Visual 1050 User's Guide

Visual Technology Incorporated

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Warning:

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. 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 appropriate to correct the interference.

Visual 1050
User's Guide
Update Pack 1A

Visual Technology Incorporated
UD 001-001 1A

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Preface

This Guide presents information which supports the use of the Visual 1050 personal computer:

- Section 1 "System Setup" provides unpacking, installation, power up and preliminary checkout instructions.
- Section 2 "Introducing the Visual 1050" is a summary of the major features and capabilities of the computer system.
- Section 3 "Some Basics" is included with newer users of computers particularly in mind. It presents important concepts and practices associated with microcomputers in general, the CP/M operating system which is implemented on the Visual 1050, and certain Visual 1050-specific topics as well.
- Section 4 "Getting Started" is a tutorial-style presentation on the use of the Visual 1050, the primary focus of which is the use of the Visual 1050 Utility Manager.
- Section 5 "Extensions" provides additional information pertaining to system operation, specifically the role of system ports in relation to the operating system.
- Section 6 "Installing Software" is intended to shed some light on the process of software installation, with specific attention being paid to issues which may arise if and when the user wishes to purchase and install software packages on the Visual 1050.

Three appendices are included in this Guide: Appendix A is an ASCII conversion chart with decimal, hexidecimal, and octal representations of the ASCII code; Appendix B provides an enumeration and description of the command sequences to the display screen of the Visual 1050; Appendix C presents the keycodes generated by the Visual 1050 keyboard.

A Glossary of terms has been included in this Guide. The first occurrence of a term which is defined in the Glossary has been printed in an italic typeface. Other terms which do not appear in this Guide have been included in the Glossary as well.

1 System Setup

Introduction

We trust that you were directed to this section and have not yet unpacked your system. Directions are provided here for the unpacking, setup, and checkout of the Visual 1050.

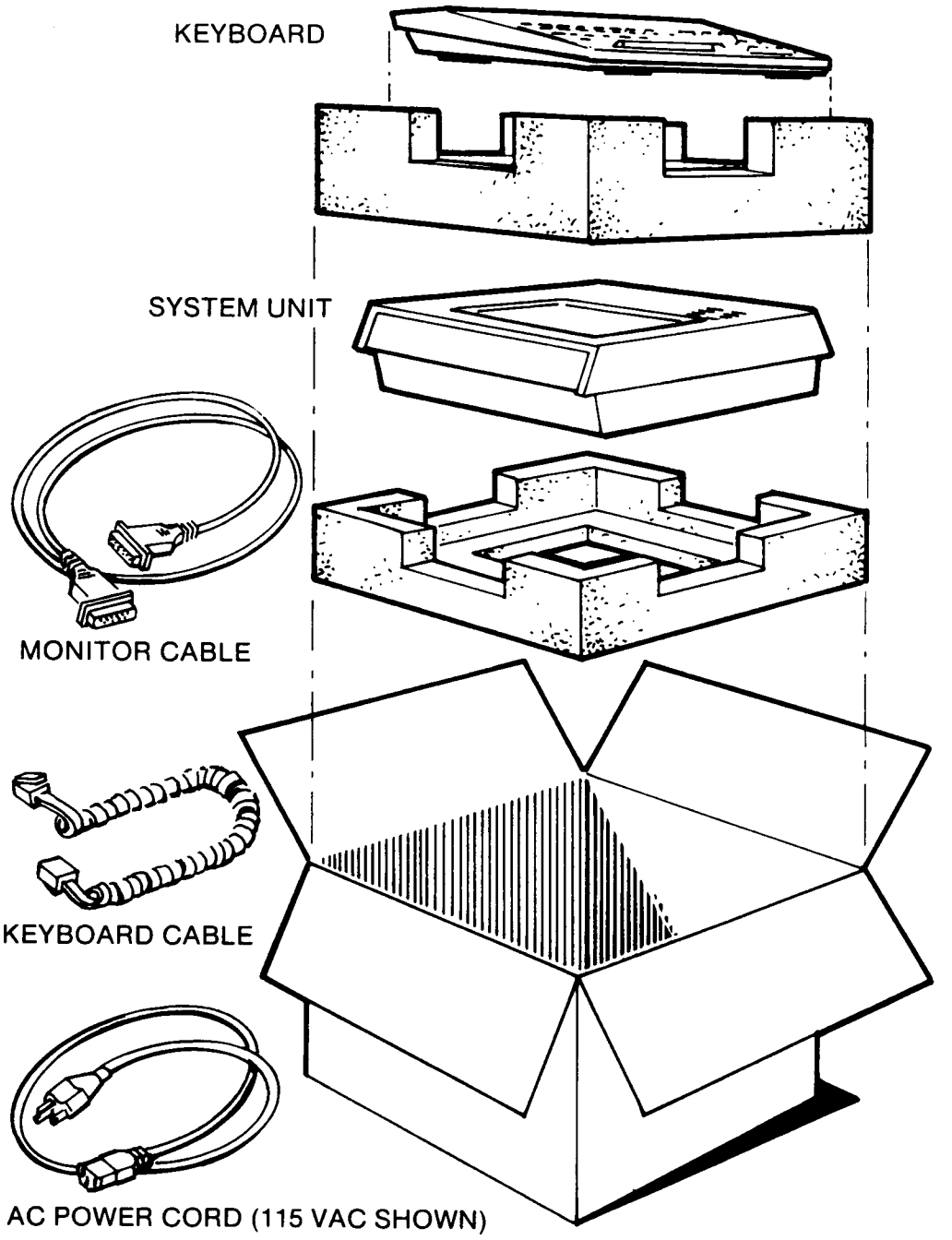
Unpacking and Inspecting Your System

1. Remove the remaining contents of BOX 1. One of the items in this box is the **Visual 1050 Packing List**. Refer to the Packing List and check off the items listed on it as you unpack your system.

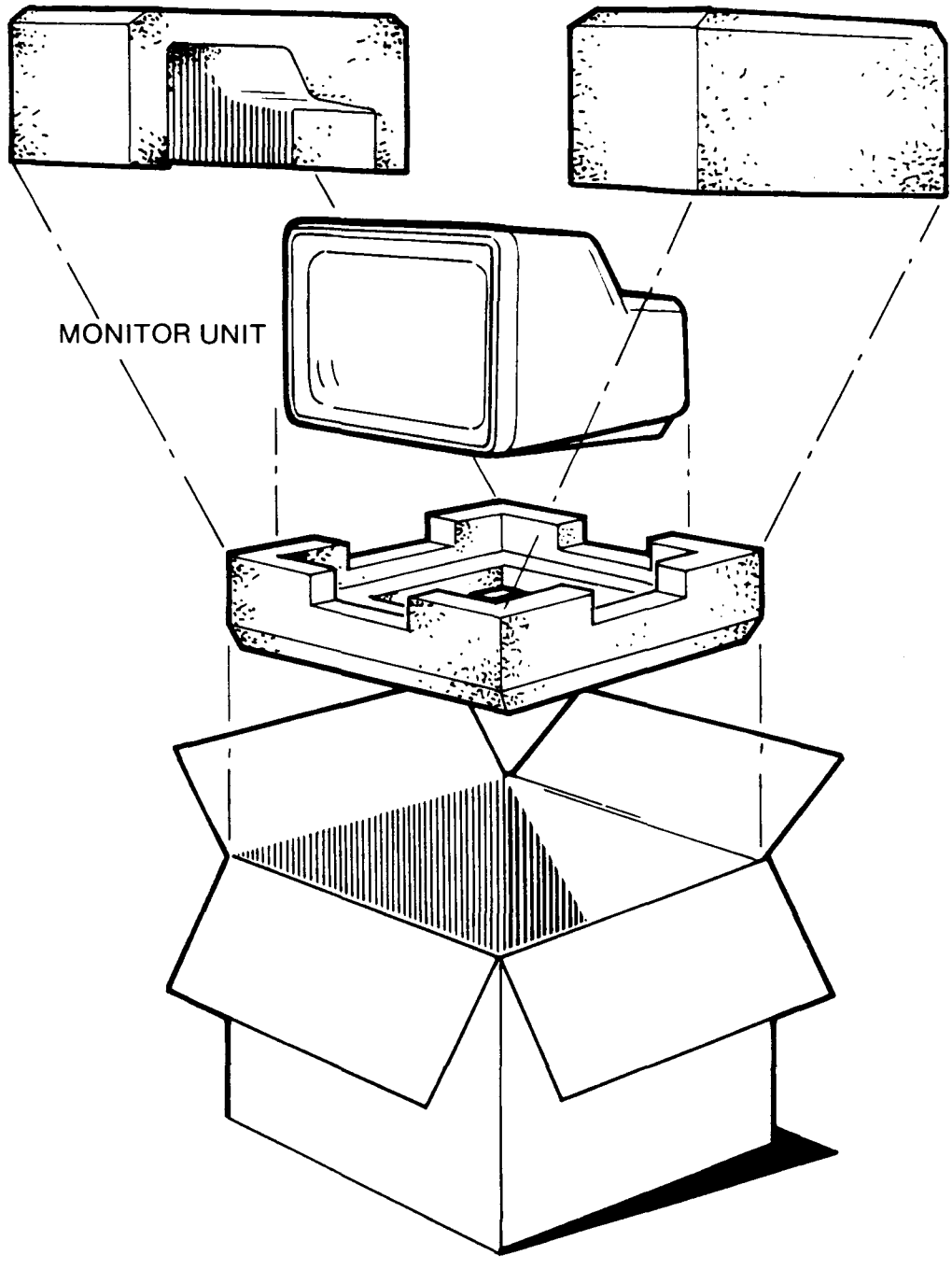
   Among the items in BOX 1 are the **Software License Agreements** and the **Visual Customer Support Packet**. Set them aside for careful reading.

   NOTE: Do not break the seal on the box of diskettes until you have read and agreed with the terms of the software license agreements.

2. Open **BOX 2 of 3 "System Unit"** and carefully remove the items, checking off the appropriate items on the Packing List.



3. Open **BOX 3 of 3 "Monitor Unit"** and carefully remove the items. Check off the items on the Packing List as you did with the other boxes.



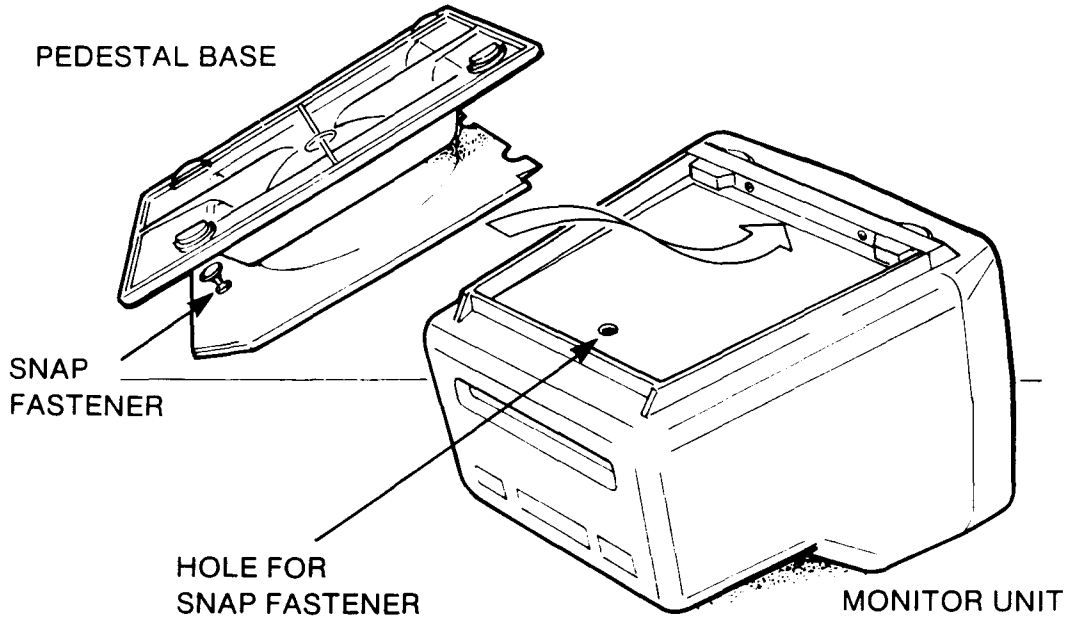
4. If you have not received all the items on the Packing List, open the Visual Customer Support Packet and use the telephone number provided there to contact Visual Technology Incorporated.

   NOTE: Save the shipping boxes and packing materials in case the need arises to ship the system again.

Attaching the Pedestal Base to the Monitor Unit

The Monitor Unit is designed to be operated with its pedestal base, which you unpacked from BOX 3 along with the monitor. Follow the instructions below to attach the pedestal to the Monitor Unit:

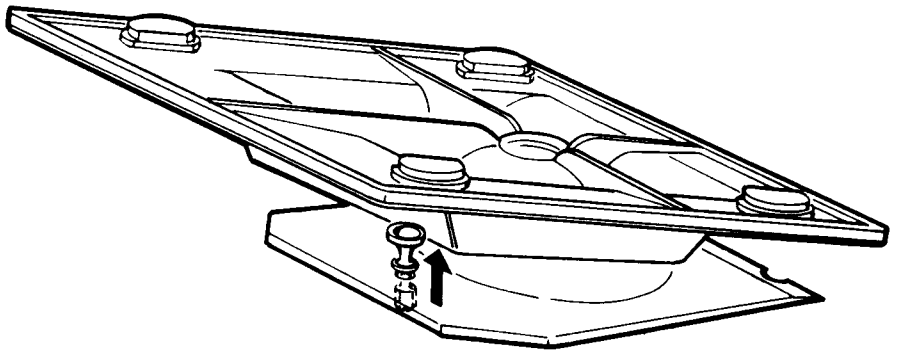
1. Gently place the Monitor bottom-side up on a carpeted floor or similar non-abrasive surface. Observe the design of the bottom surface. Note the placement of a hole toward the rear of the base. Note also that two sections of the base have been cut out at the left and right front corners, next to two screws along the front of the Monitor unit base.



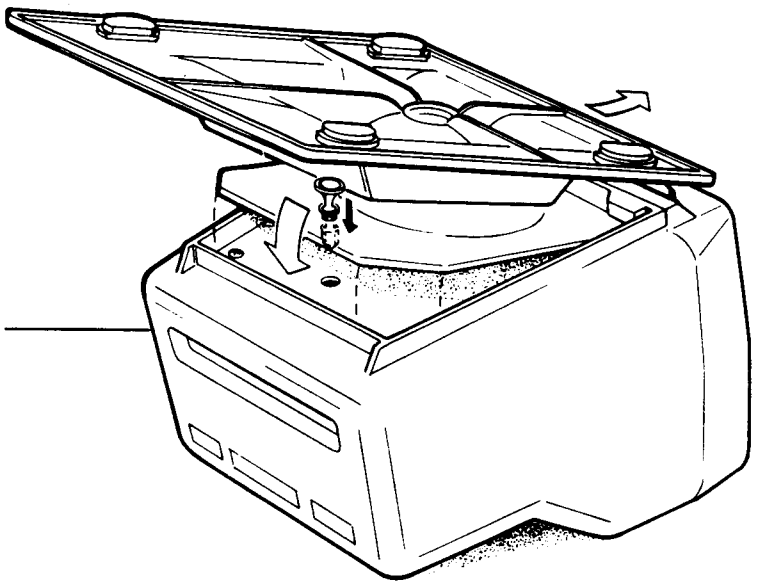
2. Grasp the pedestal and observe its design. Note that the upper section of the pedestal (the one with the deep bowl shaped protrusion) has two semi-circular cutouts along one edge (the front

edge), as well as a plastic snap fastener which is set in a hole at the center of the other edge (the rear edge).

3. Grasp the snap fastener on the pedestal and "pop" it into its retracted position. (The movement is upward if the pedestal is oriented upside-down, as in the illustration below.)



4. Grasp the pedestal and slide its front edge along the Monitor Unit bottom surface until it contacts the front, inside edge of the Monitor Unit. The semi-circular cutouts of the pedestal should be aligned with the two screws at the front, inside edge of the Monitor Unit base.



5. Set the pedestal base down onto the bottom surface of the Monitor Unit. The snap fastener should be aligned with the hole in the Monitor Unit.
6. Firmly press the snap fastener down into the hole in the Monitor Unit, snapping it into place. Ensure that the snap fastener has been fully set into the Monitor Unit by firmly but gently pulling the pedestal away from the Monitor Unit. If the snap fastener has not seated properly, repeat steps 4, 5 and 6.

Environmental Requirements

The Visual 1050 requires certain minimal conditions under which to properly operate. The information provided here may influence where you place your Visual 1050 system.

- **Electrical Power Line:** Your Visual 1050 has been manufactured for 115 VAC, 60 Hz input power or for 230 VAC, 50 Hz input power (not both). The serial number label, located at the rear of the System Unit, indicates what input power is required by your Visual 1050. A properly grounded power line of the appropriate voltage is required. The Visual 1050 system (with no printer connected) draws a maximum of 4 amps of current at 115 VAC and 2 amps at 230 VAC.

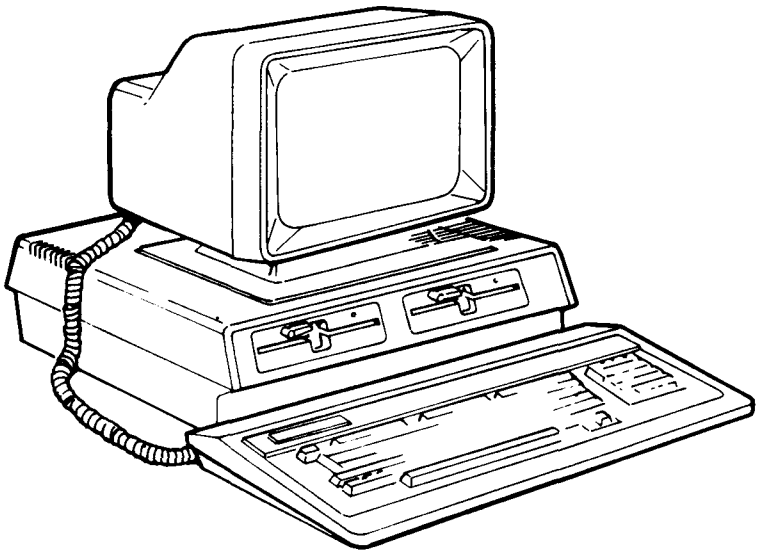
  WARNING: The power cord provided with the unit has a three-prong plug for connection to a properly grounded AC power line. The three-prong plus is provided to minimize the hazard of electrical shock to you. Do not defeat the purpose of the plug.

- **Clean Air:** Any computer equipment requires fairly clean air in its environment. A fan is used to circulate air from the environment through the System Unit for cooling purposes. Airborne particles have been shown to be a hazard to diskettes and disk drives.
- **Non-Condensing Air:** Sources of moisture should be kept away from the computer system. Moisture can wreak havoc on electronic equipment of any kind, and magnetic media such as diskettes can be adversely effected. For this reason, be sure to

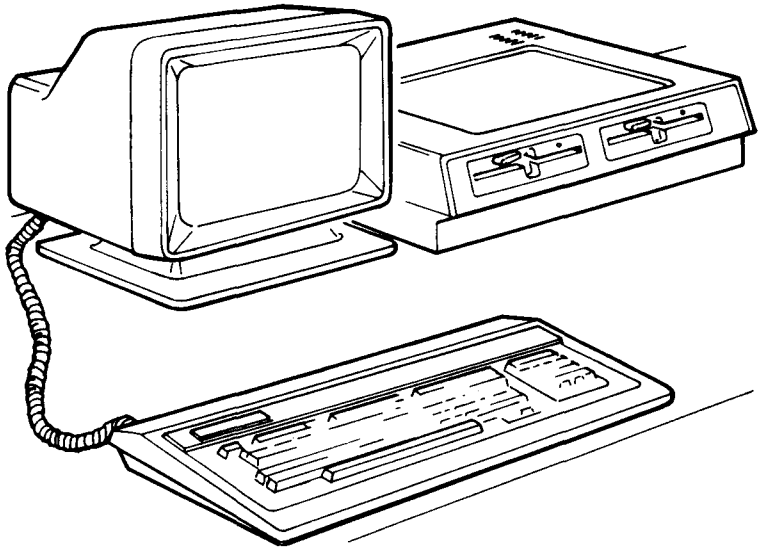
locate the Visual 1050 away from any sources of moisture, such as a steam radiator.

Component Arrangement

The components of the Visual 1050 can be positioned in a variety of ways to suit your personal taste. The Monitor Unit can be placed on top of the System Unit, in a kind of "piggy back" arrangement.

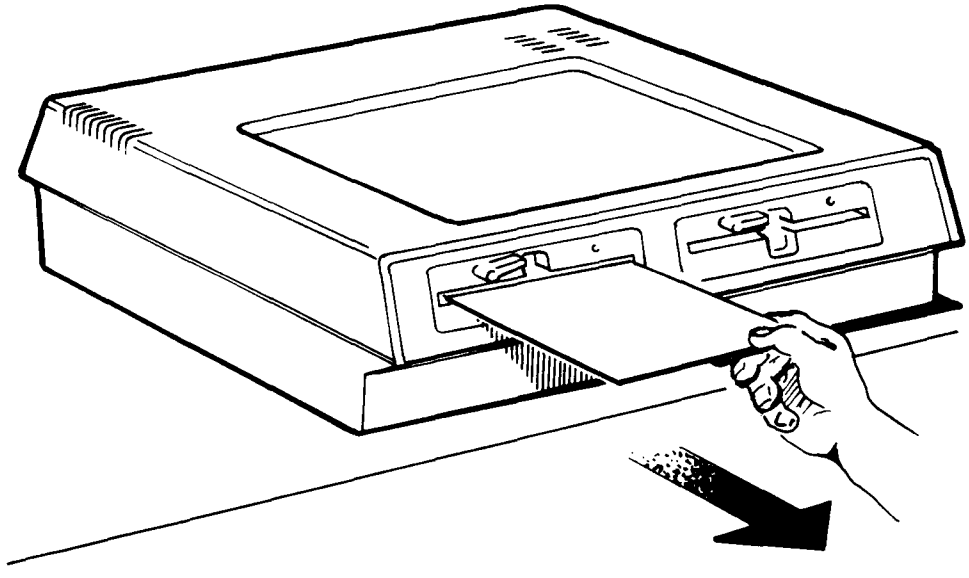


Alternatively, the Visual 1050 can be set up with the Monitor Unit on the table and the System Unit off to the side. A small printer can be placed on top of the System Unit if desired.



Removal of Disk Drive Inserts

Remove the cardboard inserts from the disk drives, which are provided to protect the drives during shipment. To remove each insert, first release the locking mechanism of the drive by turning the drive handle to the open position, then gently draw the insert out of the drive. Be sure to save the inserts for future use should the need arise to transport the System Unit.

