 3-1. HP 1000 Model 16/17 (2196A/2197A)

FRONT VIEW

REAR VIEW

DISC DRIVE
HP-IB CABLE

DISC DRIVE
POWER CABLE

COMPUTER (FRONT
COVER REMOVED)

POWER DISTRIBUTION
UNIT (PDU)

GROUND WIRE

COMPUTER POWER
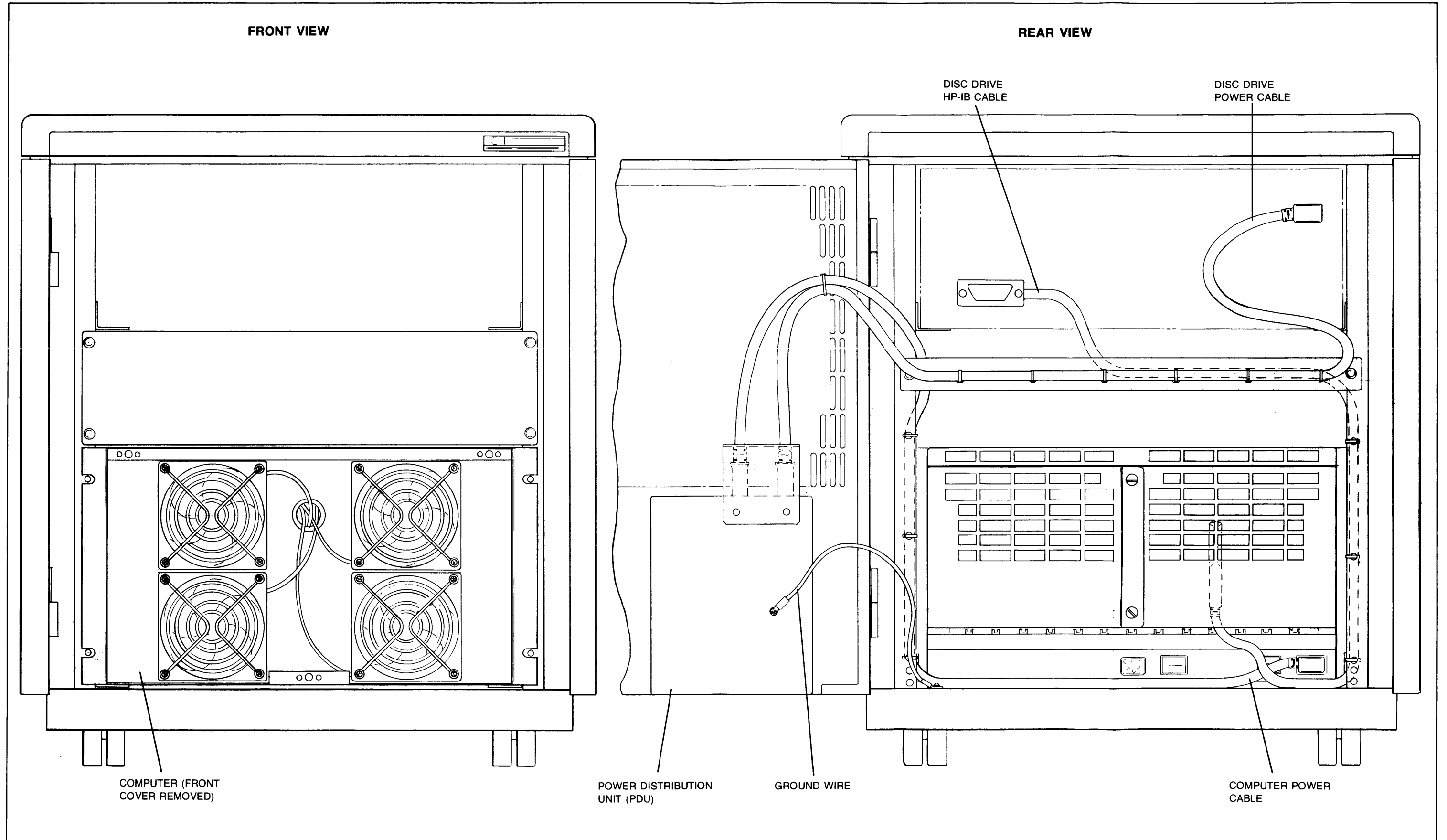CABLE

Figure 3-2. HP 1000 Model 16/17 (2196B/2197B)

A-1. INTRODUCTION

This appendix describes the A-Series system functional test program, FTEST, which is part of the Primary System. Included are a description of the test and its operation, a detailed specification of the run parameters and their defaults, and a sample of the program output.

A-2. DESCRIPTION

FTEST is a functional test of the peripherals and interface cards of the A-Series system. It is intended to give a go/no-go indication of the status of each device and interface card attached to the computer and report this status to an LU (logical unit) or a file.

