Installation Manual
for the
Models 26, 36 and 36C Computers

Manual Part No.   09836-90000

Hewlett-Packard Desktop Computer Division
3404 East Harmony Road, Fort Collins, Colorado 80525
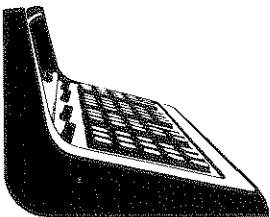
Printing History

The manual printing date and part number indicate its current edition. The printing date will change when a new edition is printed. Minor changes may be made at reprint without changing the printing date. The manual part number will change when extensive changes are made.

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April 1983...First Edition
    This manual replaces the *9826/9836 Installation Manual*, part number 09826-90098.

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Unpacking and Set Up

Introduction

Your new Model 26 or 36 is a flexible, powerful, and easy-to-operate computer. It supports a number of programming languages and operating systems, and has the capacity to link up to diverse peripheral devices.

This manual describes how to configure a Model 26 or 36 for your particular application. This includes setting switches, inserting memory cards and interface cards, interpreting the results of the computer's self-test, and loading an operating system or programming language. Once you've loaded a system or language, refer to the Getting Started information supplied with the system or language for further instructions.

The Model 26 and 36 are members of the HP Series 200 family of computers. We also refer to the Model 26 and 36 as the HP 9826 and 9836 computers, respectively. Other Series 200 computers include the Model 16 (HP 9816) and the Model 20 (HP 9920). All Series 200 computers use the same operating systems and programming languages, allowing you to develop programs on one machine and run them on other computers in the series. The manuals supplied with your programming language, operating system or applications program explain any operational differences between Series 200 computers.

Unpacking the Computer

Your HP computer was thoroughly tested and inspected before being shipped. All equipment should be in good working order. After removing the computer from its carton, carefully check it and the accessories for any damage caused by transit. You should also check the accessories against the packing list supplied. Notify your HP sales office if any damage is found. Also file a claim with the carrier. If any items are missing, call your HP sales representative for assistance.

Be sure to save the shipping carton in case the computer needs to be returned for repair.

Installation Highlights
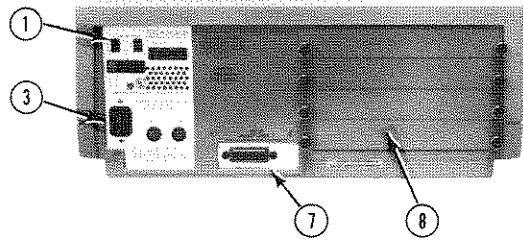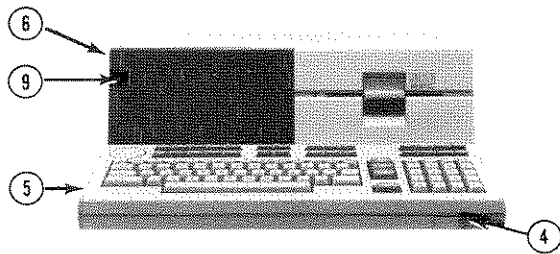
The Model 36A and 36C Computers
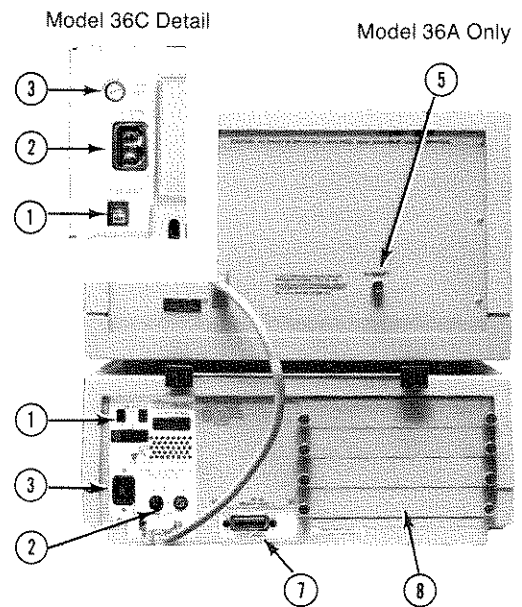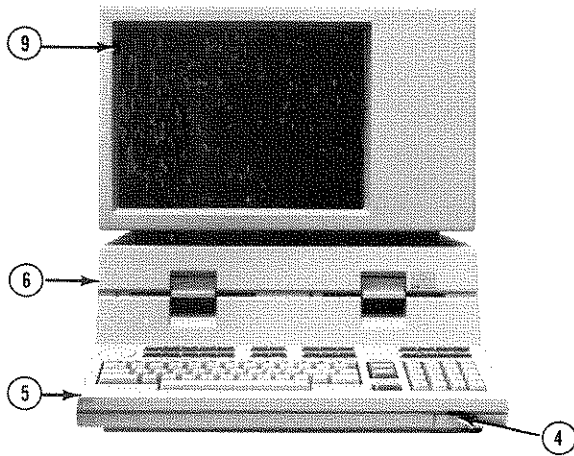
The Model 26 Computer

(1) **Voltage Switches** - The computer is designed to run at either 90-125 Vac or 198-250 Vac. The line frequency range is 48-66 Hz.

(2) **Fuses** - You must have the correct fuses inserted for the computer to run.

(3) **Power Socket(s)** - The three-pronged power socket is especially designed for an HP power cord. The power cord(s) should be in the carton the computer came in.

(4) **Power Switch** - This is the switch you should use to turn power ON and OFF. Never unplug or plug in the computer with the power switch turned ON.

(5) **Brightness Knob** - Turning the brightness knob clockwise increases the screen's brightness; turning it counter-clockwise decreases the brightness.

(6) **The Fan** - The computer has a small built-in fan to keep the machine cool (the Model 36C display has an additional fan). The fan(s) should always be running when the computer is ON. If a fan ever goes OFF while the computer is powered on, switch the computer OFF and call your HP Service Representative.

(7) **HP-IB Interface** - HP-IB stands for Hewlett Packard Interface Bus. This interface is an industry standard for communicating with external instruments and devices (IEEE 488-1975). A single HP-IB can support up to 14 devices ranging from logic analyzers to printers and plotters. A switch allows you to specify whether or not your computer is a system controller. For information about how to access devices on the HP-IB, see the appropriate programming language or operating system manuals.

(8) **Accessory Card Cage** - Remove these plates to install additional memory cards, interface cards and other accessories. This is covered later in the chapter.

(9) **Boot and Self-Test Messages** - The computer automatically tests parts of the system and loads (boots) an operating system at power-up. These topics are discussed in the later chapters.

Setting Up Your Computer

Follow these instructions to install and power-up your computer for the first time. Steps 1 thru 4 should be followed for all computers. The remaining steps are optional; they may or may not be relevant depending on your configuration.

If the computer doesn't power up as expected, refer to the Self-test Chapter.