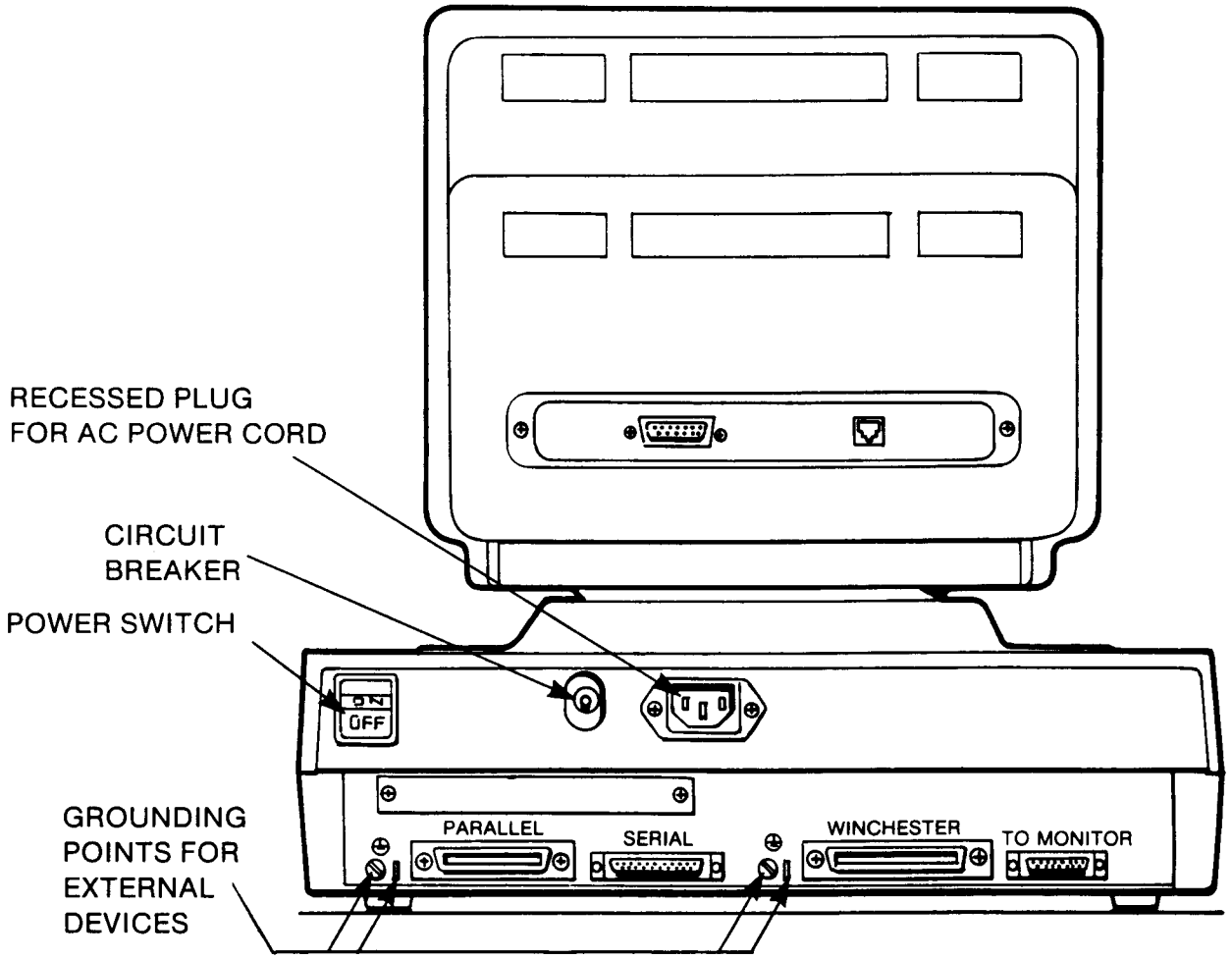


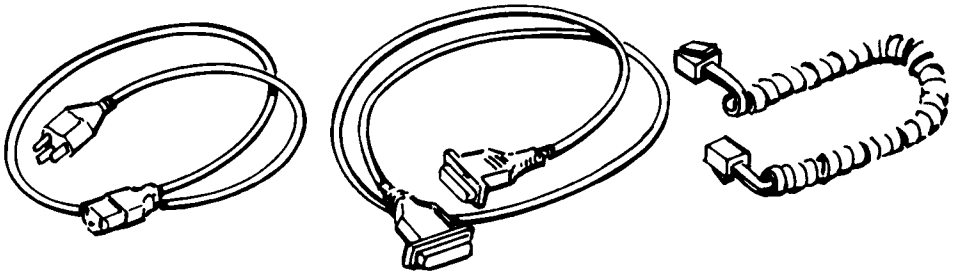
Cable Connections

WARNING: Do not connect the power cord to the system until told to do so.

Once you know where you wish to place the components of your system, you are ready to cable them together. Each cable used is different from the others, and the connectors used are unique, so there is less of a chance that something can go wrong.

1. Gather together the three cables which have been shipped with your system. Take a look at the rear panels of the System Unit and the Monitor Unit.



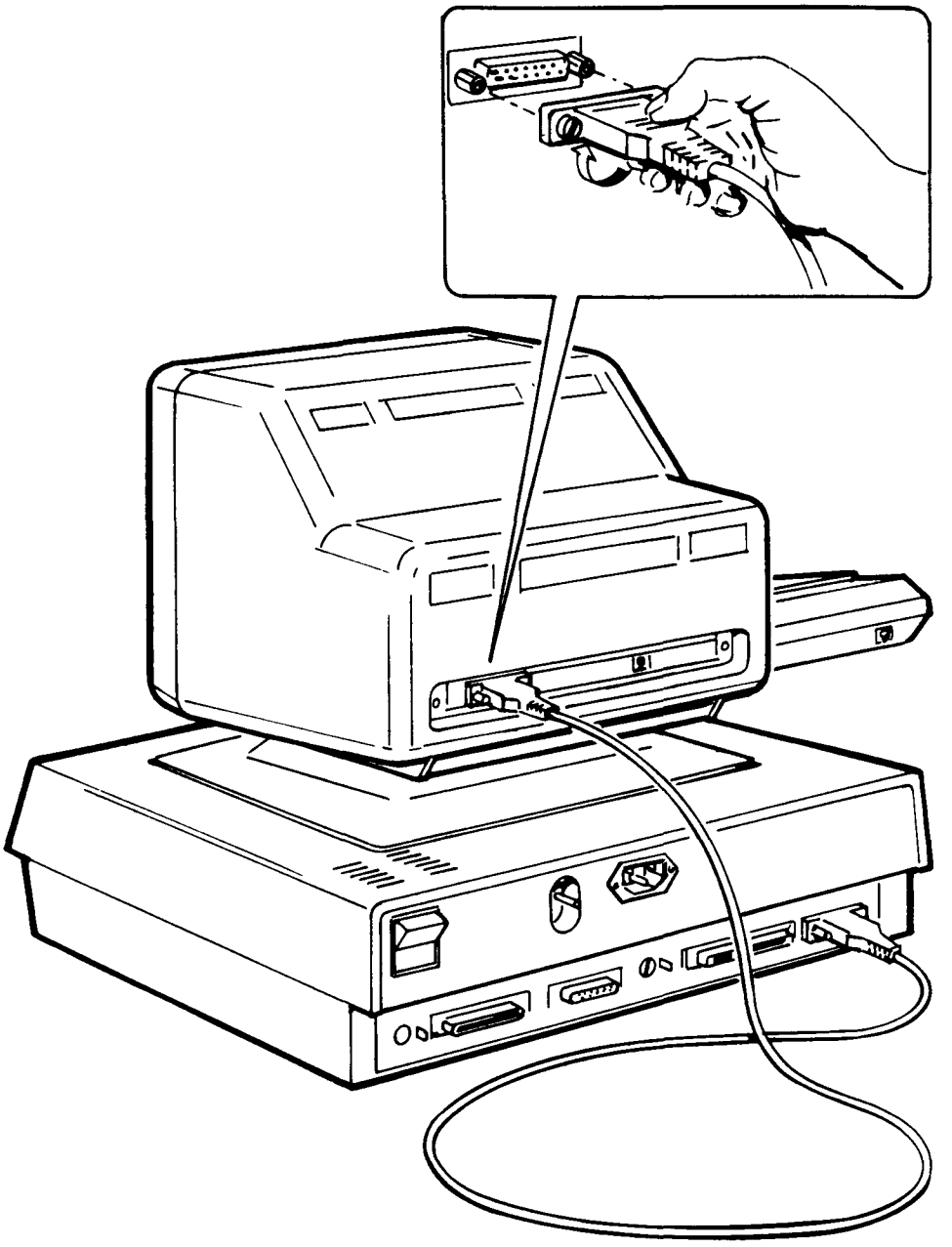


AC POWER CORD
(115 VAC SHOWN)

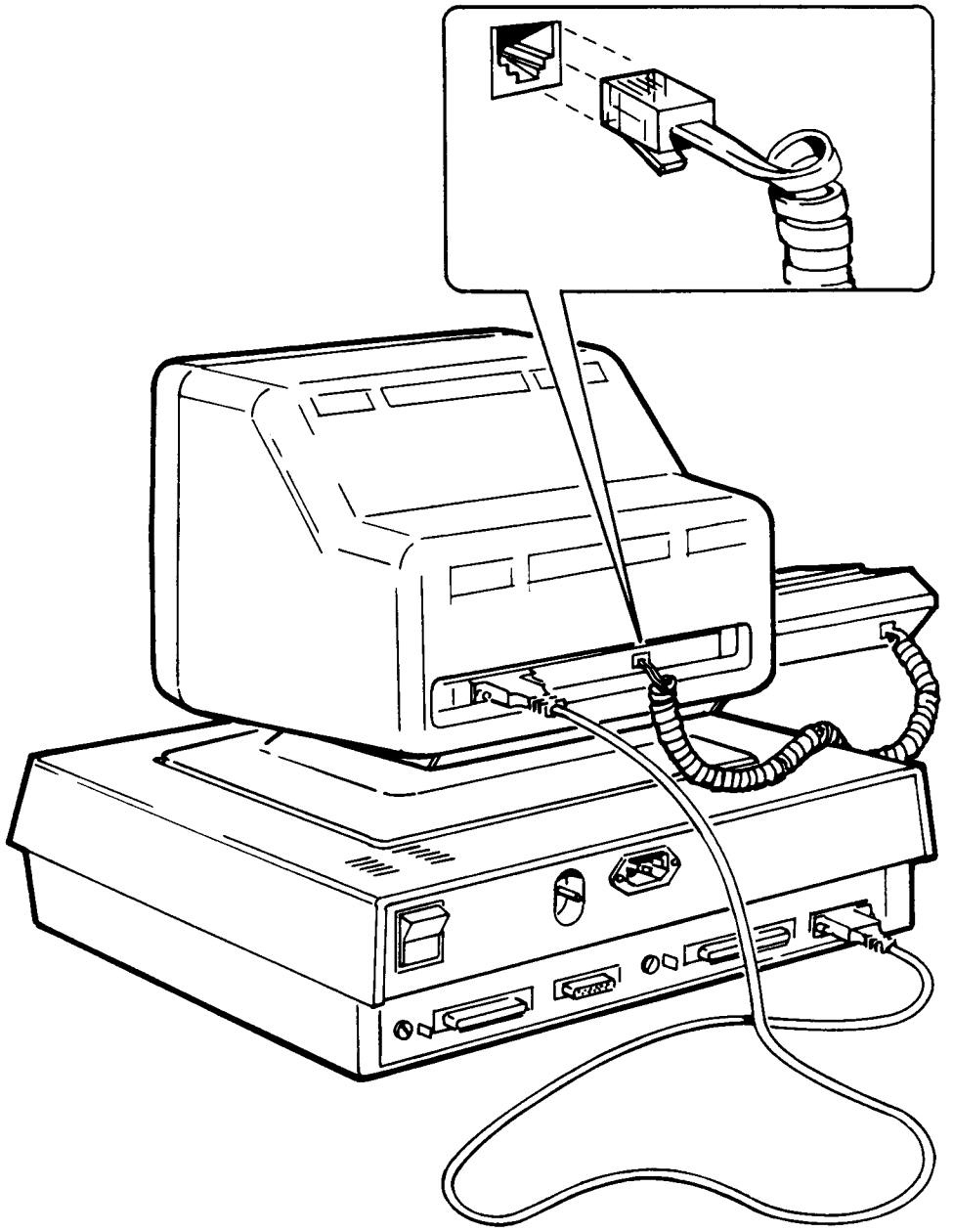
MONITOR CABLE

KEYBOARD CABLE

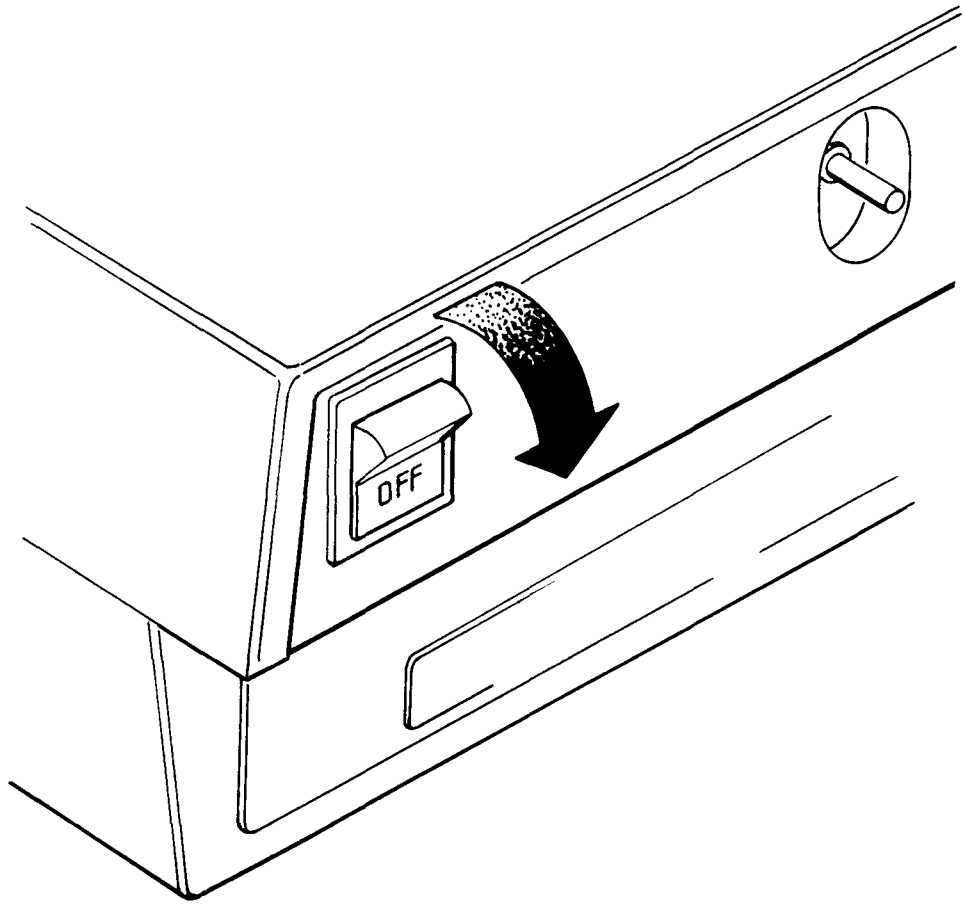
2. Connect the Monitor Unit to the System Unit with the Monitor cable. Note that the two plugs which terminate the cable can fit into their matching jacks in only one way. Note also that each plug is fitted with two screws. Use a small screwdriver to secure each plug to its associated jack.



3. Connect the keyboard to the Monitor Unit with the keyboard cable. The plugs snap into place.

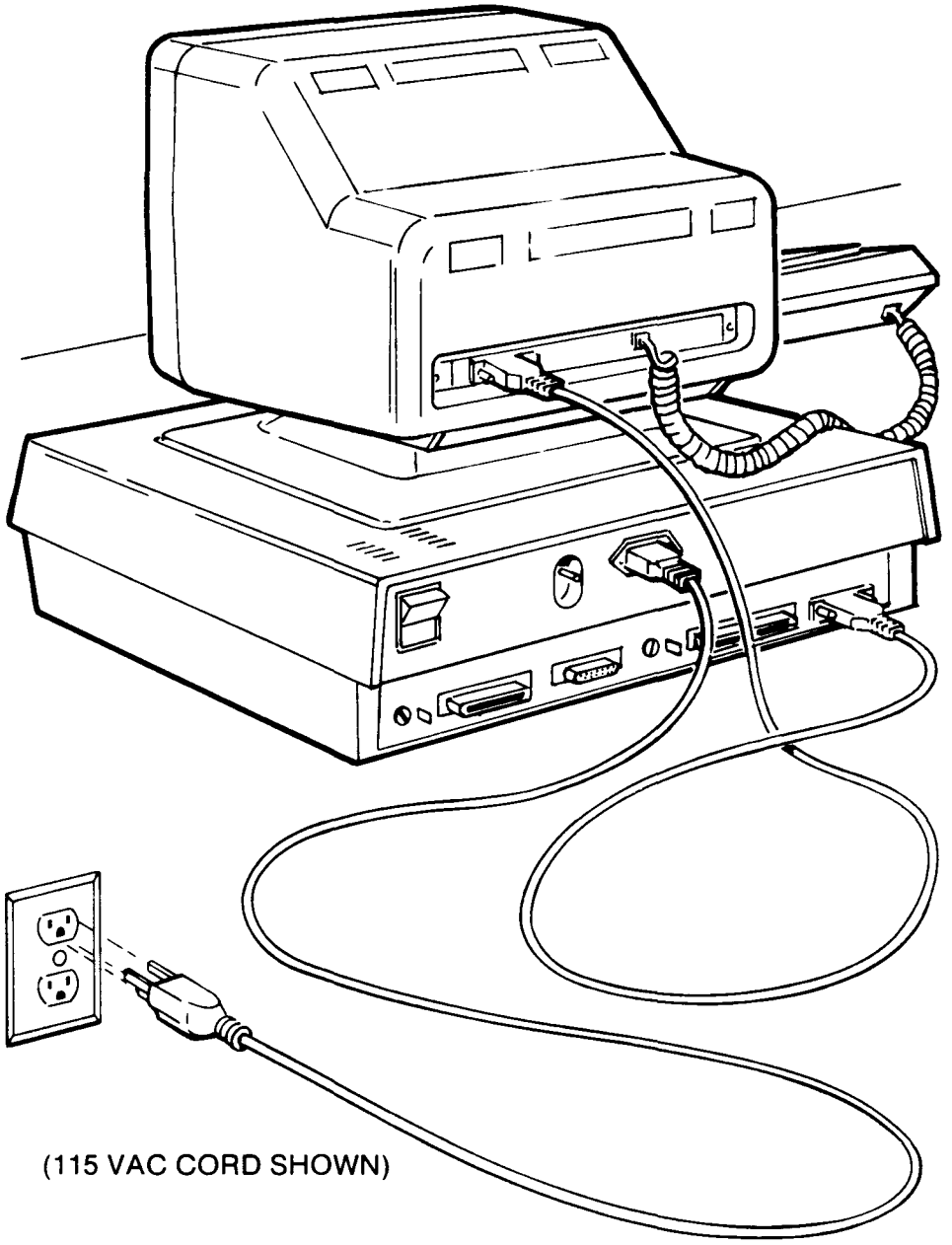


4. Ensure that the power switch at the rear of the System Unit is in the OFF position.



5. Connect the AC power cord to the rear of the System Unit. Note that the terminator of the cord has three holes which can line up in only one way with the three prongs of the jack in the System Unit. Press the cord firmly into the jack to connect.

   Plug the other end of the power cord into the wall outlet.

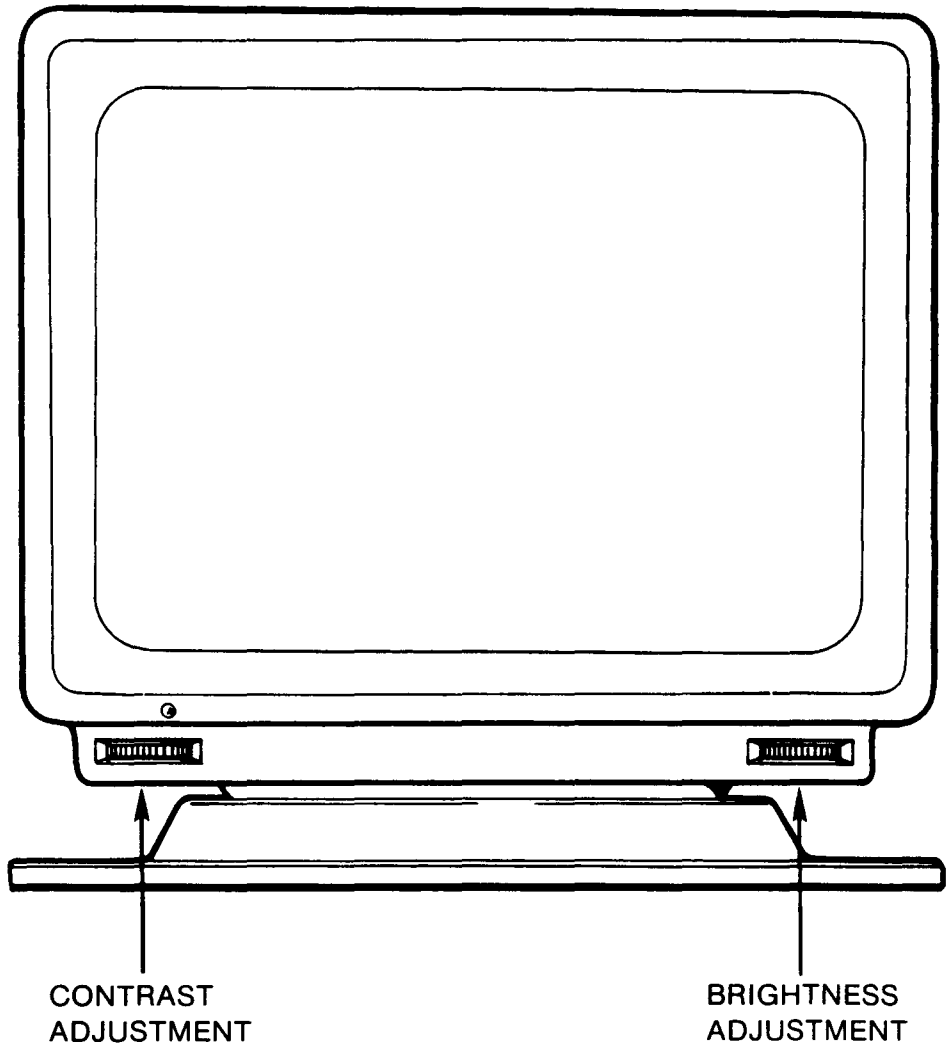


(115 VAC CORD SHOWN)