There are two test types which may be performed; the test to be run is specified by a run parameter. Test Type 1 is a test which causes the minimum disruption of the system. Test Type 2 is a disruptive self test of the system peripherals. Both tests first check each peripheral to see if it is busy, locked, or down. If any of these conditions are true, the test marks the device as such. If the device is up and available, it is tested according to its type and the type of test.

Test Type 1 performs standard I/O requests to each device and checks to see that the device performed correctly. The terminal test writes the message "THIS TERMINAL UNDER FUNCTIONAL TEST" followed by "FUNCTIONAL TEST COMPLETE PASS # XXXXXX". The terminal status is then read to verify the terminal action. If any of the operations fail, the LU is marked failed and the program then tests the terminal's interface card to see if is present in the system. If the interface card is there, the terminal is marked as "FAILED"; if it is not there, the terminal is marked "IFC FAIL". If all tests and status pass, the terminal is marked "PASSED".

Printer tests print the message "THIS PRINTER UNDER FUNCTIONAL TEST" followed by "FUNCTIONAL TEST COMPLETE". The printer status is then read and the same actions are taken as for the terminal test, marking the device as either "PASSED", "FAILED", or "IFC FAIL".

For a Type 1 disc test, a scratch file is created on each mounted disc (unmounted discs are marked "UN-MOUNTED"). A 20-character buffer is written to the file and then read back and verified. The file is then closed and purged. If any errors have occurred, the LU is marked as "FAILED" and an attempt is made to purge the file.

Any other device is not tested; only its interface card is tested. For serial (ASIC) or parallel devices, the interface card is tested for non-zero dynamic status. The device is either marked "IFC FAIL" (if dynamic card status is 0) or "FAILED" (if non-zero status). The HP-IB bus has an LU number and is tested under its own number, so unsupported HP-IB devices are listed as untested; their interface status is listed with their HP-IB bus LU.

Test Type 2 initiates device self test on the peripherals of the system, which can disrupt system operation and cause the termination of programs. The terminals, printers, and discs are given the command to initiate self test; then the program suspends itself for about 10 seconds. After 10 seconds the self tests should complete and the program cycles through the LU's, calling for self test results. Unsupported devices and failed devices are tested at the interface card in the same way as in Test Type 1, with the results having the same interpretation. All up and available discs are tested even if they are not mounted; only one LU on a single disc device is actually given the command to initiate self test. For example, if an HP 7908 is configured into the system as LUs 16 through 20 LU 16 will be told to self test, which will initiate a self test of the whole HP 7908. All LUs on the same device will have the same results.

Cartridge tape units (integral to HP 264X terminals), cartridge tape drives (integral to the HP 7908/11/12), and magnetic tapes drives (HP 7970E, 7970B) are tested separately from the rest of the system by interactive tests. These tests are bypassed unless the second parameter in the run string is specified as an interactive device. (It is normally left blank; see run parameter definitions described in paragraph A-3.) These tests will prompt for the tape LU to be tested, then indicate the status of the test as it proceeds. The test will destroy data on the tape but will issue a warning before initiating the test on each type of device. After testing each device, it prompts for the next device to test until exited. The cartridge tapes are tested first, then the cartridge tape drives, and finally the stand-alone magnetic tape drives. After the tests are complete, FTEST returns to display the results of the previously executed tests.

The results of these tests are printed out on an LU or saved in a file. The results are reported in a table which lists the device type, its current status, and the running tally of all previous executions of the test in this running of the program for each LU.

The tests can be run on the entire system or a particular LU can be specified to be tested. Either way, the test loops up to 32,767 times as specified in the run parameter and keeps a running tally of results.

A-3. PARAMETERS

The following is the command sequence and parameter definitions for FTEST.

RU,FTEST[,outfile namr[,in-device[,#-passes
        [,type-of-test[loop-lu]]]]]

outfile: If a positive LU is specified, test results are listed on the LU. If a file namr is specified and the file already exists, the results will be appended to the file. If the file has not been created, it will be created and the results will be written to the file. If the cartridge specified is not mounted, the message "OUT FILE CARTRIDGE NOT MOUNTED" is printed on the log LU, followed by the test results.

             Default: The default outfile is the log LU from which the program is run.

in-device: A positive integer. If specified, this LU will be used for I/O for the interactive test of the tape units. This is not the device being tested; it is the terminal at which the program can prompt the operator for inputs.

             Default: If no value or a value not in the range of 1 through 63 is specified, the interactive tests are not run; therefore, no I/O device is necessary. If the in-device is not an interactive device, the interactive portion of the test will not be run.

#-passes: Positive integer specifying the number of test iterations to be run. If less than 1 or not integer, #-passes defaults to 1.

             Default: If not specified, #-passes defaults to 1.

type-of-test: Integer, either 1 or 2. Test Type 1 writes test messages to each LU and reads back either the status or the message (depending on the device). Test Type 2 initiates self test on those devices capable of self test and reads the results of the self test. Note that this test may disrupt active programs. It is recommended that Test Type 2 only be run on a quiescent system.