1. Position the Computer

Place your computer on any convenient surface. Be sure that there is at least 50 mm (2 inches) of space between it and the nearest wall or ceiling for ventilation. Do not operate the computer in areas with excessive dust or smoke.

The Model 36 computer has a detachable display (monitor). After positioning the computer, carefully set the display on the computer so that the display's feet rest in the four notches on the computer's top. Then slide the locking tabs out and back in to lock the display in place.

Be sure to leave enough clearance at the back of the Model 36 for the display cable. If pressure is exerted against the computer-end of this cable, the connector could be damaged.

CAUTION
DO NOT LIFT OR MOVE THE MODEL 36 BY ITS DISPLAY. THE DISPLAY LOCKING TABS CANNOT CARRY THE WEIGHT OF THE COMPUTER.
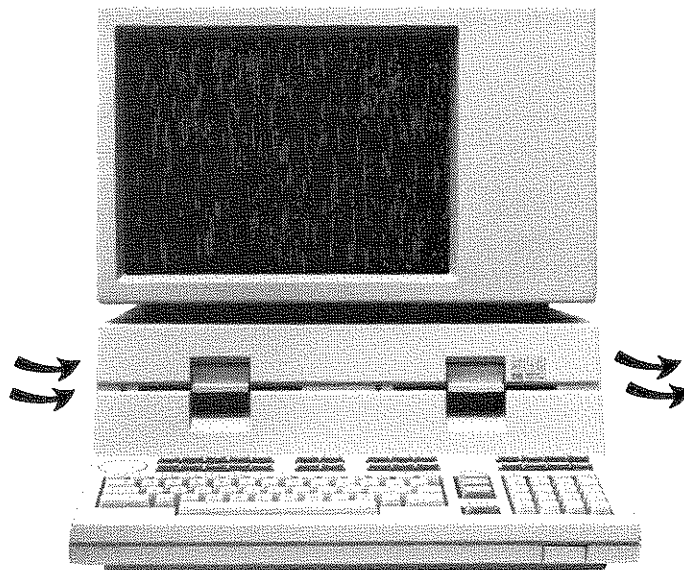
Position the Computer to Allow Free Air Flow

2. Check the Line Voltage Switches and Fuses

CAUTION

THE COMPUTER CAN BE DAMAGED IF SET FOR 115 VAC AND
PLUGGED INTO A HIGHER VOLTAGE. CHECK THE SWITCHES
BEFORE APPLYING POWER.

The computer can be set to operate at either 100, 120, 220 or 230 Vac. The switches on the back of the computer were set at the factory to the line voltage of your area. Check them to make sure they are set correctly. The switches can be changed with a screwdriver or pen.
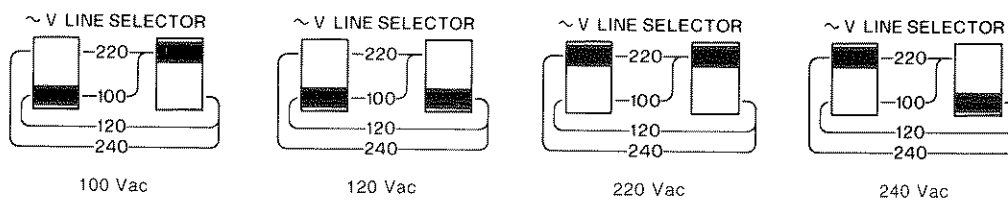
Setting the Line Voltage Switches

When installing a Model 36C Computer, be sure the display line switch matches the computer's nominal line setting, either 115 Vac or 230 Vac.

Also check the fuses before connecting a power cord. The computer has two fuses on its back panel, one line fuse and one 15 amp fuse for the internal power supply. The Model 36C has an additional line fuse on the display's back panel. Be sure the correct line fuses are installed for the line voltage in your area. The required fuses are labeled on the back panel.

WARNING

TO AVOID THE POSSIBILITY OF SERIOUS INJURY, DISCON-
NECT THE POWER CORD BEFORE REMOVING OR INSTALL-
ING A FUSE.

---

3. Connect the Power Cord

A power cord was selected and packed with your computer when it was shipped from the factory. An additional cord is packaged with the Model 36C display. Each cord has a ground connector to protect the user from electrical shock. Check to make sure you have the correct cord for your power outlet. The available cords are shown below.

WARNING

IF A REPLACEMENT POWER CORD IS NEEDED, IT MUST HAVE THE SAME POLARITY AS THE ORIGINAL. OTHERWISE, A SAFETY HAZARD FROM ELECTRICAL SHOCK OR EQUIPMENT DAMAGE MAY RESULT.

After connecting the power cord to the back panel, plug in the other end to a power outlet. If you have a Model 36C, connect the power cord for the display. Be sure the power switch is OFF (out) when you plug it in.

Denmark
8120-2956

Great Britain
8120-1351

Europe
8120-1689

Switzerland
8120-2104

United States
120V
8120-1378[1]

United States
240V
8120-0698[2]

Australia
8120-1369
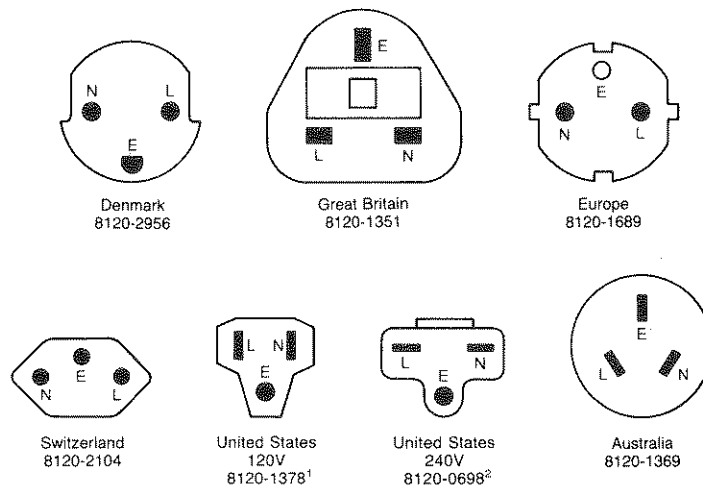
[1]UL and CSA approved for 100/120 Vac operation.
[2]UL and CSA approved for 220/240 Vac operation.

Power cords supplied by HP have polarities matched to the power-input socket on the computer:

L = Line or Active Conductor (also called "live" or "hot")
N = Neutral or Identified Conductor
E = Earth or Safety Ground

Available Power Cords

4. Turn the Computer On

Now you're ready to power-up the computer. Press in the button at the right-front of the computer. You should immediately hear the fan(s) running. It will take a moment for the screen to come on. When it does, you should see a display similar to the one shown below.