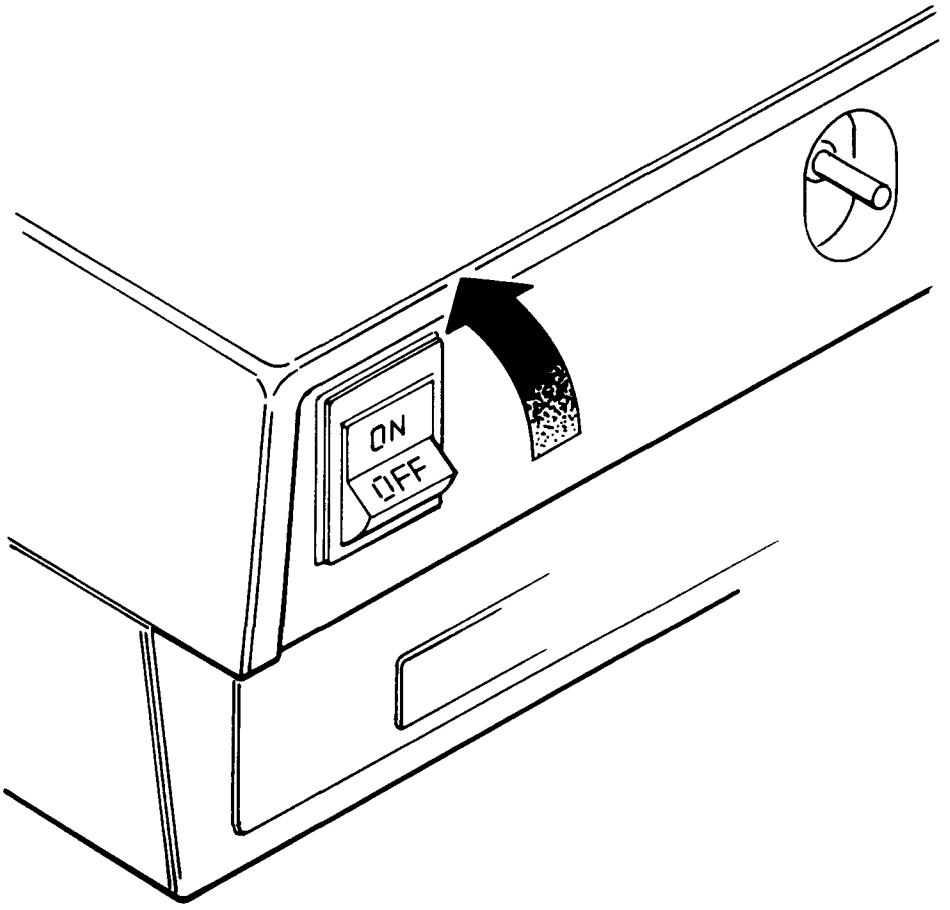
Power On Self-test

The Visual 1050 undergoes a brief startup diagnostic each time it is "powered up." To power up the system and initiate the diagnostic, follow the procedure below:

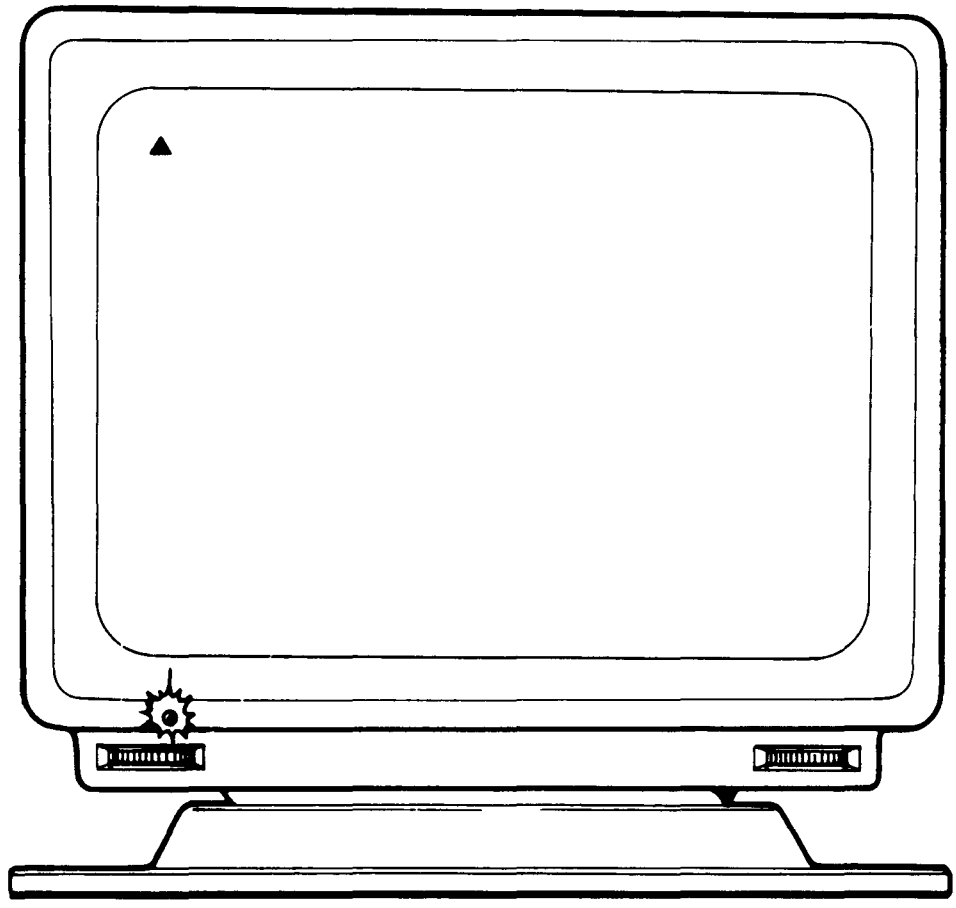
1. Set the contrast to the highest level by turning the adjustment knob to the extreme right position.
2. Set the brightness to an average level by turning the adjustment knob to the middle point between extreme right and left positions.



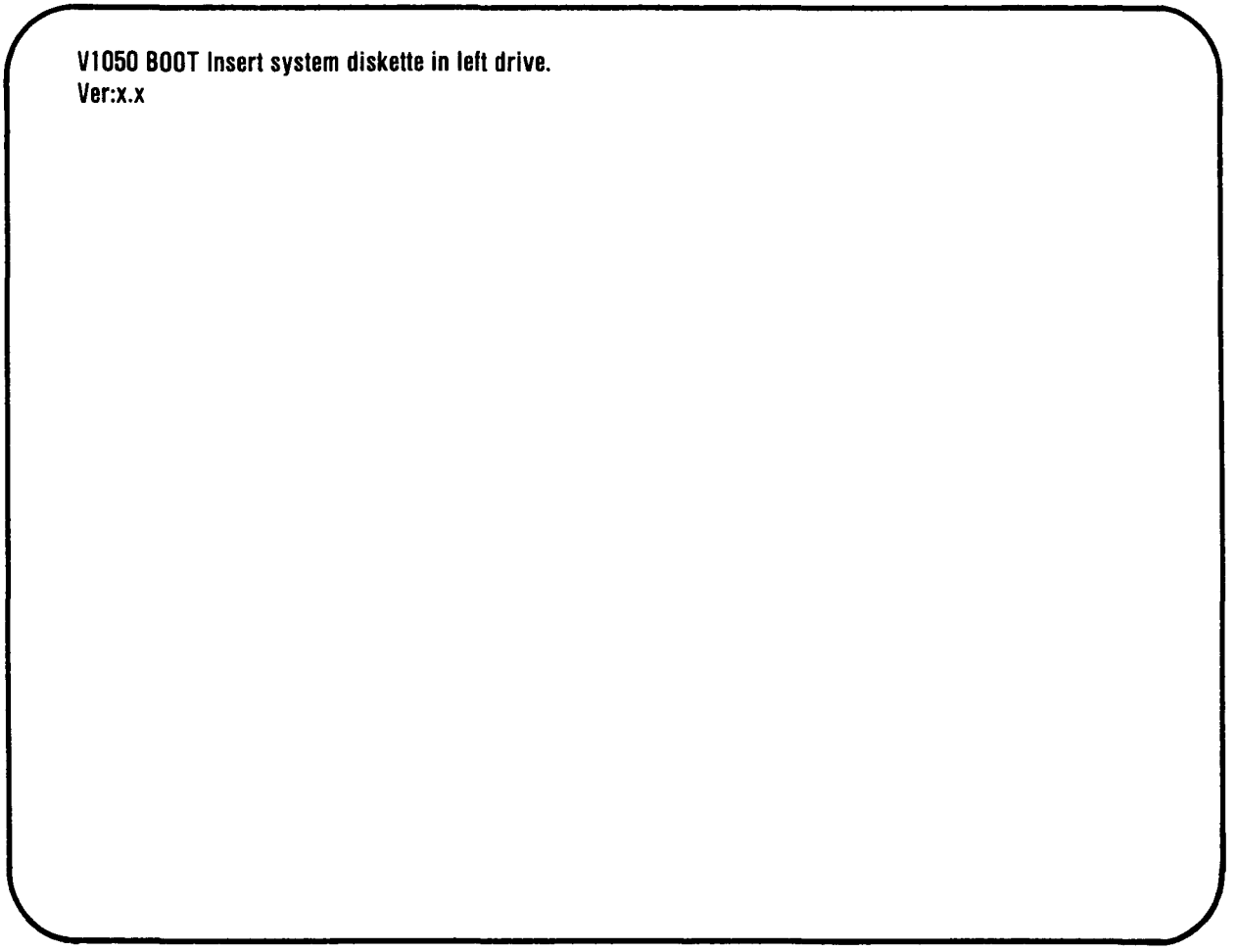
3. Locate the "Caps Lock" key on the keyboard. While observing the key, turn on the Visual 1050 by setting the power switch at the rear of the System Unit to the ON position.



4. Once you turn the power switch on, you should see the small red light on the "Caps Lock" key flash on then off once, and you should hear the fan running within the System Unit. In addition, the small red light located at the front of the Monitor Unit should be illuminated. You should also notice the blinking, triangular-shaped *cursor* at the top left of the screen.



5. After a short time (around 10 seconds) a "beep" should be sounded, and the message shown below should be displayed.



Adjust the brightness and contrast levels of the display screen to your liking.

6. The beep signifies that the Visual 1050 has passed its power up diagnostic. The computer is currently "looking" for a *bootable* diskette in the left disk drive (the A: drive). (Notice that the red light at the A: drive is illuminated, which indicates that the computer is trying to use the drive.) Since there is no diskette in the drive, the computer cannot "boot" the *operating system* into main memory.
7. If you wish, turn off the Visual 1050 at this time (it will not harm it if you do). If you do not turn it off, you will observe the light at drive A: remain on for a short time, then go off. When the light goes off, a new message will be displayed to let you know that the computer is ready to start looking again for a bootable diskette in drive A:.

```
V1050 BOOT Insert system diskette in left drive.
Ver:x.x
Type any key when ready.
```

8. If you have not done so, turn off the Visual 1050 with the power switch at the rear of the System Unit.

If Something Goes Wrong

If, while you go through the procedure for the power-on diagnostic, things don't seem to happen the way they are described, chances are that the cables were not connected properly. Review the instructions under "Cable Connections" above, and go through the "Power On Self Test" section again. Provided below is a basic trouble-shooting guide for conditions which may arise when power is applied to the system:

Symptom	Possible Cause(s)
fan does not operate:	• power cord not connected to wall outlet • power cord not connected to System Unit • AC circuit not providing power at outlet
red light at front of Monitor Unit does not light up (fan works):	• bad connection of monitor cable
"Caps Lock" light does not flash on (fan works, Monitor light is lit):	• bad connection of keyboard cable
Screen not displaying any information:	• brightness, contrast controls not properly adjusted • internal error
Diagnostic "beep" does not sound, although power is present in system (fan, lights work):	• internal error

If you have a problem which you can not resolve, use the telephone number provided in the Visual Customer Support Packet to contact Visual Technology Incorporated.

Printer Set-up and Test

If you have purchased a printer for your system, make the necessary connections at the rear of the System Unit.

Follow the manufacturer's documentation provided with the printer to complete the setup and checkout of the device.

Repacking the System

As noted above, you should save the original packing boxes of your Visual 1050 system, since they will provide protection to the system should the need arise to ship it again.

To repack the system, use the illustrations from the "Unpacking Your System" section above. Be sure to place the cardboard inserts back in the disk drives if the System Unit is to be shipped.

In Conclusion

At this point, your Visual 1050 should be ready to go to work for you. Read through the next section "Introducing the Visual 1050," where you will be shown how to run the Visual 1050 Demonstration diskette.

2 Introducing the Visual 1050

Introduction

This section is provided to introduce you to the features and capabilities of your Visual 1050 personal computer. You may be unfamiliar with some of the technical terms used here; recall from the Preface to this Guide that the first occurrence of terms which are defined in the Glossary have been printed in italic type.

As you complete your reading of this section, you will be invited to run a demonstration program which is included to graphically supplement the written materials provided here.

What You Have

The Visual 1050 is an advanced microcomputer system specially designed to serve as your professional assistant. The system includes powerful, field proven hardware components, the most popular operating system of its type, and award-winning, versatile software. In addition, the Visual 1050 comes with a user friendly, menu-style Utility Manager to help you easily access installed software packages, and use common *utilities* of the operating system.

A Design For Humans

The Visual 1050 has been designed with your operating comfort in mind. The detached, low-profile keyboard may be adjusted to lay flat on your desk, or be supported by its two rear feet. The sculptured keys are arranged in the popular IBM Selectric® layout.

The Monitor Unit sets on a tilt and swivel pedestal base so that you can orient the display screen to you — not the other way around. As shown in Section 1 "System Setup," the Monitor Unit can be set either directly on a desk or on top of the System Unit. The green phosphor monochrome display has an etched faceplate to minimize reflections from the environment. Easy-to-reach controls for both contrast and brightness are provided.

Hardware

Your Visual 1050 comes with an impressive list of hardware components as standard equipment. You won't have to spend a lot of money to add such things as more internal memory, expansion cards, a monitor, or another floppy disk drive to build a useful system; the Visual 1050 already has such features, which are extra cost options for many other computers:

Dual Processor Architecture: The Visual 1050 has two 8-bit *processors*; one processor is used as the *central processing unit* (CPU) and the other is the *display processor* which controls the display screen.

Lots of Internal Memory: A full 160 kilobytes (160K) of internal *random access memory* (RAM) is provided standard, of which 128K is programmable RAM for use by the operating system and programs, and 32K is used by the display processor.

Real-Time Clock: Included on the circuit board of the computer is a *real time clock*. The real time clock allows you to optionally "stamp" your files with the date and time of creation and updating. The clock is "backed up" by a battery so that the clock will keep time even when the power is turned off.

Internal Expansion Ports: Two *internal slots* are provided for adding optional circuit cards as they become available.

Serial Port: An RS-232C *serial port* is provided for connecting serial interface devices such as printers, plotters, and tablet digitizers. Connection to *modems* for *telecommunication* with remote computers or information services is also handled through this port.

Parallel Port: A *Centronics-type parallel port* is provided for connecting parallel interface devices such as printers and plotters.

Winchester Port: A *Winchester* port is provided for connecting Winchester hard *disk drives* which greatly increase the on-line mass storage capability of the Visual 1050.

Dual Disk Drives: Two flexible (floppy) disk drives provide a total of 800 kilobytes of on-line storage. Since one byte is used to store each character, more than 100 single-spaced typewritten pages of text can

be stored on each 400K diskette used with the disk drives. With two drives, one generally maintains the application program diskette in one drive and a related data diskette in the other drive. Thus, many large files can be "free to grow" on separate data diskettes, unencumbered by the space requirements of programs. Also, routine chores such as backing up diskettes and copying files are simple procedures when you have two disk drives.

High Resolution Display: The display screen offers high resolution (640 x 300 picture elements, or *pixels*) unit. Under control of the display processor, each individual pixel can be turned on or off. This *bit-mapped graphics* capability allows you to present detailed charts, graphs, and pictures on the screen.

Phosphor Saver Feature: This feature is provided to prolong the life of the display screen. If a period of time goes by without any operator input, the display is "turned off." The display is brought back by depressing any key.

Solid-state Keyboard: The keyboard does not use mechanical switches which can wear out over time. Because of a feature called "n-key rollover," no keystrokes will be lost, no matter how fast you type. In addition, the "autorepeat" feature can be used to enter a series of any given letter; just hold down the key for more than a second, and it will be repeatedly entered. A "keyboard click" feature can be turned on for audible confirmation of key entry.

Keyboard Keys: Seventeen function keys (marked "F1" through "F17") are provided on the keyboard. These keys help make the software provided with the Visual 1050 easier to use, and are available for user-installed programs as well. The numeric pad at the right end of the keyboard allows for rapid data entry or, in alternate mode, the entry of cursor movement or other commands within programs. The function keys and numeric pad keys (as well as a few others) have WordStar commands inscribed on them for efficient use of that powerful word processing software package. Like the function keys, a "Help" key is built into the keyboard for use with software programs provided with the Visual 1050, and is available for user-installed software.

CP/M Plus Operating System

CP/M Plus is a registered trademark of Digital Research Incorporated, and is another name for the operating system called CP/M-80 Version 3. Version 3 is the most recent release of this operating system, which we will refer to within this Guide simply as "CP/M."

CP/M is one of the most widely used microcomputer operating systems. The popularity of CP/M has fostered over the years the creation of thousands of applications programs which run within its *environment*. Just about anything that can be done with software on a microcomputer was either developed first for CP/M or quickly became available for CP/M. Thus, you can take advantage of an already established, vast program library with your Visual 1050.

Bundled Software

The software packages provided with the Visual 1050 are some of the most popular and powerful available for their respective applications:

Multiplan: Multiplan from Microsoft provides a powerful electronic spreadsheet program for your use. Multiplan can help you generate and revise budgets, forecasts, and schedules without the tedium associated with a pencil, paper, and adding machine. With Multiplan, you can develop your spreadsheets as you view them on the screen, then output them directly on your printer for a hard copy.

WordStar with MailMerge Option: This is the powerful word processing package from MicroPro International. You can enter text, make edits, reformat text, include other files into the currently edited file, write portions of the currently edited file to other files, search and replace strings of characters, and much more — as you watch the screen. WordStar can do formatting and pagination to your specifications while it prints your document files. With MailMerge, a WordStar option, you can generate form letters and handle mass mailings with a minimum of bother. In addition, you can incorporate spreadsheet information generated by Multiplan into your WordStar document files.

DR Graph: DR Graph from Digital Research is another outstanding software package. With DR Graph, you can use your Visual 1050 to

generate many kinds of charts and graphs, including line charts, bar charts, pie charts, scatter plots, and step plots. You can annotate your charts with text, selecting from several letter designs. With DR Graph, you develop your graphs on the screen, then output them directly to your printer or plotter. If you have a plotter with color capability, DR Graph can be used to output color charts. You can even output four charts on the same sheet of paper. As an added feature, you can pass Multiplan spreadsheet data to DR Graph for the generation of graphs.

CBASIC: The CBASIC programming language *interpreter* from Digital Research has been included with your Visual 1050 as well. You can write your own programs in CBASIC, then run them on your Visual 1050.

Communications Program: An advanced communications program has been provided with your Visual 1050. Via the RS232C serial interface, you can use the program to make file transfers with, for example, a local mainframe or minicomputer system. With a *modem* (not included) you can use your Visual 1050 as a terminal to a remote computer or information service.

The Utility Manager

A special feature of the Visual 1050 is the Utility Manager. Itself a program, the Utility Manager presents an easy to use menu from which you can run common CP/M utilities, but without having to learn the syntax associated with them. In addition, the Utility Manager provides an easy way to access the bundled software packages described above. You can incorporate other programs (those you purchase or those you create) into the Utility Manager as well. Another good thing about the Utility Manager is that you can turn it off, so you won't have to use it if you don't want to.

Compatibility With Other Disk Formats

One of the valuable features of CP/M is its wide support by independent software vendors; thousands of programs have been created to run in it. Fortunately, you can have easy access to this software, even though in some cases it may not be available on diskettes formatted for the

Visual 1050. That is because a command is included in the bundled software which allows you to tell the Visual 1050 that you wish to "read" programs or data off a diskette which has been formatted for certain other personal computers. These other computers include the DEC Rainbow™ and Kaypro II™.

See For Yourself

A demonstration program has been provided for your enjoyment. To run the program, follow the procedure outlined below:

CAUTION: Before you run the program, however, we must briefly touch on some guidelines on handling diskettes. Take a look at the paragraph called "Handling Diskettes" in Section 3 "Some Basics" of this Guide. Once you feel that you can handle diskettes without harming them, go ahead with the instructions below.

1. Turn on the Visual 1050 with the power switch at the rear of the System Unit. The disk drive handles should both be in the unlocked (open) position, since nothing should be in the drives.
2. Obtain the **CBASIC and Demonstration** distribution diskette from the diskette box. Take the cover off the diskette and insert the diskette into the A: (left) disk drive. Turn the disk drive handle to the locked (closed) position.
3. Observe the display screen. The computer will go through the actions it did before during the Self-test procedure in Section 1 "System Setup." However, since the diskette you placed in the A: drive is "bootable," the computer will be able to load its operating system into internal memory. Soon the information shown below will be presented at the display screen. The CP/M operating system *prompt* **A >** should be presented on the bottom line of the screen. (The numbers may be different than those shown in the figure.)

```
CP/M V3.0 Loader
Copyright (C) 1982, Digital Research

BNKBIOS3   SPR  F100  0F00
BNKBIOS3   SPR  B800  0800
RESBDOS3   SPR  EB00  0600
BNKBDOS3   SPR  8A00  2E00


xxK TPA

CP/M Version 3.0, BIOS version x.x
***BANKED VERSION***
A>
```

4. In response to the **A >** prompt, enter **submit 1050demo** followed by a carriage return, and enjoy the Visual 1050 demonstration program. The demonstration will run continuously until you terminate it by entering a 'CTRL-C' (by simultaneously depressing the 'CTRL' key and the 'C' key).
5. After you terminate the program, you will again be presented with the **A >** prompt. If you wish, you can run the demonstration program again; if not, simply open the disk drive, withdraw the diskette and place it within its envelope, then turn off the Visual 1050.

In Conclusion

We hope that you are enthusiastic about the capabilities of your Visual 1050. Now we can set about helping you take advantage of these capabilities. Section 3 of this Guide provides information which you must understand before you are able to start using your computer for what it is intended: saving time and energy.

3 Some Basics

Introduction

In this section, we will discuss fundamental aspects of the operation of the Visual 1050. If you are new to computers, please pay close attention to the materials presented here; those of you who have a working knowledge of microcomputers and disk-based operating systems may wish to skim over the section.

The Operating System

Every general-purpose computer, whether it costs fifty dollars or five million, needs an operating system. The operating system, often simply called the 'system', is the program or set of programs which form the interface between the physical hardware of the computer and the operator at the console, or the applications program which is running in the computer. A computer without a correctly operating operating system does not even look at its own keyboard to see whether anyone is typing.

The operating system "brings the computer to life," and in fact gives it whatever semblance of personality it may appear to have. It takes in what you type at the keyboard and tries to understand what you want (or at any rate what you have typed). It sends characters to the display to let you know what is going on inside the computer system. It operates the disk drives when necessary, and keeps track of where information is stored on the diskettes.

The most wonderful and efficient operating system in the world still doesn't accomplish anything useful by itself. It can run the motor, so to speak, but it can't put the machine in gear. In order to do anything tangible you must have applications programs which are programs which actually accomplish something for you. As we stated in Section 2, the operating system provides an 'environment' within which application programs run. This environment provides a number of services which are made available to application programs. CP/M, for example, provides more than fifty such services.

The Visual 1050 Utility Manager

As you become familiar with CP/M you will find it to be a powerful and flexible operating system, and you will hopefully grow comfortable with its internal conventions. At the beginning, though, it may seem cryptic and contrary.

The Visual 1050 Utility Manager was developed so that you could input your directives to the operating system with a consistent form. Itself a program, the Utility Manager presents a menu of options from which you may instruct the operating system to carry out commands, run programs provided with your Visual 1050 or ones which you define, or to set up many of the features of the Visual 1050 to your liking. Therefore, if you are unfamiliar with CP/M, you can be productive with the Visual 1050 right away.

Starting the System (Booting)

When you apply power to the Visual 1050, you set in motion a moderately complex chain of events. The first thing that happens is that an internally stored program begins to run. As we witnessed in Sections 1 and 2 of this Guide, the program carries out a power-on diagnostic of certain hardware components, then sounds a beep if the diagnostic is passed. The program then looks for a diskette in the A: (left-hand) disk drive. If it finds a bootable diskette in the drive, it starts to load the CP/M operating system into internal memory. It does this by first loading a small program called CPMLDR. That program loads CP/M and runs it. This stepwise progression reminded some of the early programmers of the phrase "He pulled himself up by his own bootstraps," and the loading process became known as 'bootstrap loading', 'bootstrapping', then simply 'booting'. Booting, therefore, refers to the process of initiating the operation of the computer as a system, as opposed to simply applying power to the hardware.