             Default: If not specified or specified as anything other than Type 2, type-of-test defaults to Type 1.

loop-lu: If a number between 1 and 63 (inclusive) is specified, only the LU identified by that number will be tested.

             Default: If no value (or a value outside the range of 1 through 63) is specified, the program will test all of the LU's in the system.

A-4. HALTING EXECUTION

FTEST should not be halted during execution since some devices may be left in undesired states. In particular, the time-out on each device is modified in the course of the test and discs are in the self-test mode for portions of Test Type 2. FTEST tests the break flag at the end of each test loop and will halt after printing the output of any pass during which the break bit has been set. Use the command BR,FTEST and the program will finish at the end of the current pass, leaving the system "clean".

A-5. INTERPRETATION OF RESULTS

The results of the tests performed are output to a file or a device in tabular form. (See Figure A-1.) The meaning of each entry should be clear; however, a few points should be noted.

The sum of the results will not necessarily be equal to the number of passes completed. This is because not all possible outcomes are recorded in the table. For instance, if a disc is not mounted it will not be tested. If it is mounted during the course of the test run, the results of the tests after mounting it will be recorded but the passes of the test prior to mounting have not been recorded.

If a device fails its test, its associated interface card is tested unless it is an HP-IB device. If the interface card fails, the device is listed as "IFC FAIL". If the device fails and the interface card passes, then the device is listed as "FAILED". HP-IB devices which fail will always be listed as "FAILED" rather than "IFC FAIL" because the HP-IB interface card is tested under its own LU number.

In the sample test results shown in Figure A-1, LU 3 has failed but its interface has passed; LU 7 is in the interface fail condition. LU 6 is an HP-IB printer which may have failed. To determine whether it failed or its HP-IB interface failed, it is necessary to check the status of its HP-IB bus LU. (If the HP-IB bus LU has failed, the interface has failed; if not, the printer has failed.)

LU	DEVICE TYPE	STATUS AT LAST PASS	PASSES PASSED	PASSES DOWN	PASSES FAILED	PASSES BUSY	PASSES IFC FAIL
1	KEYBD CTL DV	PASSED	1	0	0	0	0
2	UNSPORTD DVC	UNTESTED	---
3	KEYBD CTL DV	FAILED	0	0	1	0	0
4	SER RECORDNG	UNTESTED	---
5	SER RECORDNG	UNTESTED	---
6	LINE PRINTER	FAILED	0	0	1	0	0
7	UNSPORTD PAR	IFC FAIL	0	0	0	0	1
8	SER RECORDNG	UNTESTED	---
9	HP-IB BUS LU	PASSED	1	0	0	0	0
10	FLEXBLE DISC	UNMOUNTD	---
11	FLEXBLE DISC	PASSED	1	0	0	0	0
12	MOV HD DISC	UNMOUNTD	---
13	MOV HD DISC	UNMOUNTD	---
14	MOV HD DISC	UNMOUNTD	---
15	MOV HD DISC	UNMOUNTD	---
16	MOV HD DISC	UNMOUNTD	---
17	MOV HD DISC	UNMOUNTD	---
18	MOV HD DISC	UNMOUNTD	---
19	MOV HD DISC	UNMOUNTD	---
20	MOV HD DISC	UNMOUNTD	---
21	HP-IB BUS LU	FAILED	0	0	1	0	0
22	MOV HD DISC	UNMOUNTD	---
23	MOV HD DISC	UNMOUNTD	---
24	SER RECORDNG	UNTESTED	---
25	UNSPORTD HPB	UNTESTED	---
26	UNSPORTD HPB	UNTESTED	---
27	UNSPORTD HPB	UNTESTED	---
28	UNSPORTD HPB	UNTESTED	---
29	MOV HD DISC	UNMOUNTD	---
30	MOV HD DISC	UNMOUNTD	---
31	MOV HD DISC	UNMOUNTD	---
32	FLEXBLE DISC	UNMOUNTD	---
33	FLEXBLE DISC	UNMOUNTD	---
34	SER RECORDNG	UNTESTED	---
35	SER RECORDNG	UNTESTED	---
36	UNSPORTD SER	IFC FAIL	0	0	0	0	1
37	UNSPORTD SER	IFC FAIL	0	0	0	0	1
38	KEYBD CTL DV	IFC FAIL	0	0	0	0	1
39	KEYBD CTL DV	IFC FAIL	0	0	0	0	1
40	MOV HD DISC	UNMOUNTD	---
41	MOV HD DISC	UNMOUNTD	---
42	MOV HD DISC	UNMOUNTD	---
43	MOV HD DISC	UNMOUNTD	---
44	KEYBD CTL DV	IFC FAIL	0	0	0	0	1
45	KEYBD CTL DV	IFC FAIL	0	0	0	0	1
46	KEYBD CTL DV	IFC FAIL	0	0	0	0	1
47	KEYBD CTL DV	IFC FAIL	0	0	0	0	1

Figure A-1. Typical FTEST Results