Note

With brightness turned all the way down, nothing will appear on the CRT. If you're not getting any response to a power-up or to keyboard entries, check to make sure that the brightness is turned up.

```
9836C        (serial no.)
Copyright 1982,
Hewlett-Packard Company.
All Rights Reserved.

BOOTROM 3.0
Keyboard
Color Graphics
HP-IB
261984 Bytes




SEARCHING FOR A SYSTEM (ENTER To Pause)
RESET To Power-Up
```

Typical Model 36C Power-up Display

The list of components tells you that each has passed the computer's self-test. If you get a failure message, consult the Self-test Chapter for further instructions. The bottom line tells you how much memory you have. In the example above, the computer has 256K bytes of internal RAM. If you have a 128K-byte model, the number will be closer to:

```
130912 Bytes
```

Model 26 or Model 36 Computers built before May 1983 do not display the product number and serial number, nor do they have the built-in system tests shown above. These computers automatically run tests at power-up and display:

```
MEMORY TEST IN PROGRESS
```

Then the amount of available memory is shown:

```
xxxxxx AVAILABLE BYTES

UNABLE TO FIND SYSTEM
RESET TO RETRY
```

In either case, the computer ran some tests and tried to load an operating system. Since you didn't have a system disc in a drive, however, the computer couldn't find a system to load.

If any message but those shown above appears, your system may need service. Switch the computer off, wait a few seconds and switch it on again. If the message is repeated, refer to the Boot ROM Errors list at the back of the manual.

So far, you haven't loaded an operating system or attached any peripheral devices. Operating systems can be loaded either from disc (called soft or disc-based systems) or from a ROM card plugged into the computer. As you add these elements to your system, the power-up display messages will change.

Before loading a system, however, let's continue with the installation process by adding any memory cards you have on hand.

5. Install Additional Memory Cards

You can expand the computer's read/write (RAM) memory by plugging memory cards into the card cage. Each HP 98256A Memory Card adds 256K bytes of read/write memory to an HP Series 200 Computer. (Since 1K represents 1 024 in computerese, each 98256A Card actually adds 262 144 bytes of memory.)

Follow this procedure to install any additional memory cards which you have on hand.

1. Before installing a memory card, switch the computer on and note the amount of available memory (in bytes) displayed after the self-test.

2. Now switch the computer off and locate an unused accessory slot (behind the removable cover plates). Then remove each new memory card from its anti-static envelope.

CAUTION

STATIC DISCHARGE CAN DESTROY COMPONENTS ON THE MEMORY CARD. HANDLE THE CARD EITHER BT ITS EDGES OR BY USING ITS ANTISTATIC ENVELOPE. DO NOT TOUCH THE ELECTRICAL TRACES OR SET THE CARD ON A CHARGED SURFACE (LIKE A CLOTH).

---

3. Each 98256A card must be set to a unique starting address using the six-segment switch on each card. See the next drawing. If you are installing more than one memory card, first remove all memory cards. To remove a card from the computer, pull the plastic card extractors out until the card is unplugged. Then slide it out of the accessory slot.

   Now set the address switch on each card as shown on the next page. For example, if you have two 98256A cards, set the switches as shown for the top two cards in the right-hand diagram.

CAUTION

SWITCH THE COMPUTER OFF BEFORE INSTALLING OR RE-MOVING CARDS FROM THE ACCESSORY SLOTS. PLUGGING OR UNPLUGGING CARDS WHILE THE COMPUTER IS SWITCH-ED ON COULD DAMAGE THE CARD OR THE COMPUTER.

---

4. After setting each card as shown, install one card at a time and switch the computer on to verify that the available memory has increased by about 256K bytes. Install each card so that the yellow card extractor is on the left. Slide the card in until the extractors are flush with the back of the computer.

Note

If your computer has HP 98254A plug-in 64K byte memory cards, their address switches must be reset to addresses below all 256K cards. Call your HP Service Representative for details on setting 64K cards.

Adding One 256K Board

plug-in 256K RAM
built-in RAM[1]
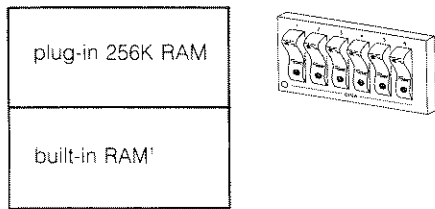
Adding up to Eight 256K Boards

plug-in 256K RAM
plug-in 256K RAM
plug-in 256K RAM
plug-in 256K RAM
plug-in 256K RAM
plug-in 256K RAM
plug-in 256K RAM
plug-in 256K RAM
built-in RAM[1]
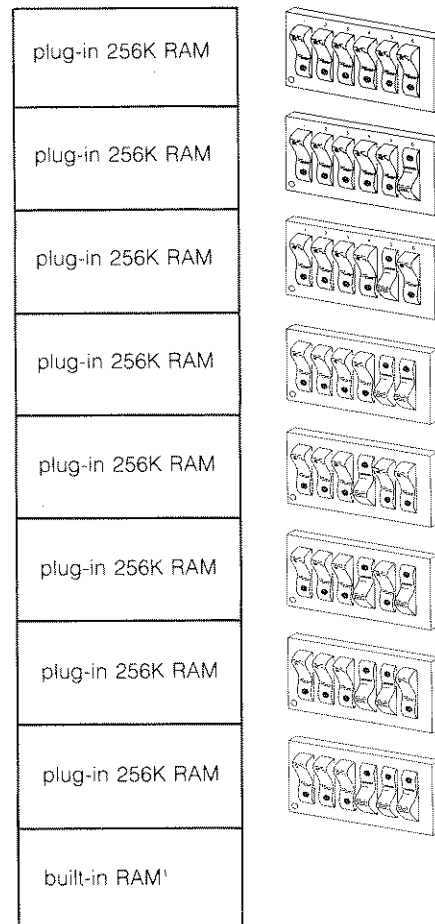
[1] Built-in memory is located on the processor board and is automatically addressed to follow the last plug-in memory card.

Setting Switches for Model 26 and 36 Memory Configurations
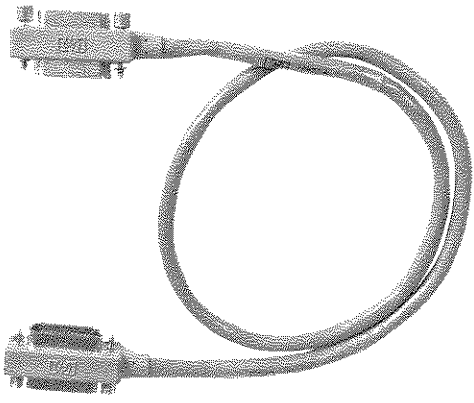
If the displayed available memory (bytes) does not increase with each installed memory card, switch the computer off and verify that the card is plugged in correctly and the switches are set correctly. See the drawings above.

If the computer still doesn't recognize the new memory card, switch the computer off, remove the card and replace it in its antistatic envelope. Then call HP for service.