CP/M recognizes two types (or degrees) of boot. The *Cold Boot* or Cold Start loads CP/M completely, as though the computer had just been turned on (as indeed it might have been). It takes twenty seconds or so to perform, and prints a sign-on message on the screen. If you have the Utility Manager turned on, the computer goes directly to the top menu level at this point.

On the other hand, the *Warm Boot*, or Warm Start does much less and takes less than a second to perform. It stops whatever program is currently running (including the Utility Manager, if you are using it) and reloads a portion of the operating system. It then returns you directly to the command level of CP/M. The Warm Boot is the normal exit taken by a program when it returns you to CP/M.

You may request a warm boot by entering a **Ctrl-C**; that is, hold the 'Ctrl' key down, then press the 'C' key. This action will interrupt CP/M commands at an appropriate time (a time when data will not be lost). A Ctrl-C will be "trapped" or intercepted by many programs (such as WordStar) however, and will not "get through" to the operating system. You may force a warm boot by entering a **Ctrl-Break**. A Ctrl-Break is not trapped by programs, and CP/M is forced to warm boot immediately. To force a cold boot, press **Ctrl-Shift-Break**; that is, simultaneously press the 'Ctrl' and 'Shift' keys, then press the 'Break' key.

CAUTION: DO NOT FORCE A BOOT BY ENTERING Ctrl-Break OR Ctrl-Shift-Break WHILE THE COMPUTER IS WRITING TO A DISKETTE. If you do, the diskette may become unreadable and have to be reformatted, losing its entire contents. You can avoid a loss of data by not forcing a boot while the light at either disk drive is illuminated and there is a diskette within it.

Operating System Commands

We mentioned above that CP/M provides numerous services which it makes available to applications programs. Such services are of little use individually; they are merely the building blocks with which the program may achieve its ends, and are of no use to human operators. There are, however, operating system resources which are directly useful to humans, and these are called *system commands*. These commands are generally related to the operation of the computer system, and provide such services as showing you the names of all the files on a diskette, listing the contents of a file, showing how much unused disk space is available, displaying the contents of internal memory, and so forth.

CP/M has over twenty-five system commands, and they are discussed in the *CP/M Plus User's Guide*. We would like to draw your attention to the commands listed below (don't look now, but when you do start reading

the *User's Guide*, look at these commands first): **DIR, ERASE, HELP, INITDIR, PIP, RENAME, SET, SETDEF, SHOW,** and **SUBMIT**.

Resident vs. Transient Commands

Some commands are built into the operating system. They are called *resident commands* and are immediately available to you at any time that you are talking to the system (if an application program is in control, you will generally have no access to the system at all, except by first stopping the application program). Other commands, while provided as part of the system, actually exist as separate programs on the diskette. CP/M calls these commands *transient commands* because they must be called into internal memory from a diskette, and they go away when they have performed their function. Many people would refer to transient commands as utilities, reserving the term 'command' for the built- n functions; the *CP/M User's Guide* uses the term 'command' instead c f 'utility' so we have followed that convention here.

Talking to the Operating System

Any program which expects you to give it input must give you some indication that it is ready and waiting for such input. That indication is known as a 'prompt', as the program is "prompting you" for input. The typical prompt consists of one or two characters which are displayed on the screen; the cursor is displayed just to the right of the prompt. The basic CP/M prompt consists of a capital letter followed by the greater-than sign, like this: **A>**. The particular letter represents the name of the disk drive which CP/M expects to use next.

Prompts used by programs have the same function, but are generally composed of different strings of characters. There is a practical reason for this: the prompt indicates which program is currently in control of the computer system. The CP/M transient command **PIP**, for example, uses an asterisk as a prompt. (Incidentally, many computer users find it tedious to use the words 'asterisk' and 'period'. They generally use 'star' and 'dot' instead, as in the frequently used phrase "star-dot-star." If you say "asterisk-period-asterisk" three times rapidly you will see the reason for this.)

Command Lines

CP/M will accept your requests in the form of a CP/M *command line*. The command line must be expressed in a particular format. The format allows for two parts. The first part can only be the name of a CP/M command (either resident or transient) or the name of a program which you wish to run. The second part (called the *command tail*) consists of information which you wish to pass to the command or program about to be executed. The command (or program) must be looking for that information, or it will be ignored. The command tail may contain the name of a file on which the command shall operate. For example, the command line **WS NEWDOC.TXT** calls the program WS.COM, which is WordStar, and tells it to start editing a file called NEWDOC.TXT. A command tail may also contain specifications or limitations for a command, as in **DIR *.COM[US=3]**, which means "show me a directory of all the files in user area three which have the filename extension **.COM**."

CP/M Response to Command Lines

When you give CP/M a command line (and press the Return key to tell CP/M that you have finished entering the command) it *parses* your command. First it examines the command to see whether there is a command tail. If there is, it places the command tail in a location where it can later be found. Then it examines the command itself to see whether it is the name of a resident command. If so, it performs the command immediately. If not, it looks on the diskette (the same one whose name was part of the CP/M prompt) to see if there is an executable program with that name. (Executable programs always have names ending in **.COM**.) If there is such a program, CP/M runs the program. If there is not, it shows you your command, with a question mark following it. This means "Sorry, boss, I don't know what you want me to do."

Running a Program

We said earlier that CP/M will "run" a program. What this means is that CP/M will find the program on the diskette, load it into the appropriate place in the computer's memory, and **turn over control of the computer to the program**. The program now has complete freedom to do whatever it wishes in the computer. There are certain bounds which such programs

will ordinarily respect (don't destroy the operating system, for example), but they are not forced to do so. It would be perfectly possible for such a program to destroy all information on all diskettes in their disk drives, then eliminate CP/M and lock up the computer so that you would have to turn the power off (and supply new diskettes) to restore normal operation. On the other hand, a program could not physically destroy the computer, nor could it physically damage a diskette.

Well-adjusted programs, however, will respect the operating system's advice on limits, and will in fact request help from the system in all matters concerning the operation of the hardware. This is true for two reasons: it saves the applications programmer a lot of work, and it means that the same program will run without modification in another computer using CP/M. This is important to the programmer because there are easily one hundred different brands of computer which can use the CP/M operating system. It is important to you because it means that practically every program advertised as "CP/M compatible" will run on the Visual 1050. (There is, unfortunately, a detail here. We said that programs will run "without modification . . . ." This is generally true concerning the internal operation of the program, but not concerning the specific commands used to move the cursor around and otherwise handle the display screen. These commands differ from computer to computer. This topic is discussed in detail in Section 6 of this Guide "Installing Software.")

Of Hangs and Hanging

Sometimes a computer will stop responding to your instructions at a time when it should be listening to you. This condition is referred to as a *hang*. (If the system won't respond to you because its attention is taken by a correctly operating program, that is not hanging. That is normal operation, even though it may make you nervous when the program seems to take a long time to do something. Courteous programs will try to make something change on the screen from time to time, just to reassure you that they haven't gotten lost somewhere.)

There are several reasons why a computer may hang. A program with an error in it will often cause this condition. The most common reason, though, is an electrical disturbance. This could be from the power line,

or it could be a static charge which you picked up when crossing the room, which was then delivered to the computer when you touched it. In extreme cases, either kind of disturbance could damage the computer.

To recover from a hang, first try a warm boot. If this fails, request a cold boot. If that fails, turn off the power to the machine, wait ten seconds, then turn it on again. If that fails, replace the system diskette with a backup system and cycle the power again. If that fails, the computer is broken. Use the telephone number listed in the Customer Support Packet to contact Visual Technology incorporated.

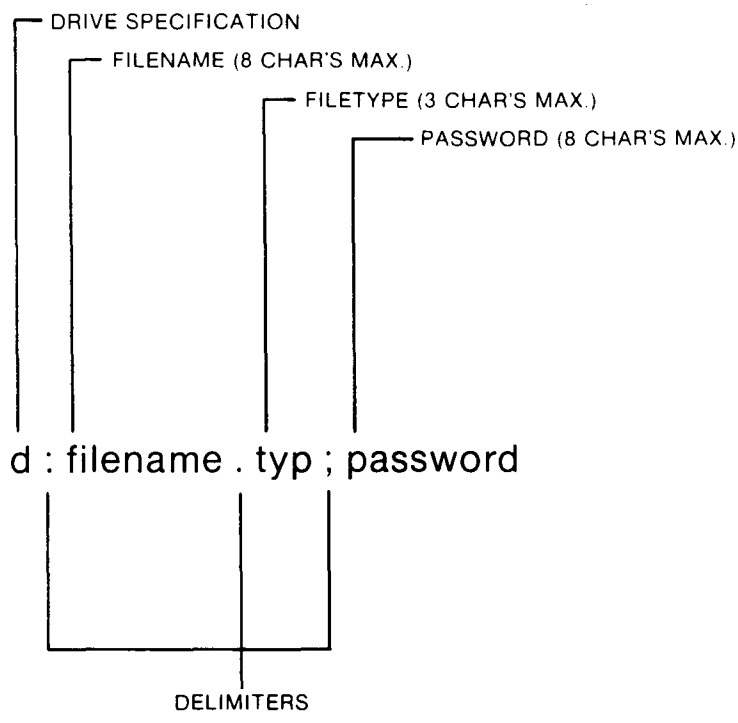
Files and Filenames

CP/M allows you to deal with information in units called *files*. A file might contain a portion of the operating system, an application program, or data to be used by another program (such as financial data, or a mailing list, or a chapter of a book). It may be helpful to consider these files as similar to files of papers in a filing cabinet; following that analogy, each diskette would correspond to a filing cabinet.

Each file is stored somewhere on a diskette. You don't know exactly where, but you don't have to because CP/M expects you (or another program) to ask for the file by name. This name is unique. That is, you may have six files with exactly the same name, but they must be on six different diskettes. If you place a file on a diskette already containing a file of the same name, the contents of the existing file will be lost.

The filename is more formally called a file specification. In CP/M it consists of up to four elements, each separated from the following one by a unique *delimiter*. They are, in order, the **drive specification, filename** proper, **filetype** (also referred to as the **file extension**), and **password**. Refer to the illustration on the next page.

The drive specification indicates the drive where CP/M is to place the file (if it is a new one) or find it (if it already exists). If you do not supply a drive specification, CP/M will use the *default drive*, which is the drive whose name appears as part of the CP/M prompt. If you use a drive name, you must separate it from the rest of the filespec with a colon (:), as in **B:IMPORTNT.DOC.**



The filename (maximum of eight characters) and filetype (maximum of three characters) together form the descriptive part of the file specification. They must be separated by a dot, or period. There are several standard types which have special meaning to the system or to certain programs (**.COM, .ASM, .HLP, .$$$, .MAC, .REL, .SYM, .INC, .HEX, .OBJ, .PRL, .SYS, .PRN, .OVR, .OVL** and others — a number of them are listed in Appendix C of the *CP/M Plus User's Guide*), but the filetype is also generally useful as an extension of the main filename. For example, if you use the **.DOC** filetype for all your document files, and the extension **.MP** for all your Multiplan worksheet files, you will find it much easier to keep track of them later on.

You may also use any capital letter or numeric digit in a filename or filespec. You may enter lower-case letters, but CP/M will convert them to upper-case. In addition to letters and numbers, you may use the following characters:

~ ^ @ # % ` ´

Do not use other characters. Some of them will generate error messages, and may make trouble for you of one sort or another.

If you do not use the maximum number of characters in a filename or filetype, CP/M will fill the rest of the name or type with spaces. You do not have to specify those spaces when using the file — indeed, you should not specify the spaces.

The last element of the file specification is the password (maximum of eight characters). If used, it must be preceded by a semicolon (;). If you wish to limit others' access to your files, you may use the CP/M password scheme. In that case you would append your chosen password to the name of any file you wanted to use. (Refer to the discussion on the **SET** command in the *CP/M Plus User's Guide* for information on passwords.)

A Note on Passwords

If you are operating with a Winchester hard disk drive, passwords may be your only way to achieve a reasonably secure system. If you are using only floppy diskettes, however, it is easier as well as much more secure to simply deny others' access to your diskettes. A good rule of thumb to keep in mind concerning passwords is that anyone who knows more about the computer than you do can probably defeat your protection schemes, but not if you have the diskettes physically locked up. That reduces the problem to the straightforward one of burglary, instead of magical computer-fiddling.

Using Wildcards When Handling Files

Sometimes you will wish to tell the computer about a group of files, instead of just a single file. Or you may have a single file in mind, but don't remember the exact name. In either case CP/M will help you by allowing you to substitute *wildcards*, or wildcard characters, for portions of the filename or filetype. The term *ambiguous filename* (abbreviated to 'afn') refers to a filename which contains wildcard characters; the term *unambiguous filename* (abbreviated to 'ufn') refers to a filename without wildcards.

There are two such wildcard characters, the question mark (**?**) and the star (asterisk: *****). The question mark matches any single character including the space character, and the star is equivalent to filling the rest of the name or type with question marks. The star must be the last (or only) character in the name or type. Below are some examples of valid and invalid uses of wildcards:

Valid Use	Equivalent to	Matches
.	????????.???	any filename
ws*.*	WS??????.???	any filename beginning with 'WS'
??FOR*.COM	??FOR???.COM	any filename with filetype '.COM' which has 'FOR' beginning at the third character in the filename

Invalid Use	Reason
*WS.COM	'*' must be the last character in the filename
*.co??	too many characters in the filetype (max. 3)
??[*.*	[is an illegal character for filespecs

The CP/M commands **DIR**, **PIP**, **ERASE**, and **RENAME** will accept filespecs with wildcard characters in them. On the other hand, **TYPE**, **ED**, **GET**, **HEXCOM**, **PATCH**, and most others will not.

Disk Drives and Their Formatted Capacities

The Visual 1050 uses five-and-a-quarter inch floppy diskettes as its main storage medium. The particular disk drives provided with the Visual 1050 read and write on only one side of the diskette, and place 80 tracks of data on that one side. They are known as 96 tpi (tracks-per-inch) drives, because the tracks are separated such that 96 of them would occupy one inch along the radius of the diskette. This track density is twice that of the more ordinary 48 tpi drives.

The use of eighty-track drives operated in double density mode contribute to a total *formatted* capacity of 400 *kilobytes* on each Visual 1050 disk drive. A kilobyte is roughly one thousand (1024, actually) bytes, and a byte is enough space to store a single printable character. Numbers, incidentally, are usually stored more efficiently than text, so you could expect to store more than one numeric digit in a single byte.

Since there are about 3600 characters on a standard WordStar page of fifty-five lines and sixty-five columns, there should be room for one-hundred-thirteen pages of such text on each diskette. However, a total of fourteen kilobytes are reserved for use by the Visual 1050, including space for the *directory* which keeps track of your files on the diskette; thus, there is really at most 386k (that is, 386 kilobytes) available to you. That still leaves room for one-hundred-nine pages. In practice you would usually have at least a few blank lines on a page, so this estimate is slightly conservative. In practical terms this means that you could conveniently edit a thirty-five page document in WordStar. (This does not mean that you cannot edit long documents, merely that they must be cut up into manageable chunks and rejoined at printing time by MailMerge.)

Formatting Diskettes

Formatting, or initializing, is the process of placing certain preliminary information on a diskette so that the computer will recognize the diskette and be able to use it. This preliminary information takes up a lot of space — sometimes a third of all the space on the diskette; without it, however, the system will not work at all. That is why we specified formatted capacity a few paragraphs ago. The unformatted capacity of a diskette is a much larger amount, but to quote it would be somewhat misleading, since the extra space is of no use to you.

Formatting is accomplished by a program called a Disk Formatter. On the Visual 1050 it is called FMTDISK.COM. It is a dangerous operation because it will totally destroy any data previously stored on a diskette, and leave no chance to recover it. The Visual 1050 formatter program does not look on a diskette to see whether there is already something there (some do), so be very careful when using it to reformat diskettes. It's a good idea, incidentally, to format an entire box of diskettes at a time. Sometimes you will need a formatted diskette in a hurry to recover from a corner you have painted yourself into, and stopping to format one may destroy the very data you are trying to save.

We noted above how the diskette format is the way in which a computer "recognizes" a diskette. When you buy software, it has to be in a format that the Visual 1050 can recognize and read, or it is of no use to you. For your convenience, the Visual 1050 can recognize and read diskettes formatted for the DEC Rainbow™ and Kaypro II™ computers. Each of these

computers uses a forty-track double density format, with a physical track spacing of forty-eight to the inch. By instructing the drives to step twice for each track, however, the Visual 1050 can read the diskettes. The simple process of reading these other formats is discussed in Section 4 of this Guide.

What Kind of Diskettes?

The correct diskettes for use with the Visual 1050 are those which are **5 1/4 inch, Soft-sectored, Single Sided, Double Density, 96 tpi**. Manufacturers of these diskettes include Verbatim, 3M, Memorex, and Dysan.

Handling Diskettes

Diskettes are quite sturdy in many ways, but the information on them is vulnerable in ways which you have probably never had to think about before. If you wish to have the trouble-free use of your computer, you must learn to take good care of your diskettes. Follow the guidelines below:

- Hold the diskette only by its jacket. Never touch the surface of the diskette itself.
- Keep diskettes in their envelopes when you don't have them in the drives. Otherwise a speck of dust may fall on and later damage the diskette surface, and a stray droplet (from a sneeze, for example) may ruin the diskette.
- Don't bend them. Their floppiness is an accident of design, not a desired characteristic.
- Store diskettes upright, without lateral pressure, away from direct sunlight and extremes of temperature and humidity. If you have to use a diskette which has been stored at a significantly different temperature than it will be used at (in from a cold car, for example), it is best to let the diskette rest for several hours at the working temperature before using it.
- Don't leave diskettes in a hot car. They cannot survive temperatures above 125 degrees Fahrenheit, and should not be used at temperatures above 115 degrees at the diskette surface, which is likely to be 10 to 15 degrees hotter then room temperature.

- Keep diskettes away from magnets. Magnets are found in loud speakers, telephones, and motors. Items which become magnetized include paperclips, staples, pins, small tools, and even ball-point pens, so keep these away from diskettes.
- If possible, write on diskette labels before putting them on the diskettes. If you must write on a label which is already in place, write very gently and use only a fibertip pen. Pencils and ball-point pens may dent the diskette surface. In addition, as stated above, the ball in a ball-point pen may become magnetized.
- Never use an eraser on a diskette. Even if you don't damage the diskette while erasing it, the eraser particles which are left behind can wreak havoc with it.
- Keep your diskettes **clean**. You can't clean them if they get dirty, so don't let them get dirty.

If a diskette starts giving you trouble (meaning that the system returns a disk error while you are using the diskette), we recommend that you reformat it, then mark it as having had an error, including the track and sector that the error was found on. (This is what the "T-0023, S-0004" part of the error message tells you.) Then restore the data from your backup copy of the diskette. If you get a second error in the same place, that means that the diskette surface is physically damaged there. In that case, throw away the diskette. Diskettes are quite easily damaged, and they do wear out eventually. If you can afford it, throw the diskette away the **first** time it shows an error.

Also, if anything spills on a diskette, or if anything greasy, oily, or sticky gets on the diskette surface, throw it away. If you try to use such a diskette, you will probably contaminate the disk drive; if you contaminate the disk drive, you will ruin more diskettes which are put into it.

To properly insert a diskette in a disk drive, follow the procedure below:

1. Open the drive if it is not already open. Do this by turning the small lever so that it lies parallel to the slot in the drive.
2. Hold the diskette you wish to use with your thumb on the label. This should ensure that the diskette goes into the drive right-side up, which is label-side up.

3. Gently insert the diskette into the drive. If you have to use enough force to bend the diskette, something is wrong.
4. After you slide the diskette all the way into the drive, gently turn the lever to close the drive. If the lever does not turn easily, the diskette is not in all the way.

Oops! I wish I hadn't erased that file . . .

There are two ways in which you can guard against accidentally erasing one or more files.

The first approach is to use *write-protect tabs*. A write-protect tab is a small piece of opaque but removable tape which you fold over the small notch on the upper right side of the diskette (held as you would when reading the label). A disk drive will not write on a diskette which has a write-protect tab even if the operating system asks it to do so; indeed, the drive tells the system not to ask it to write on the diskette. If you try to write on the diskette, you will get an error with the words **R/O** or **Read-Only** or **Write-Protect** in it.

The second approach is to declare a particular file or group of files to be write-protected. You do this with the CP/M transient command **SET.COM**; the file will remain protected until you declare it otherwise.

Note that you can also declare a drive to be write-protected, but this is not of much real use, as the protection disappears at the next warm boot.

The connection between the concepts of write protection and file erasure may seem curious to you, insofar that the common use of the term 'erasure' has nothing to do with 'writing'. Actually, no file is ever actually "erased" in the commonly understood sense; the part of the directory entry for a given file is flagged by the operating system as erased. This is accomplished by writing on the diskette directory. Hence, to erase a file, the operating system must write on the diskette.

It is important to note that, although you may be tempted to place write-protect tabs on the distribution diskettes provided with your Visual 1050, you should not do so. The operating system must write on the diskettes so that the Utility Manager can operate properly. Apply write-protect tabs to your distribution diskettes once you have backed them up, and use working copies of these diskettes.

The Need to Back Up Your Diskettes

You should never run programs or make any changes whatsoever to the programs as originally provided on the distribution diskettes. In general, when you buy software, you should copy the original diskettes and then put the originals safely away. Do all further work on the copies. If a loss occurs of a program which has not been backed up, it will be your loss, not the software vendor's. You will be instructed on how to back up your distribution diskettes in Section 4 of this Guide.

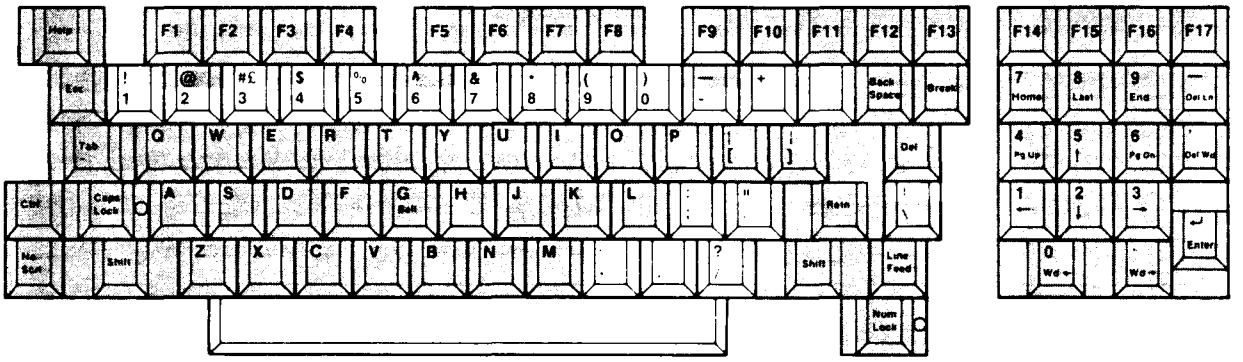
Keys and Keyboards

The Visual 1050 keyboard is similar to a typewriter keyboard in many respects, although it has more keys. It has the same two types of keys: keys like 'A' and 'B' which produce characters, and keys like Shift which modify the character-producing keys. Unlike a typewriter, the Visual 1050 keyboard has two different shift keys, one labeled 'Shift' and the other labeled 'Ctrl', which stands for CONTROL. As on a typewriter, the Shift key is used with another key to produce an upper-case character. The Ctrl key "shifts" another key to produce a *control character*. Control characters are non printing characters which are interpreted by the operating system and application programs as commands to them.

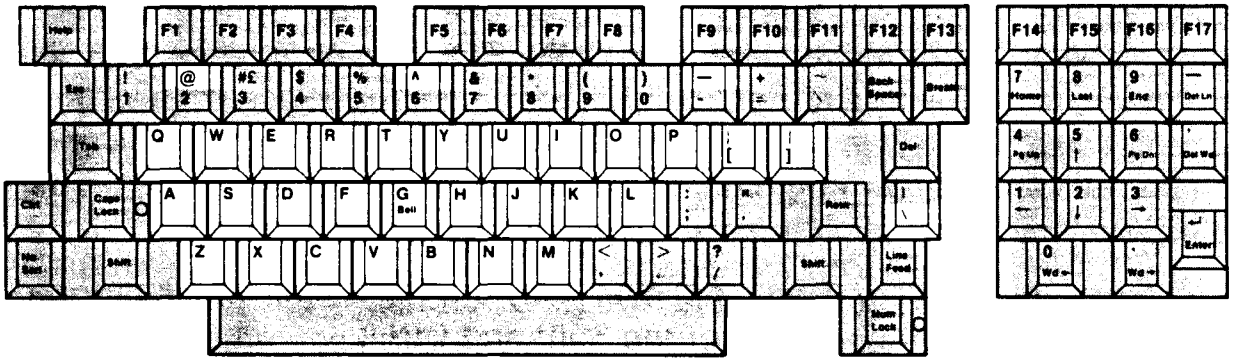
It is perfectly accurate to say that every key on the Visual 1050 keyboard produces a character, except for the Shift and Ctrl keys, which are used to modify the characters produced by the other keys. However, it is more useful to view the keyboard in a different way, where a third group exists which we will call **action keys**. These are keys which **are capable of causing some action to be performed** by the operating system or an application program.

We will use a series of illustrations to point out the keys on the Visual 1050 keyboard. In all cases, the keys which are shaded are the ones which we **are not** talking about.

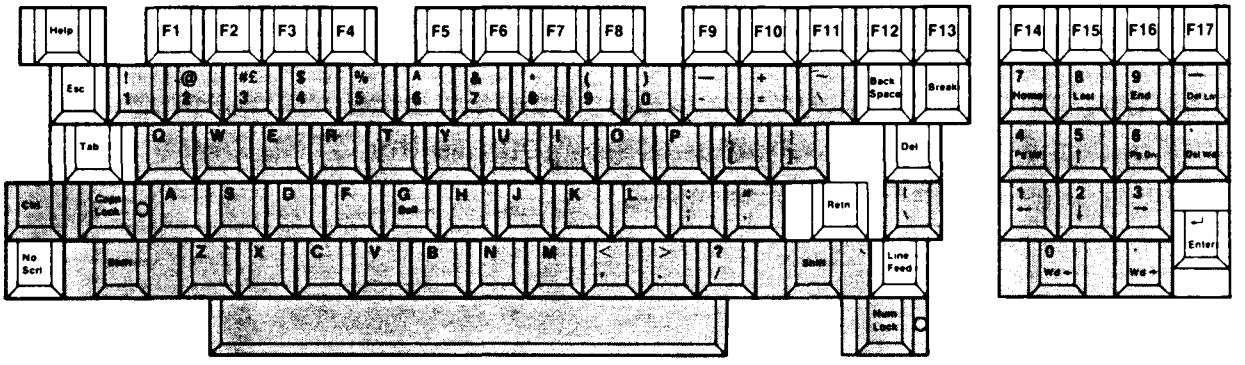
The first illustration shows keys which always produce printing characters (like the typewriter) whether or not you use the CTRL key; that is, the Ctrl key has no effect on these keys.



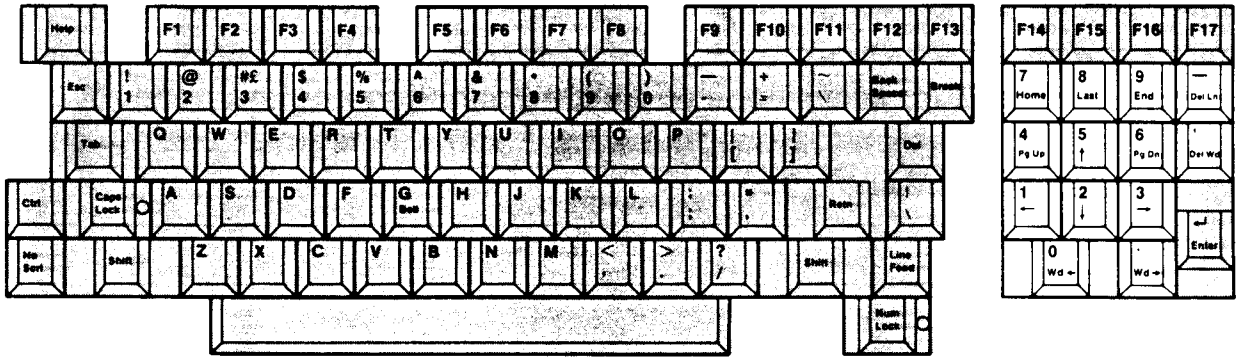
The next illustration shows keys which produce printing characters as well, except when you enter them with the Ctrl key. If you enter one of these keys with the Ctrl key, it will become an action key, as defined above.



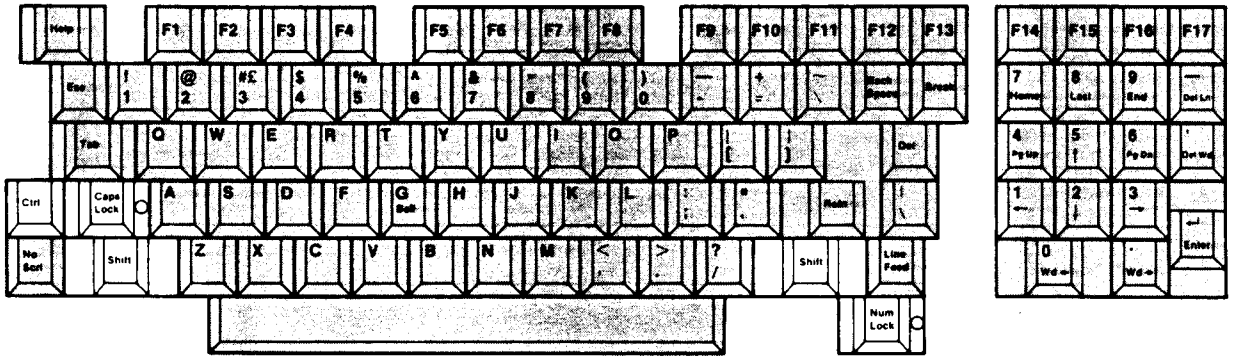
The next illustration shows keys which are **always** action keys. Most of them will produce four different characters (unshifted and non-control, shifted, Ctrl-, and Ctrl-shifted), but all of the characters which are produced belong to the "action key" definition we are using.



The next illustration shows keys which are on what is referred to as the 'numeric pad'. These keys will produce numbers or be action keys, depending upon the setting of the key labeled 'Num Lock'. If the light on the Num Lock key is illuminated, it means that this set of keys will generate numbers; if the Num Lock key is not illuminated, these will be action keys. Upon power up of the Visual 1050, these keys are set to be action keys.



There are only five keys remaining on the keyboard. These are the various shift keys: Shift, Ctrl, Caps Lock, and Num Lock.



That's really all there is to the keyboard. It may at first seem a little imposing to you; however, such feelings should quickly disappear after you begin to use the keyboard.

In Conclusion

Quite a bit of information has been presented in this section. If you are feeling a little overwhelmed, and do not understand it all at this time, do not worry. The information has been included here so that you will be able to "know the ropes" of the Visual 1050 and its powerful operating system CP/M, but understand that that process may take a little time. In other words, don't get the idea that you have to master the materials presented above before you use the computer. As we said above, the Utility Manager has been provided for your convenience. Therefore, keeping in mind the discussions of diskette handling and the need to back them up, move on to Section 4, where you will begin to use the Utility Manager of the Visual 1050.

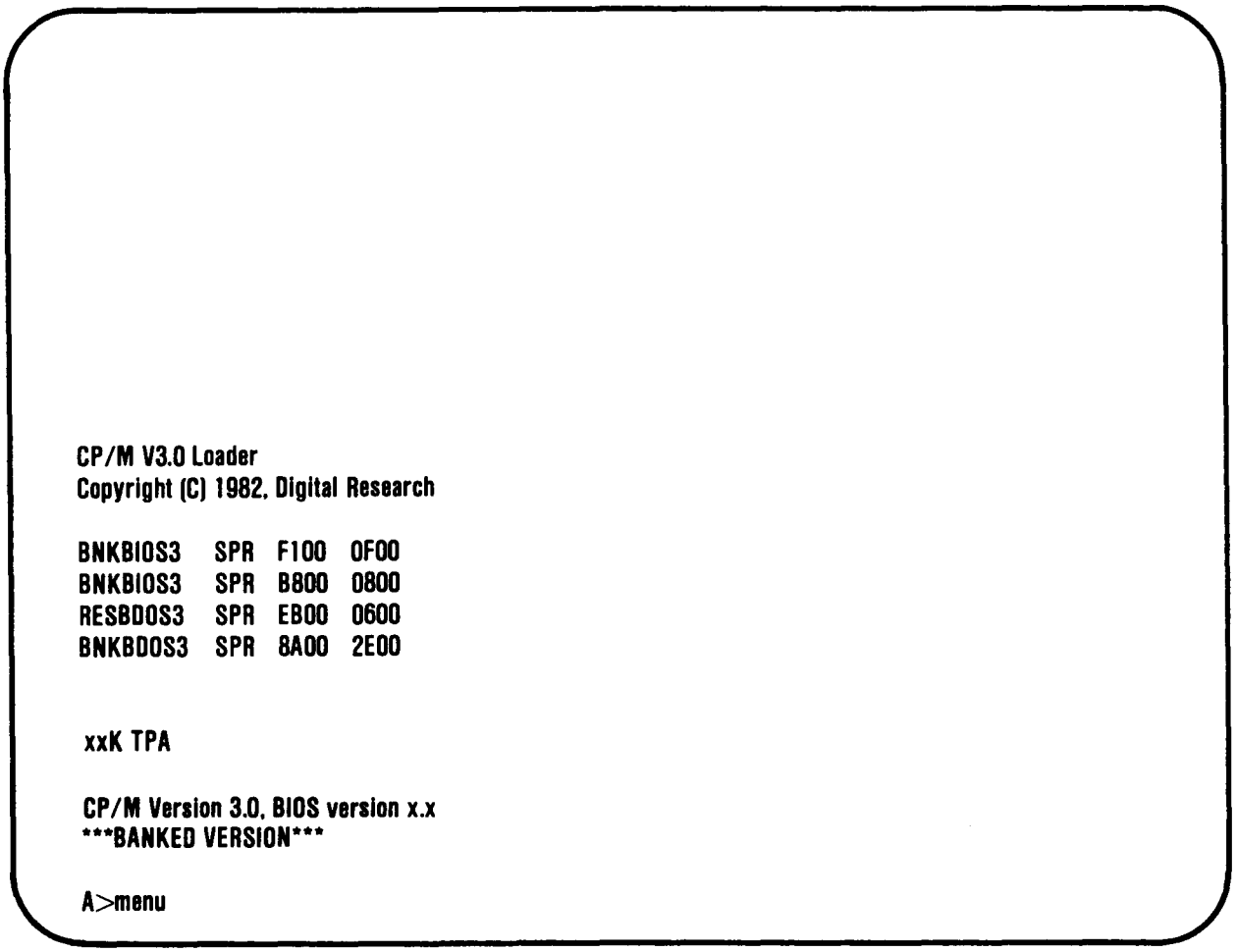
4 Getting Started

Introduction

In this section we will begin to interact with the computer system, and thereby do a little "learning-by-doing." By way of the Visual 1050 Utility Manager, we'll use some of the operating system commands which we discussed in Section 3. After getting a sense of how the Utility Manager works, we'll "turn it off" to experience the operating system directly, and then cause it to be run again. We will see how the software packages provided with the Visual 1050 are run from the Utility Manager, and explain how the Utility Manager works.

Up and Running

Power up the Visual 1050 by setting the power switch to the ON position. Place the diskette marked **CP/M Plus** in the A: (left) drive. Be sure that you close the drive door. For now, do not place any diskette in the B: (right) drive. After a short time, the screen should look like the illustration on the following page.

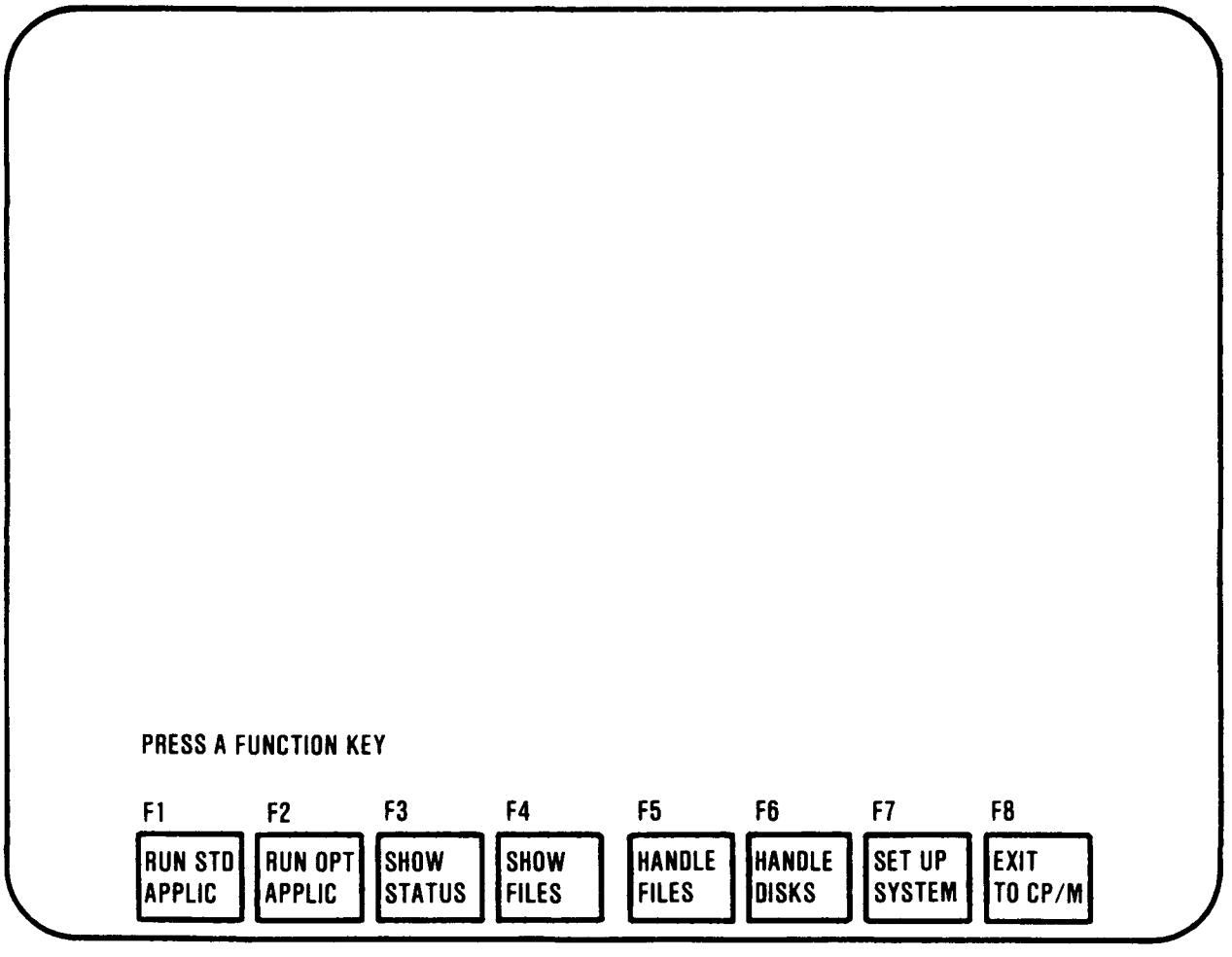


The display shown above may look familiar to you; the computer initially went through the same series of actions as it did at the end of Section 2 when you started the system with the **CBASIC and Demonstration** distribution diskette: after the power up diagnostic, a copy of the operating system was booted, or moved into the internal memory of the computer.

This time, as shown in the figure above, the string of characters 'menu' has been entered next to the CP/M prompt **A>**. A system command (which we will discuss later) was invoked just after the operating system was booted. This program entered the string 'menu' (and a carriage return) in response to the prompt, just as if you had entered it. Recall from Section 2 that you entered the string 'submit 1050demo' followed by a carrriage return when you wanted to run the demonstration program. Here the string 'menu' has been entered so that another program can be

run. This program (known as menu.com to the operating system) has been referred to in this Guide as the Visual 1050 Utility Manager.

The initial presentation of the Visual 1050 Utility Manager is shown in the illustration below.



Getting to Know the Utility Manager

The Visual 1050 Utility Manager is a menu-style program which allows you to control certain features of the Visual 1050, to easily use operating system commands, to access software packages which are provided with the Visual 1050, and to access programs which you may create yourself.

We can get a sense of the structure and usage of the Utility Manager by taking a look at the on-line documentation which is provided as a com-

ponent of it. Several screens of on-line documentation may be accessed by entering the Help Mode of the Utility Manager. Press the **Help** key at this time to enter Help Mode, and read the text which is presented on the screen. Note that the help text states that you are at the top menu level; other (lower) menu levels are also mentioned in the text. Menus at these lower levels present related options, such as those associated with the box at the bottom of the screen labeled **RUN STD APPLIC** (short for "run standard application programs," or the programs provided with the Visual 1050).

After reading this screen of help text, access the screens of help text associated with each of the boxes at the bottom of the screen by sequentially pressing the keys **F1** through **F7**. As each function key is pressed, notice that the box at the bottom of the screen associated with it begins to "blink" between bright and normal brightness levels. This is how the Utility Manager lets you know that it has begun to carry out your requests. Each box will continue to blink until you select the next function key. **Do not press F8** (associated with the box labeled 'EXIT TO CP/M') at this time. **The F8 key terminates the Utility Manager** and "drops" you into the operating system. The F8 key functions in this way from all menu levels the Utility Manager. (If you do press **F8** by accident, type **MENU** in response to the CP/M prompt to restart the Utility Manager, then press **Help** again to continue where you left off.)

After reviewing the on-line help text for function keys F1 through F7, exit the Help mode by pressing a key **other than** F1 through F8 (such as the space bar). You will then be presented with the top level of the Utility Manager once again.

The Prudent Thing to Do

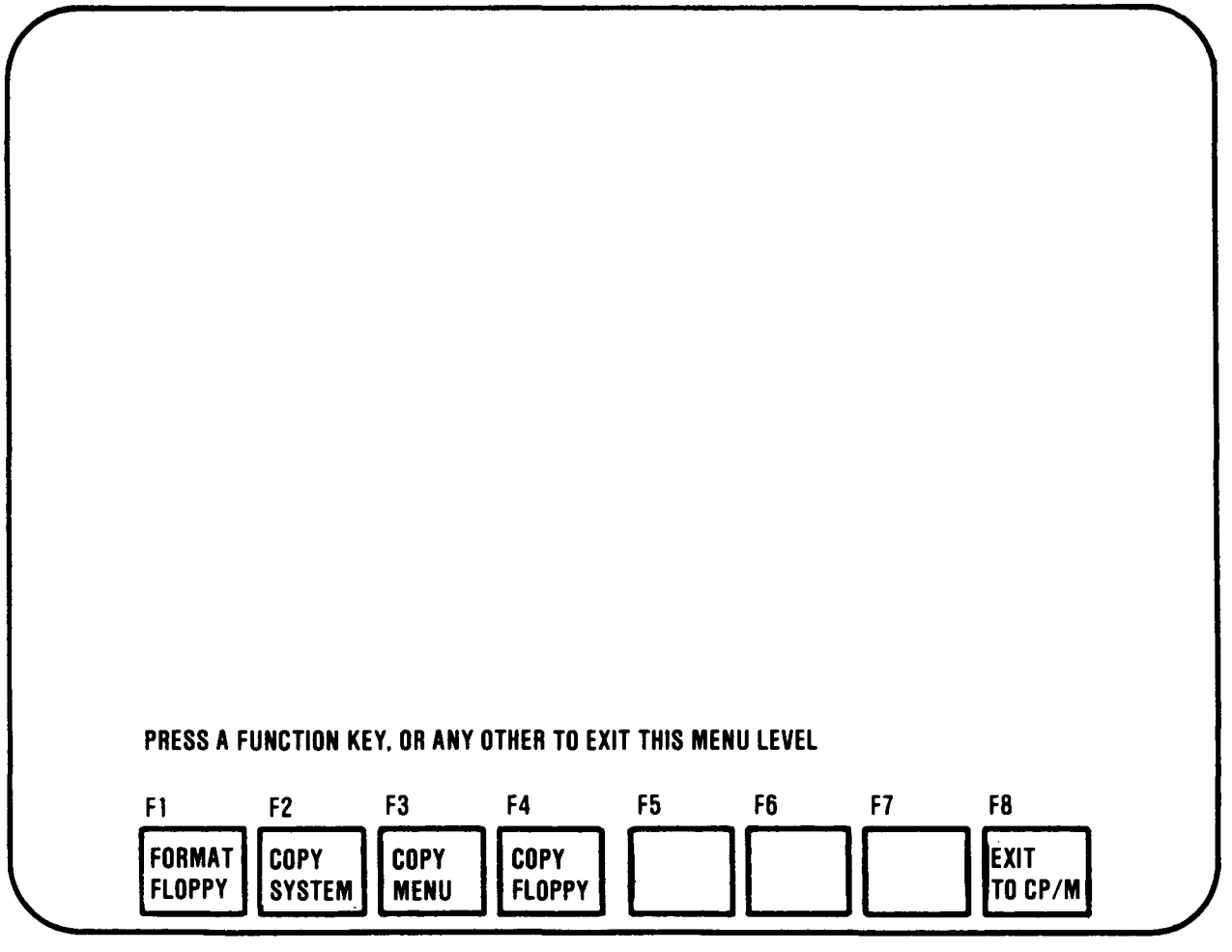
In Section 3 of this Guide we stressed the importance of "backing up" your new software at the earliest possible time. The distribution diskettes provided with the Visual 1050 are, of course, no exception.

We hope that you have purchased a box of the appropriate type of blank diskettes. If you have not done so, you would be prudent to purchase it before continuing with this section. Before we go through a series of exercises with the Utility Manager, we will take you through two proce-

dures, which comprise the two paragraphs immediately below this one: "Formatting Your Blank Diskettes" and "Copying the Distribution Diskettes."

Formatting Your Blank Diskettes

From the top level of the Utility Manager, press **F6** to access the **HANDLE DISKS** menu.



As you can see, you can format your blank diskettes from this menu with the F1 key. At this time, place a blank diskette in the B: drive. Be sure to lock the disk drive in the closed position.