6. Connect HP-IB Devices

Most peripheral devices such as disc drives and printers can be attached via the built-in HP-IB Interface. A 1-metre cable is supplied with the computer. Additional cables are available from our Computer Supplies Operation. In the United States call either 800-538-8787 or 408-738-4133.

Length	Part Number	
	Low EMI	Standard[1]
1 metre	10833A	10631A
2 metres	10833B	10631B
4 metres	10833C	10631C
½ metre	10833D	-

Available HP-IB Cables

You can connect up to 14 devices on the same interface (see each device's manual for possible restrictions). When you have more than two HP-IB devices on the same interface, it's best not to connect them all to the same connector. This will prevent damaging the connector on the instrument.

Be sure that no two devices on an HP-IB are set to the same primary address. This address is set using switches on the device. To ensure a complete installation, follow the instructions in each device's manual.
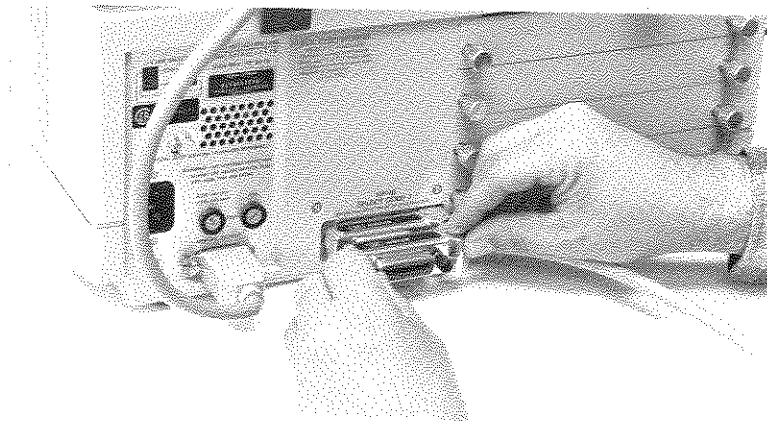
Connecting Devices to the HP-IB

[1] These cables do not meet our electro-magnetic interference (EMI) standards. They may cause electrical interference on other electronic equipment.

System Controller Jumper

The computer is set at the factory to be the System Controller on the built-in HP-IB. The System Controller has the most control over other devices on the HP-IB. If you wish to designate another device as the System Controller, you can set the computer to not automatically be the System Contoller by moving an internal jumper.

The System Controller jumper is located in the card cage, below the bottom accessory slot. See the arrow in the next photo. When the jumper is in the right-hand position, the computer is the System Contoller. When the jumper is in the left-hand position, the computer is not the System Contoller.

CAUTION
SWITCH THE COMPUTER OFF BEFORE REMOVING CARDS OR
MOVING THE SYSTEM CONTROLLER JUMPER. OTHERWISE,
THE COMPUTER COULD BE DAMAGED.
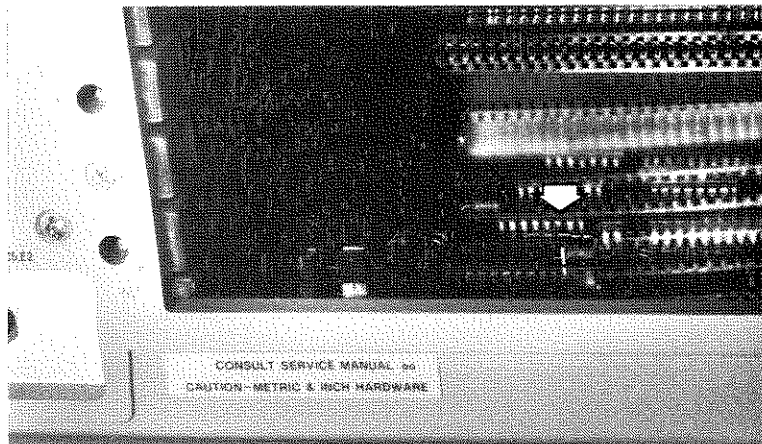
System Controller Jumper

7. Install Interface Cards

CAUTION
THE COMPUTER MUST BE SWITCHED OFF BEFORE ANY IN-
TERFACE CARDS ARE INSTALLED. PLUGGING IN OR UN-
PLUGGING CARDS WITH THE COMPUTER ON CAN DAMAGE
THE CARD AND THE COMPUTER.

Now that your computer is installed and any additional memory cards are plugged in, you can install interface cards and connect peripheral components.

The computer has eight accessory slots in its card cage. Each slot can hold a memory card, but only every other slot can hold an interface card. This allows you to install up to four interface cards with at least four memory cards. If you have a language system ROM card, it can be installed in place of a memory card.

Each interface card is supplied with a manual explaining how to configure and install the card. Now is the time to follow those instructions to install each card.

If you are going to use a BASIC system, be sure that you set the select code for each card to a unique number above 7. The BASIC system reserves select codes 1 thru 6. The HPL system reserves select codes 0 thru 6 and 16 thru 31. The built-in HP-IB interface uses select code 7.
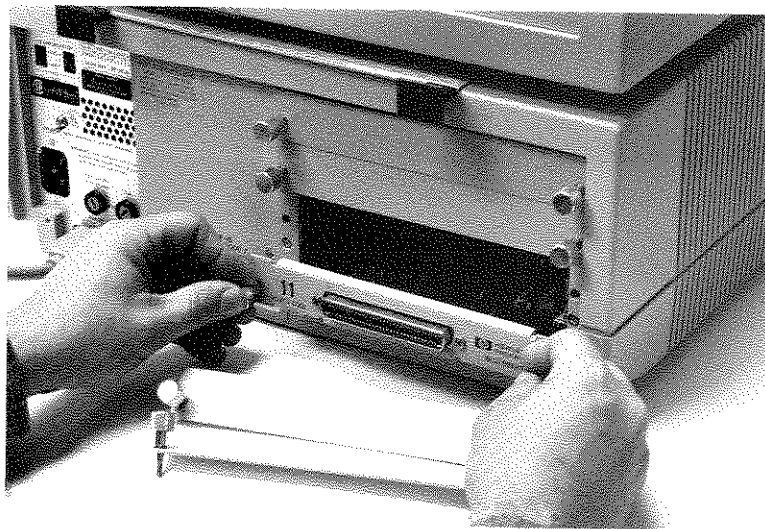
Installing Interface Cards

After you've configured and installed the card, turn the computer ON. If the computer has boot ROM 3.0 or later, it will verify the card's presence by listing the interface product number and its select code during the self-test. For example:

```
HP98622 at 12
```

If you have an earlier boot ROM, you can verify the connection by running the appropriate interface test supplied on the System Tests Discs. Refer to the System Tests Manual for instructions. The System Tests can be ordered separately by specifying part number 09800-10530.

8. Install a Language ROM Card

HP offers some of its operating systems and programming languages on both soft media (discs) and hard media such as Read/Only Memory (ROM). Each ROM card can be installed exactly like a memory card except that there are no address switches to set. They can be inserted in any unused accessory slots. Be sure to replace the card cage cover plates after installing the card.