Press **F1** from the **HANDLE DISKS** menu. The format program will begin to run, although you can "bail out" and not continue with it by pressing the F8 key. We wish to continue, however, so press **F1** again. The pro-

gram will then prompt you for the name of the drive **where the blank diskette is** which you are going to format, by presenting the following to the screen:

Drive to be used for format? [B]

The **[B]** indicates that the B: drive is taken to be the default response to the question, so that if you press the Carriage Return key it would have the same effect as if you enter 'B'. Therefore, press either the Carriage Return or **B**. The program allows you to bail out now as well, as you can see by the screen display. (This would be a good time to make **absolutely sure** that you have **a blank diskette in drive B:.**) Press **C** to initiate the formatting of the blank diskette.

As the formatting program runs, it will display its progress on the screen. Let the program run its course; when the formatting is complete, it will let you know. If the formatting fails, it will let you know that as well. If it does fail to format properly, try it again. If it fails again, obtain another blank diskette from the box of diskettes, and try that one. If you cannot properly format a diskette, contact Visual Technology with the telephone number provided in the Customer Service Packet.

The formatting program will allow you to format another diskette immediately, as long as it is in the B: drive. This is a handy feature of the program, since it speeds up the process of formatting several diskettes (such as a whole box) at the same time. Take advantage of this feature by formatting the whole box of blank diskettes at this time. Be sure to lock the drive latch before you initiate formatting for each diskette. (It is a good practice to mark each diskette so that, in the future, you will know that it has been formatted. A good place for the mark is the permanent label of the diskette.)

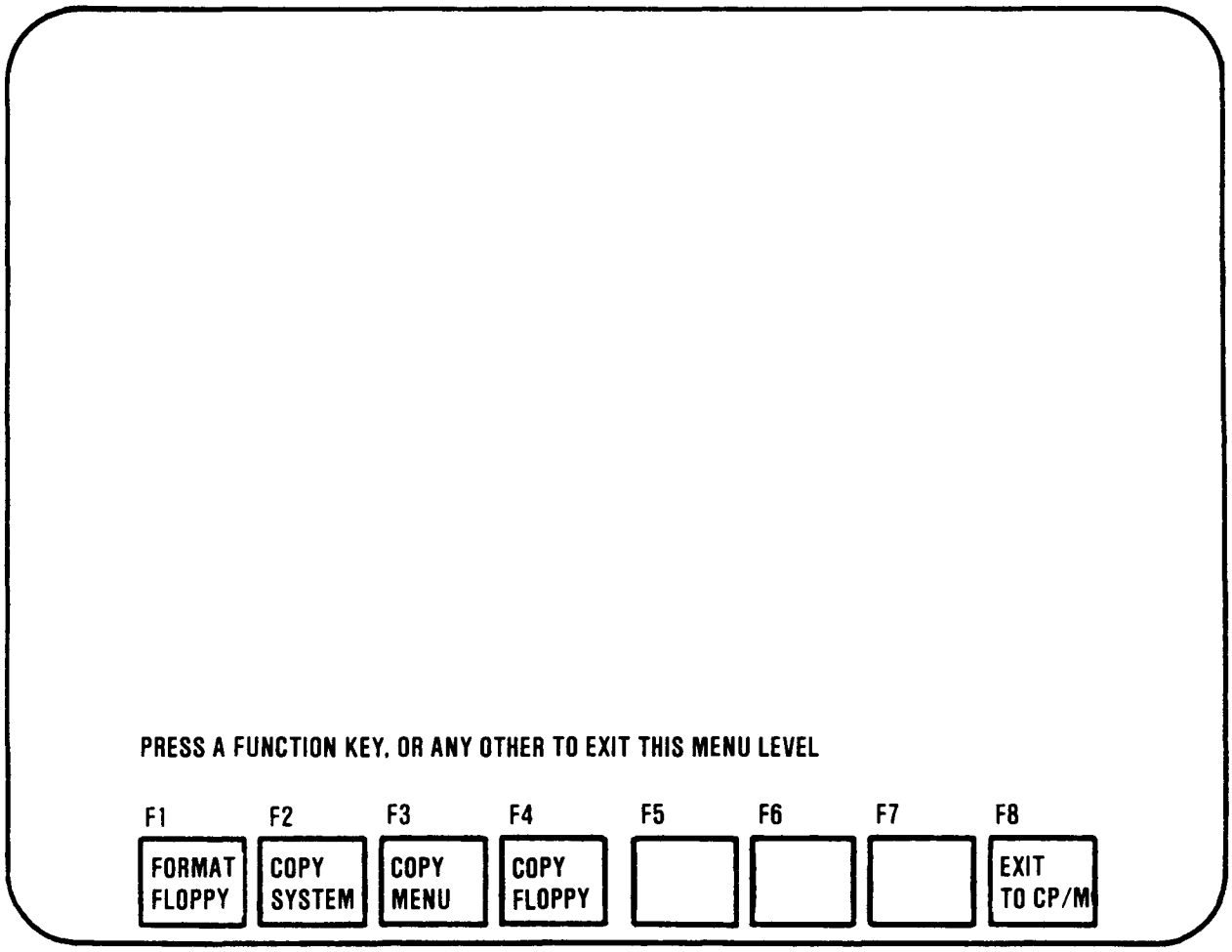
Once you have formatted the whole box of blank diskettes, exit the formatting program by pressing **F8**. You will be returned to the **HANDLE DISKS** menu of the Utility Manager.

Copying the Distribution Diskettes

We will now back up the following distribution diskettes: **CP/M Plus, CP/M Additional Files, WordStar with MailMerge, Multiplan, DR Graph, CBASIC and Demonstration**. Do not copy the **Data** distribution diskette;

it is a blank, non-formatted diskette, and we want it to remain that way for the purposes of the exercises which follow in this section.

The **CP/M Plus** distribution diskette should still be in the A: drive, and the Utility Manager should be displaying the **HANDLE DISKS** menu.



Press **F4** from this menu. The **DISKCOPY** program will be run. The program will state that it duplicates the diskette in the A (left-hand) drive, and prompt you for the name of the destination drive:

Destination drive? [B]

where the **[B]** (as with the formatting program) indicates that the B: drive is taken to be the default response. Enter **B** or a Carriage Return. The program will then respond with:

Source on A then type return

to which you respond by entering a Carriage Return. The program will display a graphic representation of the 80 tracks of a diskette, and then present the following:

Destination on B then type return

to which you respond by entering a Carriage Return. As the formatting program did, the diskette copying program will chart its progress on the diskplay screen. The program will indicate when the process is complete, or let you know that the duplication has failed. If duplication fails, try it again with the same diskette in the B: drive. If that fails, try a different diskette in the B: drive. If that fails, use the telephone number in the Customer Support Packet to call Visual Technology Incorporated.

Once the duplication has been completed, the program will present the following:

Duplication complete. Type C to repeat, any other to exit

Remove the diskette from the B: drive, and label it to indicate that it is a copy of the **CP/M Plus** distribution diskette. For now, set it out of the way. Take the **CP/M Plus** distribution diskette out of the A: drive, place a write-protect tab on it (refer to Section 3 if necessary), and place the distribution diskette out of the way.

Like the formatting program, the disk duplication program allows you to duplicate a series of diskettes, all during the same sitting. Let's take advantage of this feature, and duplicate the five remaining distribution diskettes on the list above. To do this, simply place each distribution diskette in the A: drive, place a blank, formatted diskette in the B: drive, and type **C** to continue. You will be prompted each time as you were when you duplicated the **CP/M Plus** distribution diskette. After each distribution diskette is duplicated, place a write-protect tab on it and put it aside for safe-keeping.

Once the six distribution diskettes have been duplicated and set aside, **place the copy** of the **CP/M Plus** distribution diskette in the A: drive. Now press a key **other than C** to exit the duplication program. The **HANDLE DISKS** menu of the Utility Manager will return to the screen. Press a key **other than** keys F1 through F8 to return to the top menu of the Utility Manager.

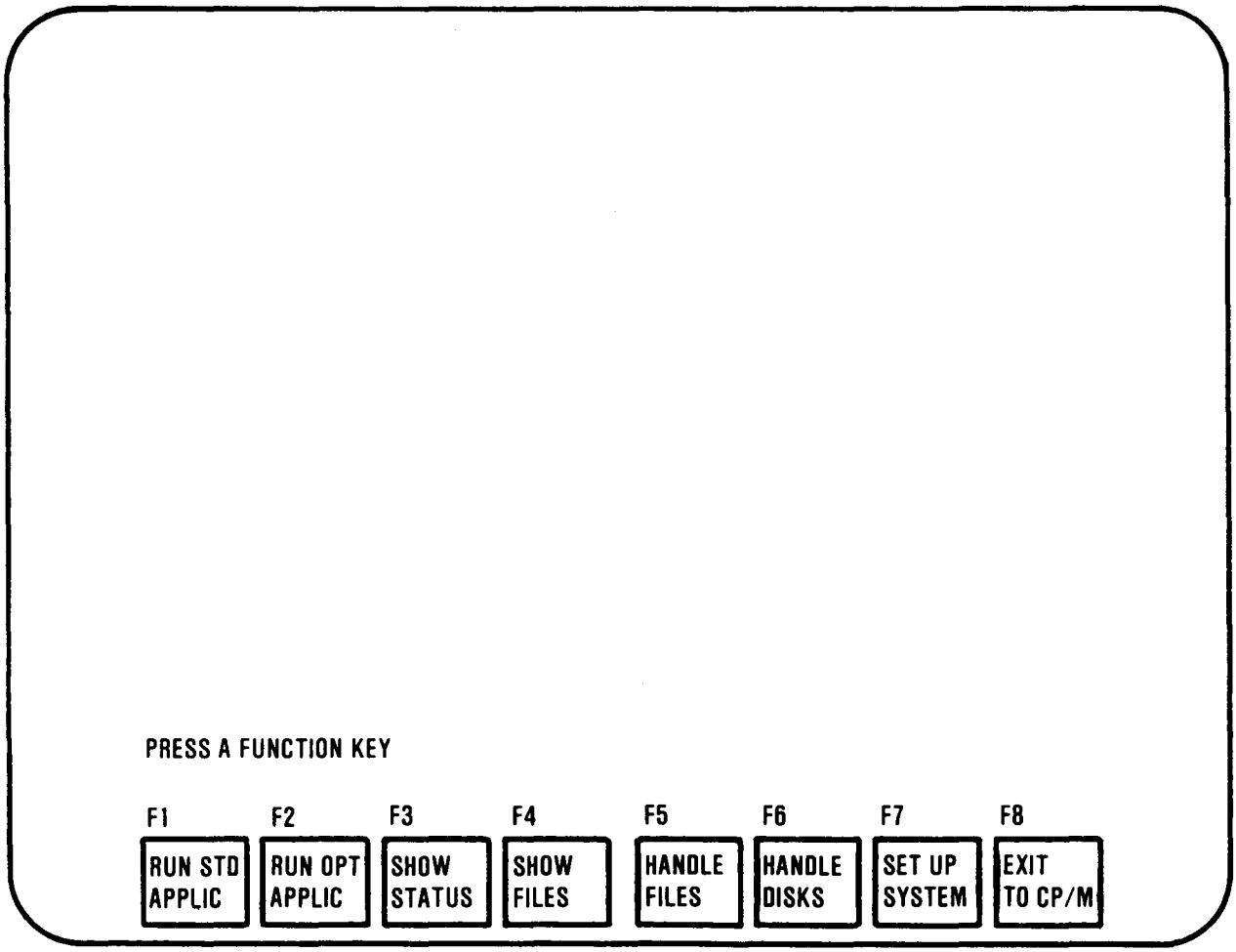
From now on, we will refer to these working duplicates by the same name as the originals, without the word "distribution." For example, the copy of the **CP/M Plus** distribution diskette shall be referred to as the '**CP/M Plus** diskette'.

NOTE: Do not write-protect your working copies of the distribution diskettes. If they are write-protected, the Utility Manager will not function.

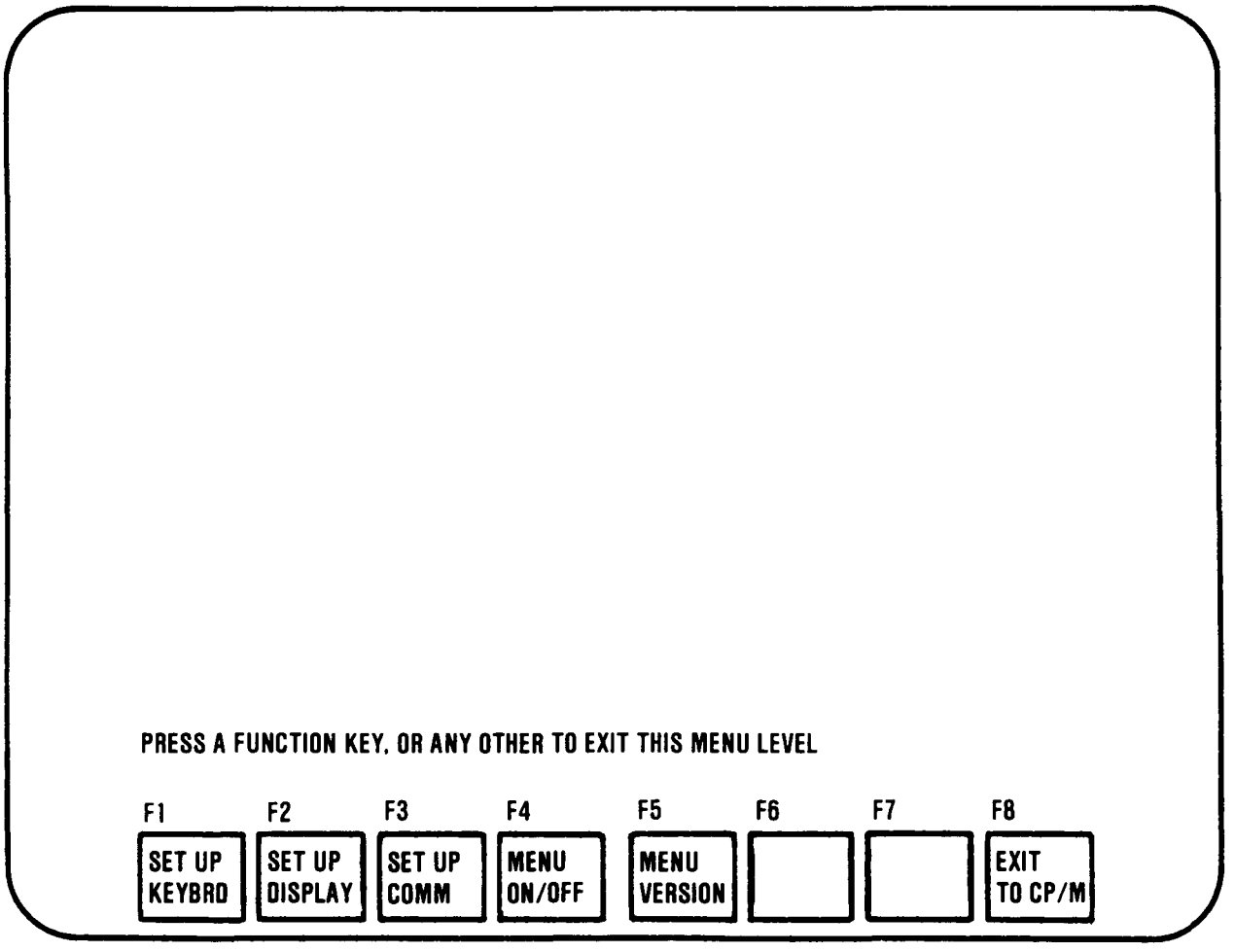
Let's Use the Utility Manager to Change the Cursor

You may recall from the Utility Manager's Help Mode that, through the **SET UP SYSTEM** menu, you may select a lower menu level from which you may specify the cursor presented at the display screen. As an exercise, let's use the Utility Manager to tell the system to display a different cursor than the triangular-shaped one we have seen (which is the default cursor).

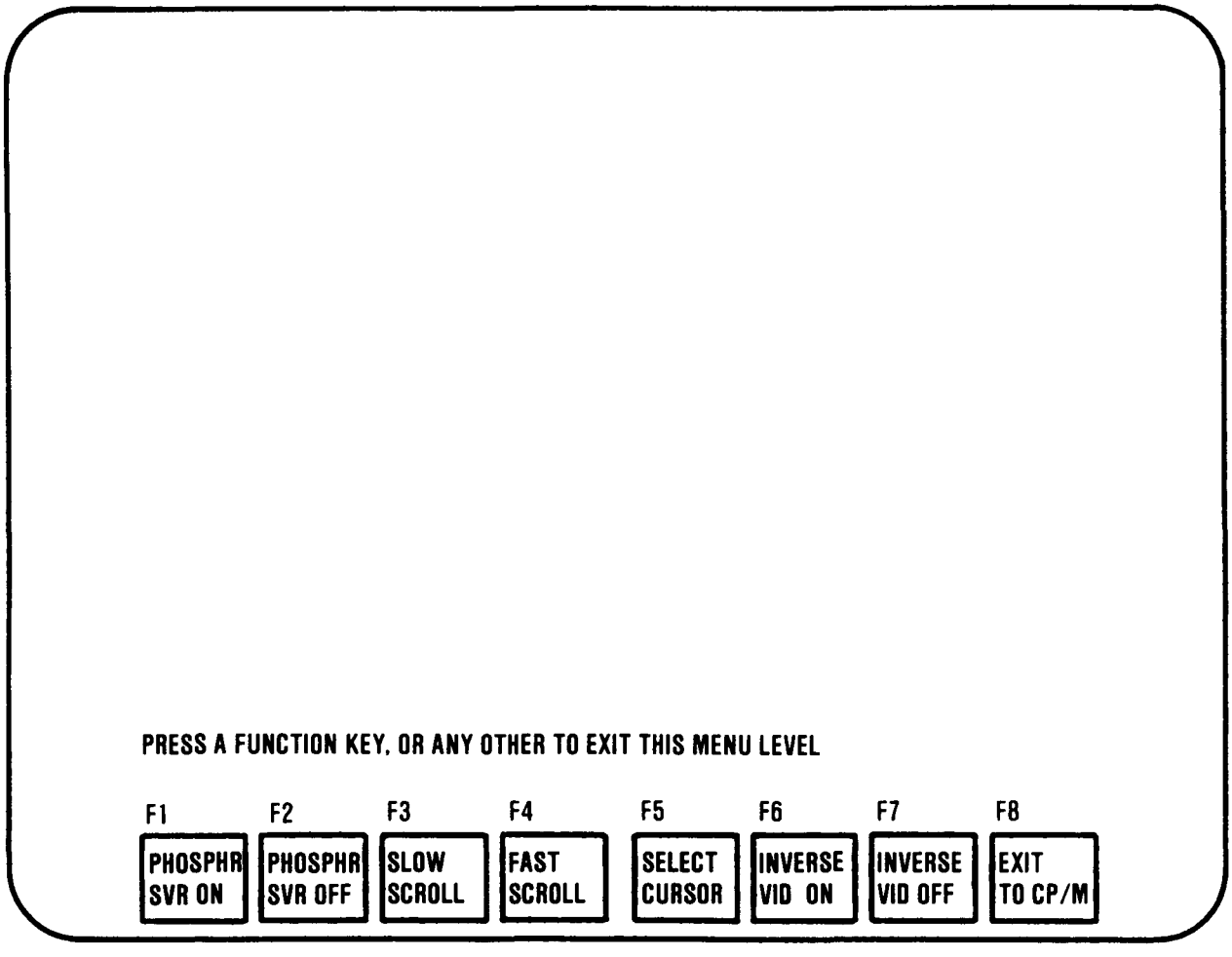
The top level of the Utility Manager should be currently presented at the display screen, as shown on the following page.



Press **F7** to access the **SET UP SYSTEM** menu. After a short time, the screen should look like the illustration on the following page.

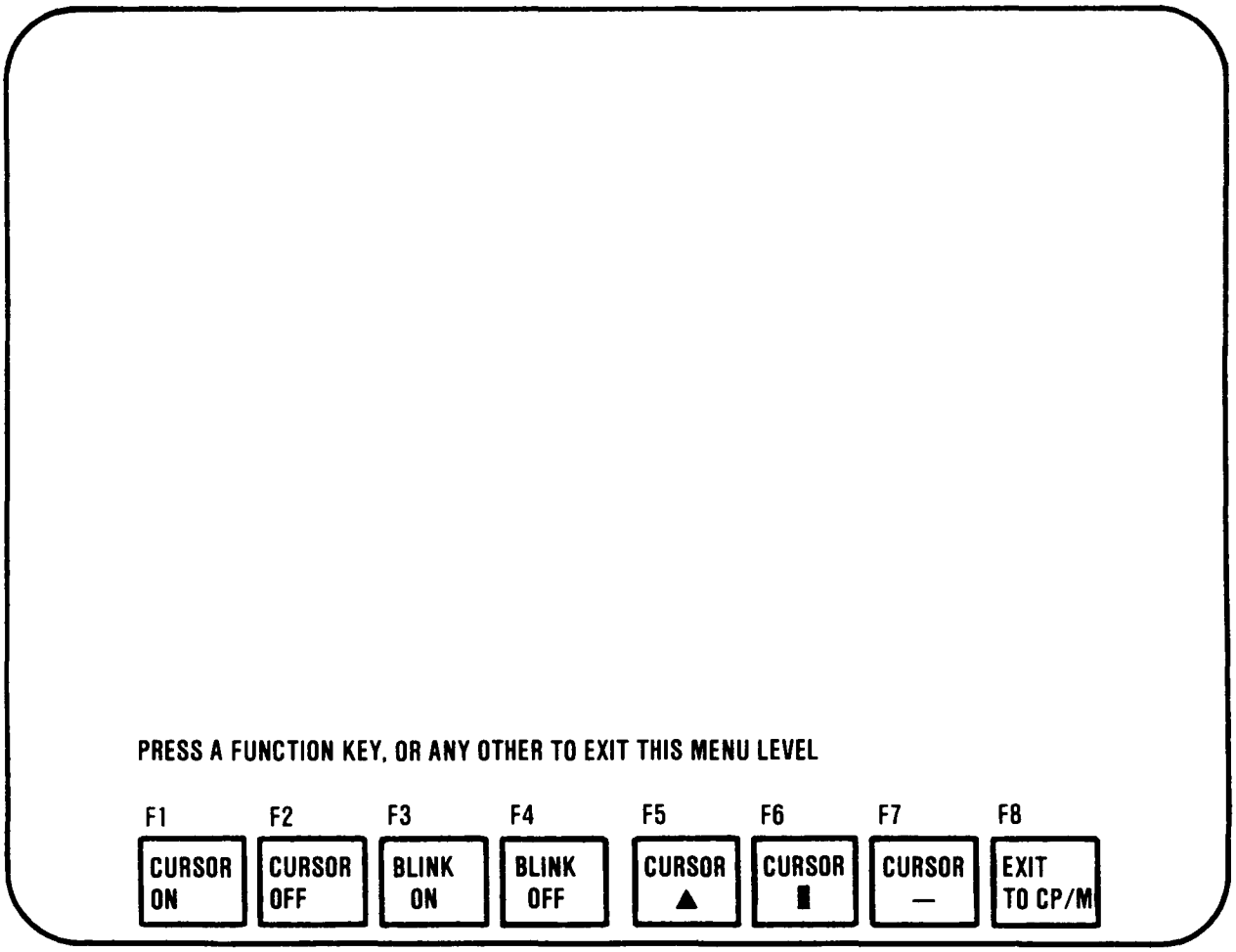


There are several options available to you from this menu. Among them is the **SET UP DISPLY** (for "set up the display screen features") menu, which is associated with the F2 key at this menu level. Press **F2** now to view the options from the **SET UP DISPLAY** menu.