Instructions on loading an operating system from ROM are in the next chapter.

The Next Step

Now that you have set up and switched on your computer, go ahead and load an operating system. Before continuing on to Chapter 3, however, please read Handling Flexible Discs in the next chapter. Your discs contain a wealth of information and need to be treated with care.

Chapter 2

Operator Maintenance

Cleaning the Computer

The computer has been painted with a long lasting, water-based paint. It is both non-toxic and environmentally safe. It will preserve the appearance of your computer for many years. When you want to clean the case, follow the instructions below to sustain the quality finish. If the case finish becomes damaged, ask your HP sales and service office for touch-up paints.

CAUTION

CHEMICAL SPRAY-ON CLEANERS USED FOR APPLIANCES AND OTHER HOUSEHOLD OR INDUSTRIAL APPLICATIONS MAY DAMAGE THE CASE FINISH. DO NOT USE DETERGENTS THAT CONTAIN AMMONIA, BENZENES, CHLORIDES OR ABRASIVES.

Before cleaning the computer, disconnect the power cord and any interconnecting cables. Dampen a clean, soft, lint-free cloth in a solution of clean water and mild soap. Wipe the soiled areas of the case, while ensuring that no solution gets into the unit. To clean more heavily soiled areas, use a solution of 80% clean water and 20% isopropyl alcohol. Then dry the case with a clean, soft cloth. A non-abrasive eraser can also be used to remove pen and pencil marks.

Cleaning the Disc Drive Heads

The disc drive's read/write heads should be cleaned periodically to ensure trouble-free operation. A head-cleaning kit is available from HP for use with a routine on the System Tests Discs. Order kit part number 92193A.

CAUTION

DO NOT ATTEMPT TO CLEAN THE DISC HEADS MANUALLY OR WITH ANY MATERIAL OTHER THAN SUPPLIED BY HP. OTHERWISE, HEAD DAMAGE OR MISALIGNMENT COULD OCCUR.

To clean the disc heads:

1. Switch the computer off.
2. Insert a System Tests Disc, either 09836-10034 or 09800-10534, in the disc drive and close the door.
3. Switch the computer on. The system tests program is automatically loaded.
4. When the initial test menu is displayed, press either Clean Disc or Clean Heads softkey. Follow the displayed instructions.

Complete details on running the new system tests program are in the System Tests Manual, 09800-10031. The new tests replaced the previous system tests supplied with the Model 26 and Model 36 computers. The new tests can be ordered from any HP sales and service office. Order part number 09800-10530.

Handling Flexible Discs

This section introduces you to the flexible disc media. Commands are available in each language for initializing discs, cataloging disc files, copying discs and purging files. Refer to the appropriate language manual for details.

The built-in disc drive handles standard 5¼ inch flexible discs. The flexible disc, also called a mini-disc and a diskette, is a thin piece of plastic enclosed in a special plastic jacket. The disc is covered with a thin oxide coating on which your program and data information are stored.

When you insert the disc in the drive and close the door, the drive is ready to read information from or write information onto the disc. When the computer requests a read or write, the disc spins at a constant rate, (like a phonograph record). The yellow light on the disc drive indicates that reading or writing is taking place. Do not attempt to remove the disc when the yellow light is on.

The built-in disc drive reads and writes on both sides of the disc and requires discs labeled for "double-sided" and "double density" use. Be sure to use only media supplied or approved by HP. Boxes of ten discs are available by ordering HP part number 92190A. Other discs may not be of adequate quality or may damage the drive.

Disc Handling Precautions

Be sure to follow these guidelines to ensure trouble-free operation:

- Handle discs only by the labeled area. Never touch the disc surface which shows through the protective jacket.
- Always return the disc to its storage envelope after each use. The envelope not only protects the disc from physical damage, it's made of an anti-static material to prevent dust from accumulating.
- Write only on the disc label using only a felt-tip pen. Don't write on the disc jacket. Don't use a lead pencil or a ball-point pen.
- Although the disc is flexible, don't bend or fold it.
- Avoid using or storing discs in temperature extremes, or in areas with excessive smoke or dust. Even cigarette ash can damage the disc surface. Close the disc drive door when it's not in use.
- Do not place discs near sources of strong magnetism, such as an electric motor or toy magnet. This will destroy data on the disc and may prevent further use of the disc.
- Do not attempt to clean the disc or remove it from its protective jacket.
- Use only discs approved by HP. Others may impair data integrity or damage the disc drive.

Note

Do not use more than two layers of adhesive labels on a disc. Additional labels could cause the disc to jam in the drive or prevent reliable disc operation.

Inserting and Removing Discs

Open the drive door by lifting the door handle up. Check to make sure there is not another disc in the drive already. Insert the disc as shown on the right. Close the door.

Be sure to return the disc to its storage envelope when not in use. This keeps dust from getting on the oxide surface. Also close the drive door when not in use.

CAUTION
IF YOU ACCIDENTALLY INSERT ANOTHER DISC WHEN ONE IS ALREADY IN THE DRIVE, REMOVE THE BOTTOM DISC FIRST. OTHERWISE, THE READ/WRITE HEADS COULD BE DAMAGED.

Write Protection

Covering or uncovering a notch in the disc jacket determines whether the disc drive can write information on the disc. When the notch is covered, it's impossible for the drive to write on the disc; thus information already on the disc is protected from being written over or erased. This is useful when a disc contains source information which should only be read.

Labels are supplied with discs to allow you to cover the write-enable notch.

oxide
surface

write
enable
notch
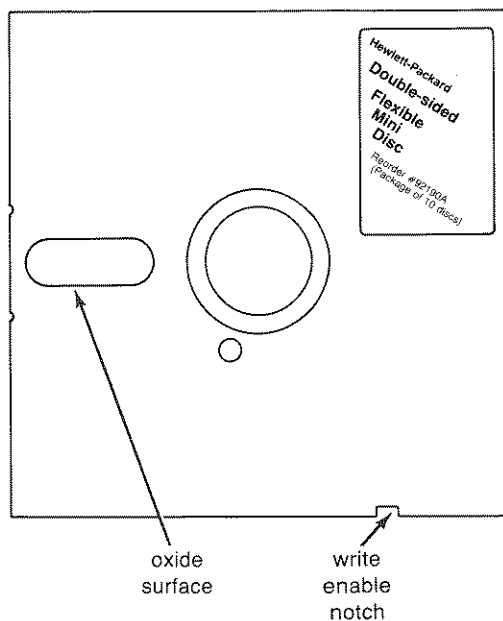
Chapter 3

Loading an Operating System

Introduction

The Model 26 and 36 computers each have a built-in boot ROM (read-only memory) which automatically loads an operating system from a plug-in ROM card or disc drive. The boot ROM is named for the way it brings the system up by its own "bootstraps". This was sometimes a long, tedious operation with early computer systems. By "operating system" we mean any HP Series 200 programming language (like BASIC, Pascal or HPL), a mass storage system like Shared Resource Management (SRM), an HP application program like VisiCalc[1], and any other system software that conforms to HP's Series 200 operating system format.