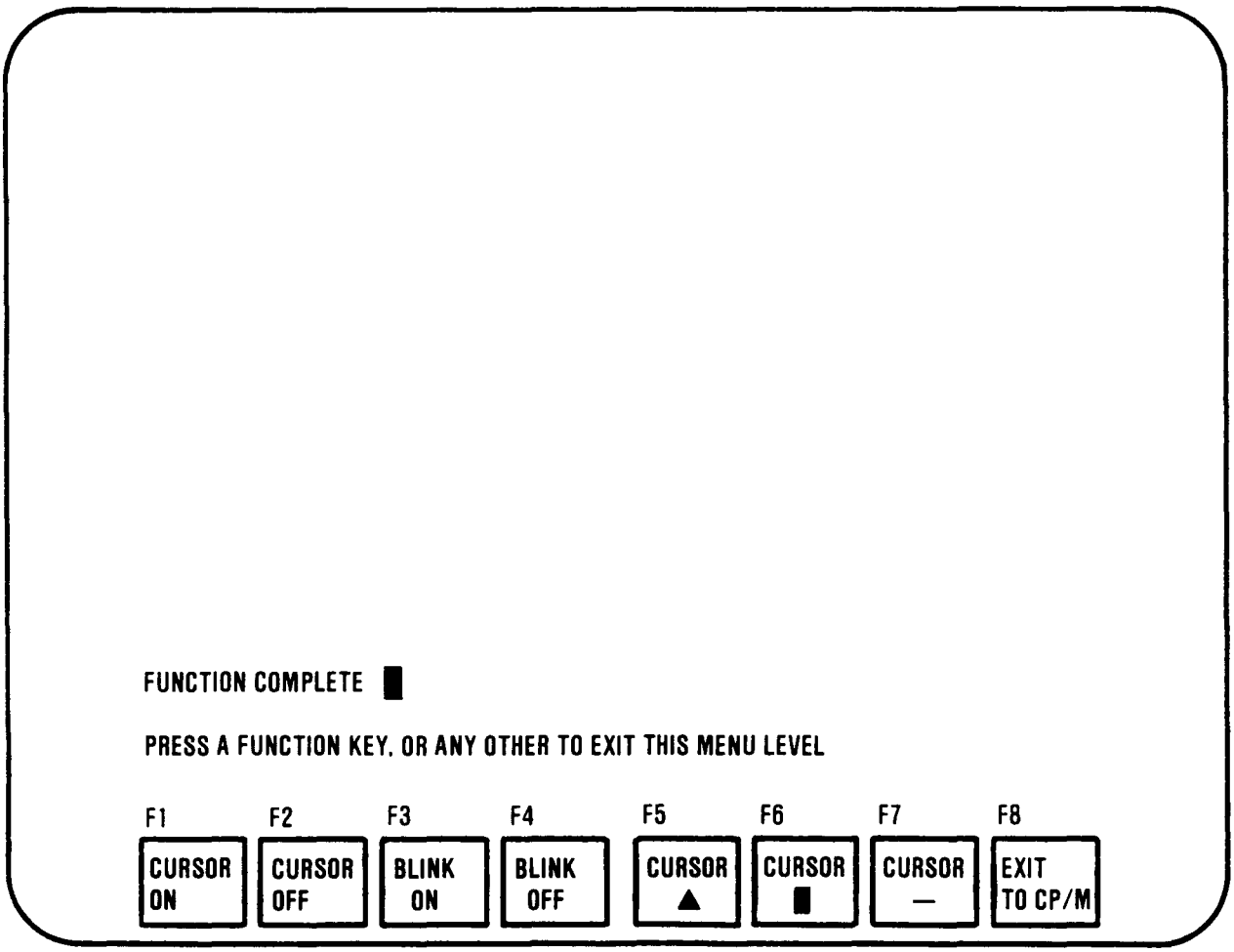


Several features pertaining to the operation of the display screen of the Visual 1050 are controlled from the Utility Manager. The "screen saver" feature, discussed in Section 2 of this Guide, is enabled and disabled (turned on and off) from this menu with keys F1 and F2. (This feature is currently enabled.) You may specify the scrolling speed of the display here, using keys F3 and F4. (The scrolling speed is currently set to fast scroll.) You can use the F6 and F7 keys to enable or disable 'inverse video', which presents the screen data in a "dark-on-light" mode instead of the currently enabled "light-on-dark" mode.

Press **F5** now to access the **SELECT CURSOR** menu.

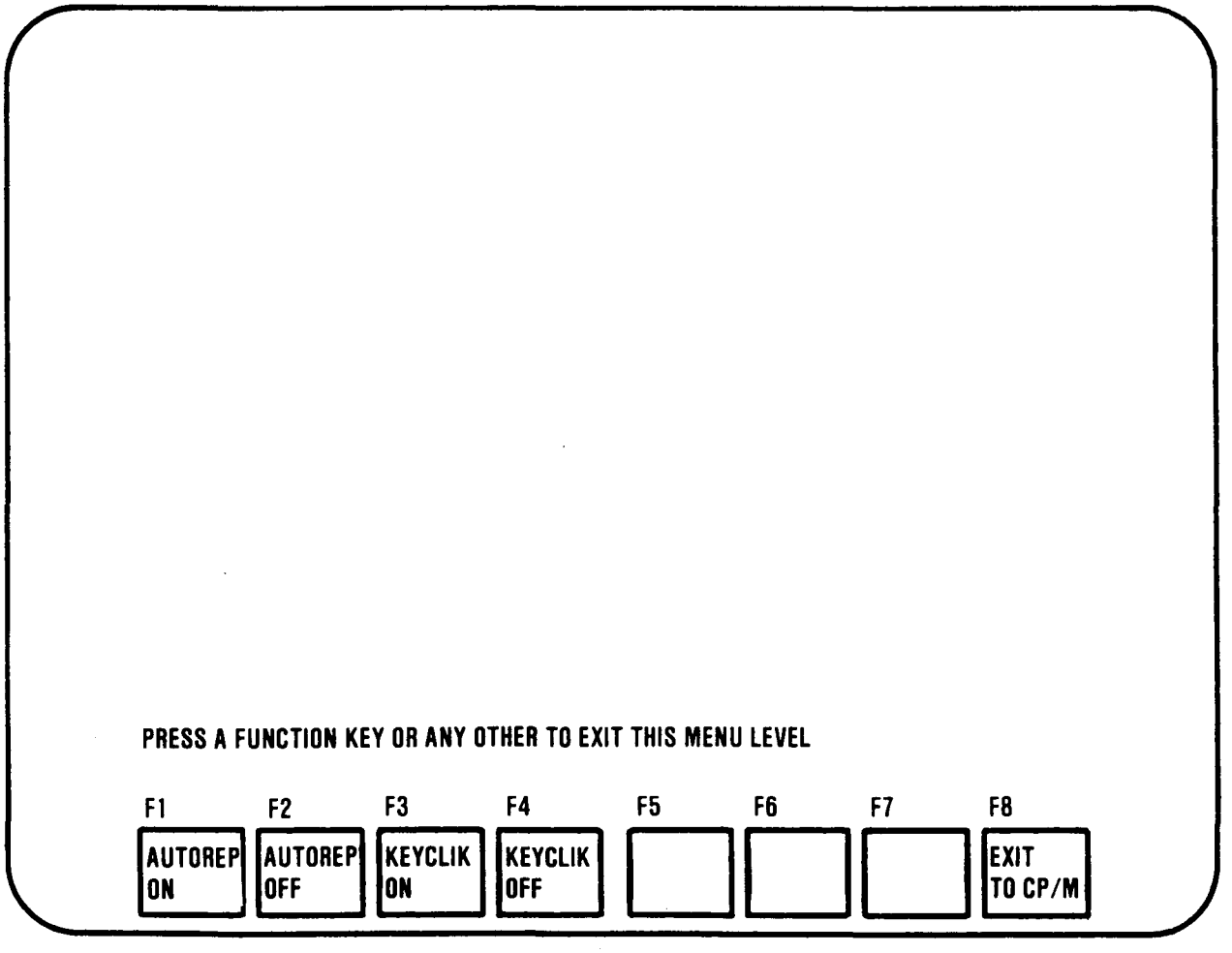


From this menu, besides being able to select from three different cursors, you can tell the system to not blink the cursor, and you can turn the cursor off (which is to not display the cursor). Without getting involved in these options, let's continue with the exercise and select another cursor: the filled-in rectangle. To select the rectangular cursor, press **F6** at this time. Watch as the current cursor (the triangle) is replaced with the rectangle "right before your eyes," as it were.



You may have noticed that the Utility Manager displayed the message **FUNCTION COMPLETE** as the cursor changed from the triangle to the rectangle. Don't be alarmed that the box at the bottom of the screen is still blinking; as you can see, the task you specified has been completed.

Before we return to the top menu level, we will pass through the intermediate levels to which we were introduced "on the way down" to the current menu. At this time, press **any key other than** keys F1 through F8 (such as the space bar) once to return to the **SET UP DISPLY** menu. Now press the key again to return to the **SET UP SYSTEM** menu. As we saw above, there are several other options at the **SET UP SYSTEM** menu besides the **SET UP DISPLY** menu options with which we have become familiar. Among the other options is the **SET UP KEYBRD** (for "set up the keyboard") menu. Let's take a closer look at the **SET UP KEYBRD** menu by pressing **F1** at this time.



You can enable and disable (with keys F1 and F2) the "auto-repeat" feature of the Visual 1050 keyboard. This feature allows you to repeatedly enter a character from the keyboard by simply pressing down on a given key for more than a second or so; when auto-repeat is disabled, only one character will be entered from a given key, no matter how long you press down on the key. (The auto-repeat feature is currently enabled.)

In addition to the auto-repeat feature, you can control (with keys F3 and F4) whether or not a "click" will be sounded each time a character is entered from the keyboard. As you can hear, the keyclock feature is currently enabled.

Now press a key (other than F1 through F8) to exit this menu level. Once again the **SET UP SYSTEM** menu will be presented. To conclude this exercise and return to the top menu level of the Utility Manager, press the key once again.

What Files Are On This Diskette?

We can use the Utility Manager to view the directory of a given diskette. Directory information is accessible through the top level of the Utility Manager with the F4 key. Before we use this key, review the function of the **SHOW FILES** option by reading the Utility Manager's on-line documentation: press the **Help** key, then press **F4**. After reading the materials presented in the on-line documentation, exit the Help Mode by pressing a non-Function key.

Press **F4** at this time. The Utility Manager will prompt you for the name of the disk drive where the diskette you want to know about has been placed. In response, enter **A** then enter a Carriage Return. After a short time, the directory of the diskette in the A: drive (the **CP/M Plus** diskette) will be presented at the display screen. Notice that the boxes associated with keys F1 through F8 are re-displayed at the bottom of the screen. The task of displaying the directory has been completed, and you may now select another option from the Utility Manager.

Let's see what happens when we try to view the directory of a non-existent diskette; that is, let's try to get directory information from the B: drive which has no diskette in it at this time. To do this, press **F4** again to select the **SHOW FILES** option. This time when it asks for the drive name, enter **B** and a Carriage Return. CP/M looks at the B: drive and finds no diskette there. The result is a CP/M error message displayed on the screen.

```
BIOS Error on B: T-00002, S-00001, Read Not ready, Retry (Y/N) ?
```

Enter **N** in response to the **Retry (Y/N)?** portion of the message. (If you respond with a **Y**, you will only cause the same message to be displayed.) The top menu of the Utility Manager will be redisplayed at the screen.

We have intentionally caused the error message to be displayed so that you will not be unreasonably upset if and when you encounter them on your own. This is not meant to give you the impression that error messages are a laughing matter; indeed, some errors are not so easily shrugged off as the one shown above. Rather, we hope that you will understand the messages for what they are: helpful indicators provided by the operating system, which when properly understood by you, can make your experiences more fruitful and less frustrating than they might be. If you wish to learn more about CP/M error messages, consult "CPM 3 Messages" in the *CP/M Plus User's Guide*.

Show Me More Information About the Disk Drive

Another option available from the top menu level of the Utility Manager is **SHOW STATUS**, which is associated with F3 key. As we did with **SHOW FILES**, let's first review what the on-line documentation has to say about this option. Once again, press the **Help** key, then press **F3** for the related information. After reading the materials, exit Help Mode as you did before.

Press **F3** at this time. As it did with the **SHOW FILES** option, the Utility Manager will prompt you for a disk drive name. Enter **A** in response, followed by a Carriage Return. The drive status information is presented at the display screen, and the top menu level of the Utility Manager will be re-displayed at the bottom of the screen. (If you were to try to get status information about the B: drive, you would get the same 'Read not ready' error message from the operating system.)

Formatting a Diskette

Get the **Data** distribution diskette and place it in the B: drive, making sure that you lock the drive in the closed position. From the currently displayed (top level) menu of the Utility Manager, press **F4** once again. In response to the request for a drive name, enter **B** and a Carriage Return. Observe that an error message is once again returned. The problem this time is that although there is a diskette in drive B:, that diskette has not been formatted, and **a non-formatted diskette is like no diskette at all** to the operating system.

Use the Utility Manager to format the **Data** distribution diskette as you did before to format the other distribution diskettes. Exit the formatting program, which will return you to the **HANDLE DISKS** menu of the Utility Manager.

Copying the Operating System

Since the **Data** distribution diskette has been properly formatted, we can copy the operating system from the diskette in the A: drive over to it. Once the operating system has been copied, the **Data** distribution diskette will be a bootable diskette, just as is the **CP/M Plus** diskette. Press **F2** at this time. The program COPYSYS.COM will be run by the Utility Manager, and it will prompt you with:

Source drive name (or return for default)

to which you respond by entering **A** (or a Carriage Return) since the system is being copied from the A: drive, and the A: drive is the default drive. The program will then state that the source is on A:, and prompt you for a Carriage Return. Enter the return. The program will then prompt with:

Destination drive name

to which you respond by entering **B**. The program will then state that the destination drive is drive B:, and prompt you for a Carriage Return. Enter the return. At this time, the program will ask you the following question:

Do you wish to copy CPM3.SYS ?

to which you respond by entering **Y**. The progam will go through the same routine of asking you for the source and destination drive names as it did above. Answer in the same fashion: **A** for the source and **B** for the destination drives respectively. Then the program will ask you the following question:

Do you wish to copy CCP.COM ?

Handle this in the same fashion as CPM3.SYS above, which is to copy it over. After the file is copied, the program will terminate and the Utility Manager will return to the screen.

It is an appropriate time now to use the **SHOW FILES** option. Press a non-function key now to return to the top menu of the Utility Manager. Press **F4** from this menu, and specify the B: drive. You will see that the files CCP.COM and CPM3.SYS are listed on the directory of the diskette in the B: drive.

NOTE: It is a good practice to make a note on the label of each diskette which has had the operating system copied to it. A diskette without the operating system on it can work fine; however, you cannnot cold boot from it.

The top menu level of the Utility Manager will automatically return to the screen, just below the display of the directory of files.

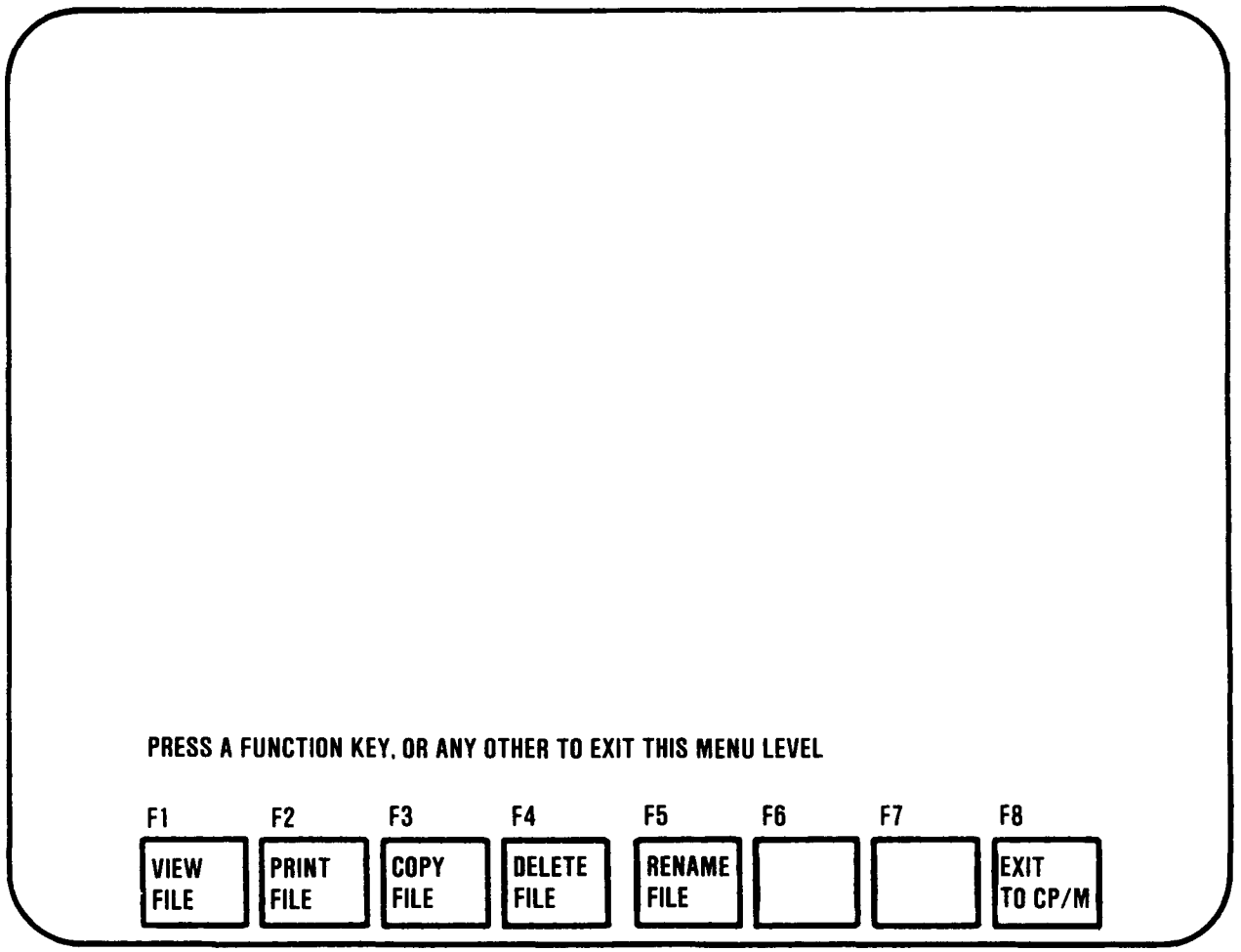
Copying the Utility Manager

We will now use the Utility Manager to copy itself onto the **Data** distribution diskette. From the top menu of the Utility Manager, press **F6** for the **HANDLE DISKS** menu. From that menu, press **F3** to run the program which copies the Utility Manger from one disk drive to another. The program asks you to enter the source drive name, to which you respond by entering **A**. The name of the destination drive is then requested, to which you respond by entering **B**. The program will then ask you if you wish to have the Utility Manager appear when you start up the computer, as it did when we started this section of the Guide. Respond in the affirmative to this question. The program will begin to copy over the files comprising the Utility Manager, and will indicate this on the display screen. As the process is carried out (it takes a few minutes) you can see the lights on the disk drives go on and off, and you will hear the distinctive sounds of the drives in action. Once the copy program completes, the Utility Manager will return to the screen. Press any non-Function key to return to the top menu of the Utility Manager.

Let's use the **SHOW FILES** option or facility at this time to see which files are now on the **Data** distribution diskette. As you did above, press **F4** from this menu, and specify the B: drive. Note that there are now several more files in the directory. The top menu of the Utility Manager will return to the screen.

Copying Files

We will not copy two files from the A: drive to the B: drive. From the top menu level of Utility Manager, press **F5** to display the **HANDLE FILES** menu.



Press **F3** which is associated with the **COPY FILES** facility. You will be prompted with the following:

ENTER NEW FILENAME OR PRESS RETURN TO EXIT THIS APPLICATION

to which you respond by entering **B:HELP.COM** followed by a Carriage Return. You will then be prompted with the following:

ENTER OLD FILENAME OR PRESS RETURN TO EXIT THIS APPLICATION

to which you respond by entering either **A:HELP.COM** or simply **HELP.COM,** followed by a Carriage Return. (You may enter the latter form since the A: drive is the CP/M default drive at this time **and** it is the drive where the source file, or "old" file is located.) After you hit the Car-

riage Return, the file is copied; the **HANDLE FILES** menu of the Utility Manager then returns to the screen.

Now press **F3** again. Repeat the procedure used above, but copy the file **HELP.HLP** from the A: to the B: drive. After the file is transferred, the **HANDLE FILES** menu of the Utility Manager will again be displayed at the screen.

Use the **SHOW FILES** facility from the top menu to verify that the two files were transferred to the **Data** distribution diskette.

Note that the **DELETE FILE** and **RENAME FILE** facilities are also available from the **HANDLE FILES** menu. These both accept file names in the same fashion as the **COPY FILE** facility. We will discuss the **VIEW FILE** and **PRINT FILE** facilities of the **HANDLE FILES** menu below.

CP/M Help Files

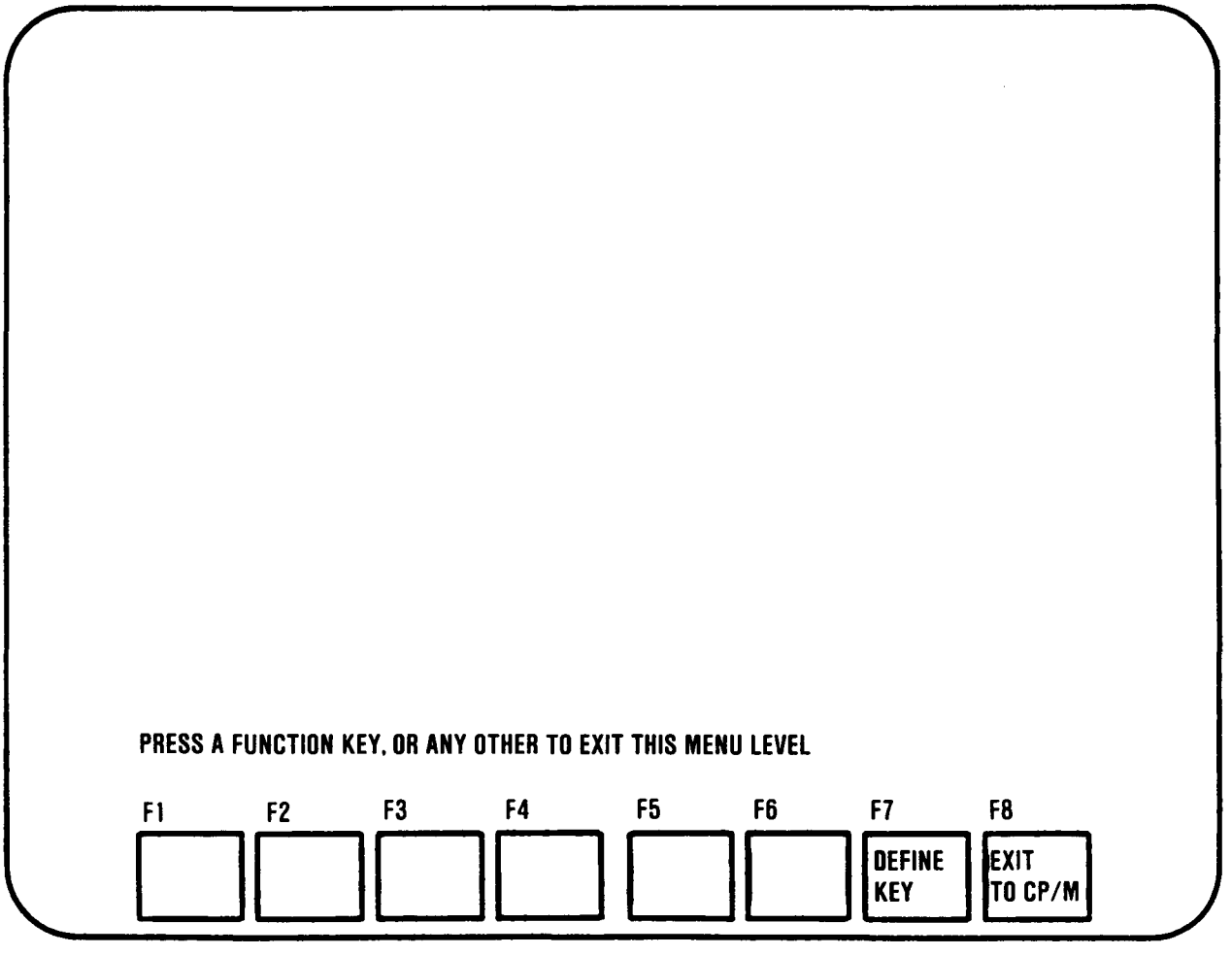
The two files which you have just copied to the B: drive make available to you a wealth of on-line documentation which has been furnished as part of the CP/M system. HELP.COM is a program which makes accessible a body of 'help' text (maintained in the associated file HELP.HLP) which provides descriptions and examples of the use of CP/M system commands. The on-line documentation presented by HELP.COM is a wonderful supplement to the materials presented in the *CP/M Plus User's Guide*.