As soon as the computer self-tests are complete, the boot ROM starts polling all ROM cards and mass storage devices connected to the computer. It loads the first operating system found. The order in which it polls media is defined by a list of priorities explained later. Once the computer begins loading a system, it blocks all input from the keyboard so that the loading process cannot be interrupted.

In this chapter, we describe how the boot ROM loads an operating system and how you can override the procedure if you want to load a system other than the boot ROM's first choice.

Earlier Boot ROM Operation

Model 26 and 36 Computers built before May 1983 were fitted with boot ROMs which do not display their revision number at power-up. If your computer displays BOOTROM 3.0 or a later revision at power-up, you can skip this section. Continue with "Automatic Booting". If your computer does not display a boot ROM revision at power-up, your computer's boot ROM operation is explained here.

Early boot ROMs first perform a memory test and keyboard test. The initial display is:

    MEMORY TEST IN PROGRESS

Then the amount of memory available is displayed:

    Available memory =   (bytes)

Any ROM cards and internal disc drive(s) are finally scanned for an operating system.

---

[1] VisiCalc is a registered trademark of VisiCorp.

If a system is found, either on a ROM card or on disc, the computer loads it and displays a "READY" message. If more than one system is found, the computer allows you to select one. For example:

```
WHICH SYSTEM?
B  H
```

In this case the computer found two systems, BASIC and HPL. The computer will wait about 10 seconds for you to indicate your choice by pressing the appropriate key. If you press another key, the computer will just beep and continue waiting. If an appropriate key isn't pressed in time, the first system listed (BASIC in this case) will be automatically loaded.

The boot ROM may encounter problems when testing and trying to load a system. The error messages for early boot ROMs are listed at the back of the manual.

This concludes operation of early boot ROMs. The rest of this chapter explains how boot ROM 3.0 operates.

Automatic Booting

This section describes what the boot ROM 3.0 does if you simply power-up the computer and leave it to its own resources. If your computer does not have boot ROM 3.0, refer to the previous section.

The first thing the boot ROM does is test the keyboard, internal resources and any available interface cards. This is called the self-test mode. Then all available read/write memory (RAM) is tested. After the available number of bytes is displayed, the boot ROM looks for any available operating systems. The operating systems can be on any of several media, including ROM cards, flexible discs and hard discs. As soon as the boot ROM finds a system, it is displayed on the right side of the screen (see the next figure). A displayed message informs you that the system is being booted.

```
                                                    Device type
                                                       ↙
    9836C      (serial no.)              :INTERNAL,0 ◄─────Unit Number
    Copyright 1982,                          1B   SYSTEM_BAS◄─────Filename
    Hewlett-Packard Company,                     ↖
    All Rights Reserved,                      Operating
                                              System Code
    BOOTROM 3.0
    Keyboard
    Color Graphics
    2 Flexible Discs
    HP-IB
    655200 Bytes






    BOOTING A SYSTEM
    RESET To Power-Up
```

Typical Model 36C Power-up Display

This example shows that the boot ROM found and loaded a BASIC system from the disc in the right-hand internal drive (drive 0). If you had no other operating system available, you could have just as easily put it in the left-hand drive. The boot ROM would have found it just as fast.

When you have more than one operating system available, however, the order in which the boot ROM scans media determines which system is automatically loaded. The list below shows the priorities used.

Boot ROM 3.0 System Loading Hierarchy

| Priority	Media
1	Internal Disc Drive 0 (right-hand drive).
2	External disc at select code 0 thru 31 on Unit 0, Volume 0.[1]
3	Shared Resource Management (SRM) disc via select code 21, on Volume 8.
4	Bubble Memory at select code 30 (bubble memory is treated as a disc file or other mass storage device.
5	EPROM at unit 0. The contents of an EPROM card is transferred to computer memory like reading a disc file.
6	ROM Board(s).
7	Internal Disc Drive 1 (left-hand drive on a Model 36).
8	Remaining external discs at select codes 0 thru 31.
9	Remaining SRM discs at select codes 0 thru 31.
10	Remaining bubble memories, select codes 0 thru 29 and 31.
11	Remaining EPROM units.

The select code is a number which the device's interface card responds to, like an address. The select code number is set using switches on the interface card. External memory devices are searched first by select code, and then by unit and volume numbers. Memory devices which are connected via an HP-IB cable are also addressed by the device's primary HP-IB address, which is set using switches on the device. All these addressing items are explained in the device's user manual.

Within each of the above categories for external media, there are additional rules for the order in which media are scanned. External devices are searched in order of select code. For example, a system at select code 10 would be found before a system at select code 11. When the search gets down to the remaining external media, multiple units at the same select code are searched before moving on to the next select code. So a system at select code 7, primary address 1, unit 1 would be found before a system in unit 2. Both systems would be found before a system at select code 7, primary address 2.

When the boot ROM finds an SRM system, it first searches disc volume 8 on SRM node 0 for a root file "SYSTEMS". Then volume 7 is searched, followed by volumes 9 thru 31.

As an example, suppose you have the system shown next.

---

[1] The boot ROM looks at devices connected via the HP-IB only at primary address 0. Devices at other primary addresses are checked later.
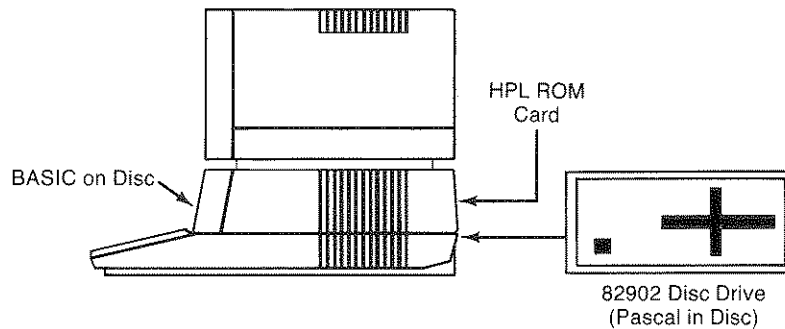
Model 36 with Three Available Operating Systems

There are three operating systems to choose from: the plug-in HPL ROM card, BASIC in an internal disc drive, and the Pascal system on disc in the 82902 Drive. The boot ROM will automatically select and load the BASIC system when it's in the right-hand drive (drive 0). But if you remove the BASIC disc or put it in the left-hand drive (drive 1), the system selected would depend upon what unit and volume numbers the external disc drive is set to. Referring to the previous table, if the external drive is unit 0, volume 0, the Pascal system on that volume would be selected. If the external drive is set to any other unit or volume, however, the boot ROM will skip it and look for another system. In this case, the HPL system will be loaded.

As you can see, you have control over which operating system the boot ROM finds first by what internal drive you use and what unit/volume numbers you set external drives to.

What if no operating systems are connected?

The boot ROM will keep cycling through its polling routine until it finds an operating system it can load. It can only poll devices that are turned on, and it will not poll the same device twice. There are two important consequences of this procedure. First, if a disc drive is on, but does not have an operating system disc in it when you power-up the computer, you cannot subsequently insert the disc and expect the boot ROM to find it. The problem is easily resolved by inserting the disc and pressing (RESET) (SHIFT-PAUSE). The second consequence is that the boot ROM will poll a device as soon as it powers up, even if it was off when the computer was turned on. This means that you can turn a disc drive on while the boot ROM is searching for a system. As soon as the disc drive is "on line", the boot ROM will poll it.

What if there's not enough memory?

Every operating system takes up a certain amount of memory. If you don't have enough memory in your machine, the system will display the message:

```
NOT ENOUGH MEMORY
```

To solve the problem, turn the computer OFF and insert a memory board. Be sure to follow the instructions in the Unpacking and Set Up chapter. Then turn the computer ON again. This time it should load the system. If you get the same message again, make sure that the memory board(s) address switches are set properly as explained in Chapter 1.

Manually Selecting an Operating System

This section explains how to override the automatic system booting procedure used by boot ROM 3.0.

To load a system that isn't the boot ROM's first choice, merely press the space bar during power-up before the boot ROM chooses a system. The amount of time you have depends on how long the self-test and memory test run. At the very least you will have a couple of seconds to interrupt the automatic booting procedure.

Pressing a key will not have an immediate effect, so don't worry if the computer doesn't seem to respond. After completing its tests, the boot ROM goes ahead and polls all connected media. Then it displays a menu of all operating systems connected to your computer and waits for you to make a selection. See the example below.

```
9836A          (serial no.)         :REMOTE, 21, 0, 8
Copyright 1982,                        1B   SYSTEM_BAS
Hewlett-Packard Company,            :ROM
All Rights Reserved,                    B   B
                                        H   H
BOOTROM 3.0                         :HP9895, 801, 2
Keyboard                               2B   SYSTEM_BAS
Graphics                            :HP7908, 803, 1
HP-IB                                  1b   SYSbOwn
HP98626 at 9                        :REMOTE, 20, 0, 8
524128 Bytes                           1F   SYSTEM_FORTH

                                       1P   SYSPASCAL









    SEARCHING FOR A SYSTEM (ENTER To Pause)
    RESET To Power-Up
```

This hypothetical example shows seven systems. They are listed in the same order they were found. The first system in the list, BASIC on the first SRM system, is the one that would have been loaded by the automatic procedure.

Beneath each device selector is a code followed by the name of the system file. This is the code you enter to select a particular system. All systems except ROMs have a code consisting of one or two digits followed by a letter. The codes for ROM systems are all single letters.

To choose a system, simply type in its code. You need not press the (ENTER) key. Your entry is displayed in the lower right corner of the CRT. If the code is valid, the boot ROM will load the system. The message:

```
BOOTING A SYSTEM
```

tells you that the system is being booted.

Choosing a System Without the Menu

If you already know what code you want before the computer displays a menu, you can go ahead and enter it while the computer is performing its self-test. The characters you type will both interrupt the automatic booting process and specify the operating system you want. In the above example, you could have typed 1P right after you switched the power ON. That would have told the boot ROM to load the Pascal system .

Note

When you are going to interrupt the boot ROM to see the menu, just press the space bar. Typing a letter may accidentally direct the boot ROM to load a system from a ROM card.

Setting CRT Line Frequency

If the CRT appears to flicker and you suspect that the computer is not set for the correct line frequency, you can change the setting for the CRT. Pressing (CTRL)-(C) during the self-test interrupts the self-test and allows you to specify either 50 or 60 Hz for the CRT. This permits you to override the factory setting. This display is shown:

```
9836A        (serial no.)           KEY    ACTION
Copyright 1982,
Hewlett-Packard Company,             T     Extended Self-Test
All Rights Reserved,                 5     50 Hz CRT
                                     6     60 Hz CRT


BOOTROM 3.0
Keyboard
Graphics
HP-IB
524128 Bytes













CONFIGURE MODE
RESET To Power-UP
```

The system waits 5 minutes for you to make a selection. After 5 minutes, it automatically RESETs. Type (5) for 50 Hz or (6) for 60 Hz. After you enter your selection, the computer runs through its self-test again.

If changing the CRT line frequency reduces the display flicker, you should ask an HP Service Engineer to permanently change the CRT line frequency (using an internal switch). Otherwise, you will have to press (CTRL)-(C) and set the frequency each time you power-up the computer.

The extended test function is explained in the next chapter.

Pausing the Boot Process

If you have many operating systems available, more than can be displayed on one screen during the boot process, the boot ROM will fill the screen and then continue the listing by writing over the first list. You may wish to pause the listing process to select a system.

While the boot ROM is searching and listing operating systems during the boot process, it displays the message:

```
SEARCHING FOR A SYSTEM (ENTER To Pause)
```

If you press (ENTER) now, the system will stop and display the message:

```
PAUSED (ENTER To Continue)
```

Pressing (ENTER) again will cause the system to resume its scan.

When you find the system you want, simply type in the system code and press (ENTER).

Restarting the Power-up Process

Pressing (RESET) serves the same purpose as turning the machine OFF and then ON again. It aborts the self-test or boot process and starts all over again. You can press (RESET) at any point during power-up before the boot ROM starts loading a system. Once the loading process begins, the keyboard is turned off. After a system is loaded, the entire keyboard is re-defined by the operating system just loaded.

Loading Using a Remote Terminal

You can control loading an operating system from a remote terminal when boot ROM 3.0 is present.

As the computer performs its self-test, it specifically looks for an HP 98626A interface with the REMOTE jumper removed. If an interface with the REMOTE jumper removed is found, a message like this is displayed:

```
REMOTE Interface at 9
```

In this case, the interface's select code is 9. This is the last message that will be displayed on your computer until an operating system is loaded. All self-test and boot ROM messages will now be displayed on the remote CRT, assuming it's properly connected. Both keyboards (the one attached to your computer and the one attached to the remote terminal) will function identically.

In order to have messages displayed on the remote terminal, you should first initialize the screen by clearing it and then moving the cursor to the spot you want the messages to appear. See the terminal's manual for details.

Chapter 4
Self-Test Operation

Whenever you power-up or hit (RESET) (SHIFT-PAUSE), your computer conducts a self-test to make sure that its hardware components are working properly. Then an operating system is automatically loaded.

Early Boot ROM Testing

Boot ROMs earlier than revision 3.0 do keyboard and RAM tests before loading an operating system. You can tell if your computer has an early boot ROM by watching the display at power-up. If this message is displayed:

```
MEMORY TEST IN PROGRESS
```

you have an early boot ROM. Error messages from early boot ROMs are listed at the back of this chapter.

Boot ROM 3.0 Testing

Boot ROM 3.0 does more extensive testing, including RAM and ROM, the CRT, the built-in HP-IB interface, and any other interfaces present. Boot ROM 3.0 displays the computer model (like "9836C") and its serial number before starting the self-test. As the boot ROM 3.0 self-test proceeds from one component to another, it reports its status by displaying messages. Any errors are also reported on the CRT. Here is a typical self-test display:

```
9836      (serial no.)
Copyright 1982,
Hewlett-Packard Company,
All Rights Reserved,

BOOTROM 3,0
Keyboard
Graphics
2 Flexible Discs
HP-IB
655200 Bytes









SEARCHING FOR A SYSTEM (ENTER To Pause)
RESET To Power-Up
```

The rest of this chapter describes how to interpret the boot ROM 3.0 error messages. Very few boot ROM errors are fatal. After reporting any failures, the boot ROM will usually go ahead and try to boot an operating system. It is up to you to decide whether the error is serious enough to warrant attention. This chapter should help you determine the seriousness and relevance of the more common self-test errors.

Self-test Messages

Although fairly extensive, the boot ROM 3.0 self-test takes only a few seconds to run. Even though it may appear that the computer is merely displaying a string of messages, it is actually performing tests in between each message. Two types of messages are displayed: status messages and error messages.

Status Messages

Status messages tell you that the computer has just completed testing a component and that the component is OK. These messages are usually nothing more than the component's name. For example, if the built-in HP-IB Interface passes its test, the computer displays:

    HP-IB

For interface cards, the system will display the name of the interface and its select code. For instance:

    HP98629A at 20

While the computer is testing RAM, it displays this message on the bottom of the screen:

    TESTING MEMORY

Error Messages

If a component fails its test, the boot ROM displays any of several messages depending on the cause of the failure. Some failures occur because the computer can't find a component that it expects to be present. In this case, it will report that the part is missing. For example:

    Keyboard Missing

In this case, the computer isn't referring to the actual keyboard, but to the keyboard processor. The message indicates that for one reason or another, the system cannot find the keyboard processor. You might also receive the message:

    Keyboard Failed

This means that the system has found the keyboard processor but that it is malfunctioning. (In either of these cases, call for service.)

After displaying an error message on the CRT, the boot ROM proceeds to the next component on the self-test agenda. After testing all components, the boot ROM either begins searching for operating systems or else displays:

    WAITING 1 MINUTE (ENTER To Abort Wait)

This message tells you that the boot ROM has found at least one error and is pausing a minute before looking for an operating system. This gives the CRT a chance to warm up so you can read the message. After waiting a minute, the computer begins looking for an operating system. System loading is explained in a previous chapter.

Boot ROM Phone Home

In addition to displaying an error and waiting a minute, the boot ROM sounds a pattern of beeps. The boot ROM is actually sending an error message to a service person. If this error pattern is sounded, check the display for an error message. Refer to the Boot ROM 3.0 Error Messages list at the back of this chapter. If the message indicates something you cannot correct, or if the display is not working, you should call HP for service. He may ask you to restart the self-test so he can listen to the error code sounded.

After the error pattern has sounded, the boot ROM searches for a system to load. If you want to cancel the 1 minute delay and the beeps, you can press (ENTER). The boot ROM will then display any operating systems found and wait for you to specify which system you want loaded. See the previous chapter for details.

Boot ROM Errors

If the self-test locates a failure in the boot ROM, it displays the message:

```
CONTINUE AT OWN RISK (ENTER To Continue)
```

The boot ROM will not continue until you press (ENTER). Errors that occur in the boot ROM can be either trivial or very serious. If, after receiving this message, you decide to continue, we suggest that you make sure you have a spare copy of any files that the boot ROM might access.

Running an Extended Memory Test

If you wish to run a more complete test of all RAM in the computer, press this sequence during the self-test:

| CTRL |-| C |

When the Configure menu appears (see below) press:

| T |

The boot ROM will restart the self-test and run a longer RAM test. This test may catch intermittent problems not seen by the power-up self-test.

Boot ROM 3.0 Error Messages

This section lists error messages sent by boot ROM 3.0. We have tried to anticipate some errors you might receive that indicate a hardware mis-configuration rather than a failure. If you still receive the error after making the recommended adjustment, it means that there is a real problem; call HP for service.

Error Message	Description and Recovery Action
WAITING 1 MINUTE (ENTER To Abort Wait)	The self-test found a failure. After evaluating the message, either press (ENTER) to begin the booting process or call HP for service.
RAM FAILED ABOVE xxxxxx	A memory failure has occurred. Call HP for service.
RAM GONE ABOVE xxxxxx	The boot ROM couldn't find RAM. Either the address switches on a RAM card are not set correctly or the memory has failed. Check the switches (see Chapter 1). Call HP for service if the error is repeated after another power-up.
HP-IB Failed	Either more than half of the devices on the HP-IB Interface are turned OFF or a device on the HP-IB has failed the self-test. First turn each device on or disconnect it. Then run the self-test again. If the message is repeated, call for service.
CONTINUE AT OWN RISK (ENTER To Continue)	Errors detected in the boot ROM. Press ENTER to continue the self-test. If the error persists, call HP for service. See Boot ROM Errors on the previous page.
UNEXPECTED USE OF xxxxxx	Indicates an unplanned system failure. Call HP for service.

Early Boot ROM Error Messages

Error Message	Description and Recovery Action
MEMORY FAILURE AT nnnnnnnn	A memory board failed the power-up test. Check for more than one memory board set at the same starting address.
INSUFFICIENT USABLE MEMORY	Not enough read/write memory for Boot ROM use. Call HP for service.
NOT ENOUGH MEMORY FOR SYSTEM	Insufficient read/write memory to load language system from disc. Check memory cards. Then press (RESET) (SHIFT-PAUSE) to load system. If error is repeated call HP for service.
KEYBOARD FAILED SELF TEST	Power-up test failed. Switch computer off and try again. If failure repeats, call HP for service.
UNABLE TO FIND SYSTEM RESET TO RETRY	Language system not found in ROM or on disc (SYSTM type file). Insert a language system disc, close the drive door and press (RESET).
	If error is repeated or computer cannot find ROM system, switch computer off and call HP for service.
FATAL FLOPPY ERROR 90,11 DRIVE NOT RESPONDING	Disc drive hardware failure. Switch the computer off and call HP for service.
FLOPPY ERROR code , nn... RESET TO RETRY	Disc drive error occurred during system load. Refer to explanation of indicated BASIC error code. After remedying the problem, press (RESET) to load system. If error is repeated, call HP for service.
UNEXPECTED USE OF nnnnnn RESET TO RETRY	Hardware error. Press (RESET) to reload the language system. If the error is repeated, call HP for service.

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