You may run HELP.COM by simply entering **HELP** followed by a Carriage Return in response to the CP/M system prompt. As long as the diskette which is in the drive (either the default or the one which you include in the file specification) contains both HELP.COM and HELP.HLP, the program will be run.

Placing CP/M Help on the 'Run Optional Application' Menu

The CP/M Help program is one of those programs which you may wish to have available from the Utility Manager. As an exercise, let's make it so that the program is available on the **RUN OPT APPLIC** menu of the Utility Manager on the **Data** distribution diskette. First, remove the **CP/M** diskette from the A: drive. Then remove the **Data** distribution diskette

from the B: drive and place it in the A: drive. From the top menu of the Utility Manager, press **F2** to display the **RUN OPT APPLIC** menu.



Note that the only option from this menu (other than the **EXIT TO CP/M** option) currently available is the one associated with the F7 key, called **USER DEFINE**. This key is pressed to tell the Utility Manager to place the name of a program in one of the boxes at the bottom of the screen, and to associate the appropriate function key with the box. Press **F7** at this time. The following will be presented at the screen:

PRESS THE FUNCTION KEY THAT YOU WISH TO DEFINE, OR ANY OTHER TO EXIT

to which you respond by pressing **F1**. The Utility Manager will ask you to

enter the filename (ending in **.COM**) which you wish to associate with the F1 key from this menu. Since we wish to make the CP/M Help program available from the Utility Manager, enter **HELP.COM** followed by a Carriage Return in response to the question. The Utility Manager will respond:

SHOULD THE MENU ASK FOR A COMMAND TAIL BEFORE RUNNING THIS APPLICATION? Y/N

If you answer 'Y' to this question, the Utility Manager (menu) will prompt the user for a command tail each time the F1 key is pressed from this menu. This doesn't mean that a command tail **must** be provided, only that the Utility Manager will ask **if** the user has one to enter. If you answer 'N', then no command tail will be expected or accepted by the Utility Manager. For this case, respond with **Y**, since the CP/M Help program will accept command tails, and it is convenient to request help about a specific topic.

Shortly after you enter your response, the box associated with the F1 key is filled-in with the string 'HELP'. The CP/M Help program is now available to you from the Utility Manager, and may be invoked by pressing the F1 key from this menu. (Keep in mind that for the Help program to function, the diskette which contains HELP.COM must also contain the associated file HELP.HLP, as the **Data** distribution diskette currently does.)

Press **F1** at this time. The Utility Manager will respond with the following:

ENTER PARAMETER(S) OR PRESS RETURN

For now, just press the Carriage Return, which will run the CP/M Help program. The initial display of Help will be presented, and is included on the following page for your reference. (More topics may be available than shown in the illustration.)

```
HELP UTILITY Vx.x

At "HELP>" enter topic {.subtopic} . . .

EXAMPLE:  HELP> DIR EXAMPLES

Topics available:

COMMANDS    CNTRLCHARS  COPYSYS     DATE        DEVICE      DIR
DUMP        ED          ERASE       FILESPEC    GENCOM      GET
HELP        HEXCOM      INITDIR     LIB         LINK        MAC
PATCH       PIP (COPY)  PUT         RENAME      RMAC        SAVE
SET         SETDEF      SHOW        SID         SUBMIT      TYPE
USER        XREF

HELP>
```

Each "topic" on the list presented by the Help program may be entered as a command tail when you run CP/M Help from the Utility Manager. First exit Help by entering a Carriage Return, and then press **F1** to run Help again. The Utility Manager will again prompt for a command tail. As an example, and to learn more about the Help program itself, enter **HELP** (as the topic of the program Help) in response to the request for a command tail. The CP/M Help program now presents more than two screenfuls of information about itself. (As directed, press the Carriage Return to view each screen of text.) Exit the Help program now by entering a Carriage Return.

Placing a Dummy Program on the 'Run Optional Application' Menu

Let's now experiment with placing into a box a made-up name for a non-existent program called **IMAGINIT.COM.** Use the procedure you followed with the Help program above, only (for the sake of this exercise) do not request that the Utility Manager prompt for a command tail. Select an unused box (let's use F2) and place the name in it. Notice two things here: first, that you may indeed place the name for this made-up program in a box; second, that the name of the program has been "chopped off" or truncated to seven letters from its original eight. This truncation of the name is unfortunately required for it to fit in the box. It is only a matter of how the file name is displayed, however; the full file-name is maintained by the Utility Manager, so you are not limited to using seven characters for you program names.

At this time, let's try to run our imaginary program called IMAGINIT.COM. Press **F2** from the **RUN OPT APPLIC** menu. The Utility Manager will return with the following:

INSERT THE DISK THAT CONTAINS IMAGINIT.COM IN THE A DRIVE,

THEN PRESS THE IMAGINIT.COM KEY AGAIN

Since the program does not exist, press the space bar to "bail out" and terminate the queuing up of the dummy program.

Removing a Program from the 'Run Optional Application' Menu

We will now remove the nonexistent program from the **RUN OPT APPLIC** menu. From this menu, press **F7** again, as if you were going to assign another box. In response to the prompt requesting the function key which you wish to define, enter **F2**, which we assigned to IMAGINIT.COM. The Utility Manager will respond with the following:

KEY ALREADY DEFINED — DELETE APPLICATION? TYPE Y/N:

to which you respond by entering **Y**. In a short time the box at the bottom of the screen associated with the F2 key will be "cleaned out," and the following will be presented at the screen:

APPLICATION DELETED. REDEFINE KEY? TYPE Y/N:

to which you respond by entering **N**. The **USER DEFINE** menu will return to the screen.

Viewing and Printing Files

You may recall that one of the options available from the **HANDLE FILES** menu is the **VIEW FILES** facility. You may use this facility to direct the transfer of a file from a disk drive to the display screen. It is important to note that while you can view **.COM** (executable) files in this way, it does not do much good, since only "gibberish" will be displayed. You can view **.ASM** files, however. These files abound on the **CP/M Plus Additional Files** diskette. Of course, if you get involved with your own programming efforts with CBASIC, you can view your **.BAS** files with this facility. **VIEW FILES** presents files one screen at a time; you will be prompted to press 'C' when you are ready to read another screenful of text.

One of the nice features of **VIEW FILES** is that you may view your WordStar text files. Due to the special nature of WordStar files, you must enter a **Ctrl-S** (CONTROL—S) to temporarily halt the output to the screen; entering a **Ctrl-Q** (CONTROL-Q) will continue the output. You may terminate the output of the file to the screen by entering a **Ctrl-C** (CONTROL-C).

You may use the **PRINT FILE** facility on the **HANDLE FILES** menu to direct the transfer of a file from a disk drive to your printer. The **PRINT FILE** facility is useful when printing **.ASM** or **BAS** files. It is generally not desirable to use **PRINT FILE** to output WordStar files, although you can output them in unformatted form. In general, you must output files generated with WordStar, Multiplan, or DR Graph from within the respective programs themselves to achieve acceptable results.

Running Applications Software

At this point, we will see how you can run the software packages provided with the Visual 1050 the Utility Manager.

From the top level of the Utility Manager, press **F1**. Now press the F1 key again to tell the Utility Manager that you wish to run WordStar. The

Utility Manager will respond with the following:

INSERT THE DISK THAT CONTAINS WS.COM IN THE A DRIVE, THEN PRESS THE WORDSTAR KEY AGAIN

The Utility Manager is letting you know that it cannot immediately run WordStar; the file WS.COM (as well as other necessary files, such as overlay files) must be "present," or located in drive A: before WordStar can be run. To provide the required files, replace the **Data** distribution diskette with the **WordStar with MailMerge** diskette. (Be sure that you place the **Data** distribution diskette in its sleeve.) Once you have placed the **WordStar with MailMerge** diskette in drive A: (remember to close the drive door), press **(F1)** (the WordStar key) again as instructed by the Utility Manager. WordStar should now run; you should soon be presented with WordStar's OPENING MENU.

Although we could now start learning about WordStar, that is not the purpose of this exercise. Instead, exit the WordStar program now by entering an **X** from WordStar's OPENING MENU. Notice that WordStar disappears as you might expect; soon after, however, the Utility Manager returns to the screen, which you might not expect. We will discuss this matter below. For now, let's run Multiplan.

Since we are at the appropriate menu level, press **F2** to run Multiplan. Once again, the Utility Manager will let you know that you need the appropriate files. Replace the **Wordstar with MailMerge** diskette with the **Multiplan** diskette, then press **F2** (the Multiplan key) once again as instructed. Multiplan will now be run. After a preliminary copyright statement, you will be presented with Multiplan's worksheet, which is a matrix of rows and columns and a list of commands at the bottom of the screen. Press **Q** for the Multiplan 'Quit' command, and respond with a **Y** when Multiplan prompts you for confirmation that you wish to exit the program. Multiplan will go away; once again the Utility Manager will return, again to the same menu level from which it left to run Multiplan.

The other programs provided with the Visual 1050 can be run through the Utility Manager in similar fashion. The necessary files to run DR Graph are located on the **DR Graph** diskette; those for CBASIC are located on the **CBASIC and Demonstration** diskette; the Visual 1050 Communications program **TTY1050.COM** is located on the **CP/M Plus** diskette.

Integrating Multiplan Data with WordStar and DR Graph

You can incorporate whole or partial worksheets you generate with Multiplan into either WordStar (for use in a text file) or DR Graph (for use as input data prior to plotting a graph). Procedures for using Multiplan data are provided in the documentation describing the use of the respective packages: for WordStar, refer to *WordStar for the Visual 1050: An Overview*; for DR Graph, refer to *DR Graph Implementation Note for the Visual 1050*.

Cast the Utility Manager Away

You may recall that you can use the Utility Manager to "turn itself off," so that it does not start up when the system is booted. Let's go through the process of turning off the Utility Manager now.

From the top menu of the Utility Manager, press **F7** to access the **SET UP SYSTEM** menu. Next, press **F4** to access the **MENU ON/OFF** menu. From this menu, press **F2** to make it so that the Utility Manager will not start up upon system boot. (Do not be surprised when the Utility Manager does not immediately disappear from the screen. After all, the Utility Manager has been — and still is — running within the system.)

Now, press the **F8** key which we discussed earlier. The Utility Manager will disappear. You should see the CP/M prompt **A>**.

In order to see that the Utility Manager will not start up upon booting the system, we must request a **cold boot** from the computer, which we discussed in Section 3. To cold boot the system, hold down both **Ctrl** and **Shift**, then press **Break**. Once the system boots, you will see the familiar start up information presented at the screen, but with a lone CP/M prompt at the bottom line, as shown on the following page.

```
CP/M V3.0 Loader
Copyright (C) 1982, Digital Research

BNKBIOS3    SPR   F100   0F000
BNKBIOS3    SPR   B8000  0800
RESBDOS3    SPR   EB00   0600
BNKBDOS3    SPR   8A00   2E00

xxK TPA


CP/M Version 3.0, BIOS version x.x
***BANKED VERSION***

A>
```

Bring the Utility Manager Back

You may recall (in "Up and Running" above) that we alluded to a system program which entered the string 'menu' in response to the CP/M prompt, just as if you had done it yourself. The program which did this is called **SUBMIT.COM**. One of the features of this version of CP/M is that it looks for a file by the name PROFILE.SUB on the diskette which is in the A: drive each time the system is started up. If it sees it, CP/M's SUBMIT program parses the file, then presents each line from the file to the operating system or to programs, depending upon the contents of a given PROFILE.SUB file. The SUBMIT command is by no means limited to this special use with PROFILE.SUB files. In fact, you used SUBMIT when you ran the demonstration program at the end of Section 2. For more information, review the discussion of SUBMIT in the *CP/M Plus User's Guide*.

In order to run the Utility Manager, enter **MENU** followed by a carriage return in response to the CP/M prompt. You will be presented with the top menu of the Utility Manager. Although the Utility Manager is running, you must go back and tell it that it should start up again upon system boot. To do this, press **F7** from the top level of the Utility Manager to display the **SET UP SYSTEM** menu level; next, press **F4** to display the **MENU ON/OFF** menu level; then press **F1**, which is associated with the **MENU ON** box. Once again, the Utility Manager will be invoked automatically when the operating system is booted.

Copies of the Utility Manager

When you ran and then exited WordStar above, you may have been surprised to see the Utility Manager return to the screen, even though it was started from the **Data** distribution diskette, not the **WordStar with MailMerge** diskette. Recall that the Utility Manager is a program, and programs after all can be placed on more than one diskette — as we have done above. The Utility Manager has been included on five different distribution diskettes: **CP/M Plus, WordStar with MailMerge, Multiplan, DR Graph,** and **CBASIC and Demonstration**.

Although the Utility Manager has been distributed on several diskettes, that alone does not ensure that the menu levels are "remembered" from one diskette to another. To maintain this "thread of connectedness" between diskettes, the Utility Manager cleverly "writes a note to CP/M" in a specific location in the internal memory of the Visual 1050. CP/M looks in this place in internal memory for such "notes" each time that a program terminates, and before it returns the system prompt to the console. If instructed to run a program, CP/M will run the program, then go back and look again. If no program is to be run, the operating system prompt will be presented at the screen.

Using the case above as an example, you initially ran the Utility Manager from the **CP/M Plus** diskette and later transferred it to the **Data** distribution diskette. When you selected WordStar, and the Utility Manager could not find it on the **Data** distribution diskette, you were asked to place the correct diskette in the A: drive. After you signalled that you were ready with the correct diskette, the Utility Manager first checked to make sure that WordStar was indeed there, and then it "wrote the note" to CP/M. The information included in the message to CP/M included the

menu level which the Utility Manager was currently at, an instruction telling CP/M to run A:WS.COM once the current program (A:MENU.COM) terminated **and** an instruction to CP/M to run A:MENU.COM after A:WS.COM terminated. After writing the note, the Utility Manager terminated itself. The operating system "read the note," looked for, found and ran A:WS.COM, and then looked for, found and ran A:MENU.COM. If A:MENU.COM was not to be found, (that is, if the **Wordstar with MailMerge** diskette did not have the Utility Manager on it) CP/M would then have presented the system prompt at the screen.

NOTE: The Utility Manager must be run from the A: disk drive.

Setting the Real Time Clock

In Section 2 we mentioned that the Visual 1050 is equipped with a hardware feature called a "real time clock." As its name implies, the real time clock is intended to keep track of the time in the "real world." A lithium battery is included so that the clock will still run when the Visual 1050 is turned off.

To set the real time clock, use the CP/M **DATE** command, which is on the **CP/M Plus** diskette. In response to the CP/M prompt, simply enter **date set** followed by a carriage return. The program will prompt you for the appropriate date and time. Once you set the time and date, check it by entering **date** followed by a carriage return in response to the CP/M prompt. The CP/M DATE command is discussed in the *CP/M Plus User's Guide.*

Time and Date Stamping and Password Protection of Files

You can set up a diskette so that its directory can be "stamped" with time and date maintained by the real time clock. Before a given diskette can be set up for time and date stamping, you must use the CP/M **INITDIR** command to first reformat the directory of the diskette. (This has nothing to do with the diskette formatting program which we used earlier in this Section.)

INITDIR will reassign every fourth directory entry as a place to put time and date stamping information relating to the previous three entries. This means that the number of files which can be placed on a directory is reduced from a maximum of 128 to 96. If there is not enough directory space on the diskette, INITDIR will terminate itself before it destroys any

directory entries. Refer to the section on the INITDIR Command in the *CP/M Plus User's Guide.*

Once you have reformatted the directory space of a given diskette with INITDIR, you are free to set up the directory for time and date stamping. This is accomplished with the CP/M **SET** command. The SET command is also used to initiate password protection of your diskettes and individual files. Refer to the section on the SET command in the *CP/M Plus User's Guide.*

We have provided as an example a file which illustrates one of the many ways which you may set up time and date stamping as well as password protection. The file is called **MAKEDATE.SUB**, and has been distributed on the **CP/M Plus** distribution diskette. It is a SUBMIT file, in that it is used by the SUBMIT command (note the **.SUB** file extension) to carry out a series of commands, as does PROFILE.SUB which we discussed above. We suggest that you review the materials cited above (as well as the section on the SUBMIT Command) in the *CP/M Plus User's Guide*, and perhaps try out MAKEDATE.SUB as a place to start. You can always tailor your own submit file to do time and date stamping and/or password protection.

Reading Diskettes Formatted for Other Computers

As stated in Section 2 of this Guide, the Visual 1050 can read software distributed on diskettes which have been formatted for certain other personal computers. You may instruct the computer to read these "foreign" diskettes with the **SETDRIVE** command, which is on the **CP/M Plus** diskette. A procedure is provided below which you may follow to copy all the files from a foreign diskette over to a Visual 1050 diskette:

1. Place the **CP/M Plus** diskette (or any diskette which contains the files SETDRIVE.COM and PIP.COM) in the A: drive. If you are working from the Visual 1050 Utility Manager, exit to the operating system.
2. Place the non-Visual 1050 formatted diskette in the B: drive.
3. Enter **setdrive** followed by a carriage return. The SETDRIVE command will prompt you to specify the drive which contains the foreign media and how it is formatted. Once you specify the format of the diskette, the SETDRIVE command will list the directory on drive B: and then terminate itself.

4. In response to the CP/M prompt, enter **pip** followed by a carriage return. The CP/M PIP command will return with the following:

   CP/M 3 PIP VERSION x.x
   *

5. Replace the diskette in the A: drive with a **blank but formatted** diskette. In response to the PIP command prompt, enter

   a:=b:*.*[orv

   The PIP command will copy all of the files from the B: drive over to the A: drive. When PIP completes the transfers, it will return with its prompt:

   *

6. Remove the diskettes from the A: and B: drives. Place the **CP/M Plus** diskette back in the A: drive, and enter a carriage return (or a Ctrl-C) in response to PIP's prompt. The operating system prompt should return to the screen.

7. Unless you wish to copy more of the foreign diskettes, use the SETDRIVE command to set the disk format in the B: drive back to Visual 1050.

The Visual 1050 is reset to expect Visual 1050 formatted diskettes in both drives each time it is cold booted (as during a power up sequence). Note that you need not use the prompting version of SETDRIVE; a shorter "in-line" version of the command may be used. Note also that information on SETDRIVE has been added to the **CP/M Help** facility discussed earlier in this section.

In Conclusion

In this section we have tried to give you a good introduction to the operation of the Visual 1050 as a computer system. The Utility Manager has been used a focal point to illustrate the use of common operating system programs, bundled software packages, user-definable programs, and user-specifiable features of the Visual 1050 itself. There are some topics which have been saved for Section 5 of this Guide; in relation to the Utility Manager, these topics concern themselves with options which are accessible through the **SET UP SYSTEM** menu.

5 Extensions

Introduction

We saw in Section 2 "Introducing the Visual 1050," that the Visual 1050 has been designed with an impressive array of hardware features. Among the features noted are several which, by their nature, allow you to expand your Visual 1050 system. The term 'expand' is used in both a physical sense, in that more hardware can be connected to the system, and in the sense that the utility of your Visual 1050 can be increased because of the presence of these features. The features we are speaking about are called *ports*. As you saw, several ports are provided, each of which is set up to function in a certain way.

What is a Port, Anyway?

A port is essentially an interface. An interface is circuitry which allows a central processing unit (CPU) to pass data back and forth with a device external to it. The circuitry handles the interchange of data at the most basic level. For example, it monitors signals from the CPU and external device which tell it they are ready to send or receive data. These external devices include disk drives, printers, plotters, monitors and keyboards. For the sake of modularity, connectors are typically associated with ports. For example, a specific printer interfaced to a CPU can be replaced by simply unplugging it and plugging in a new one. That is considerably easier than tearing apart the whole system when a printer is to be upgraded or repaired.

Logical Devices and Device Drivers

It is important to understand that, while the ports handle the basic control of the data flow between the CPU and devices external to it, the operating system controls how the ports are used.

The operating system controls several ports by associating, or "assigning" *logical devices* to *device drivers*, which are themselves associated with ports. Logical devices are an inherent part of the operating system,

and are manipulated in symbolic form during the assignment process. Device drivers are "custom" software code modules which "drive" or control external devices with the help of the interface circuitry comprising the ports. Each device driver is "tied into" a specific port. Four device drivers are provided with the Visual 1050. They are called **DISPLY, RS232, KB,** and **LPT**. There are five logical devices built into . CP/M. They are **CONIN:**, **CONOUT:**, **AUXIN:**, **AUXOUT:**, and **LST:**.

Each CP/M logical device and the Visual 1050 device driver with which it has been associated is provided in the table below:

CP/M Logical Device	Visual 1050 Device Driver (port used)
CONIN:	KB (keyboard port)
CONOUT:	DISPLY (monitor port)
AUXIN:, AUXOUT:	RS232 (RS232 serial port)
LST:	LPT (parallel printer port)

The significance of logical devices is that they represent external devices to the operating system, and that through the reassignment process alluded to above, they can be reassigned to represent different external devices. For example, the logical device **LST:** can be reassigned to the driver for the output side of the RS232 serial port. In this way, a serial interface printer can be connected to the Visual 1050, instead of (or in addition to) a parallel interface printer. The serial interface printer could not be used as a printer if the logical device **LST:** is not first reassigned to **RS232**, the driver for the serial port; it is a kind of "You can't get there from here" problem.

The CP/M **DEVICE** command is used to reassign logical devices to device drivers. When the command is run, the current assignments are displayed and the user is prompted for any reassignments. To reassign the logical device **LST:** to **RS232** (the RS-232 serial port driver), enter the following assignment:

LST:=RS232

Display the current assignments again to ensure that the change was made correctly, then exit DEVICE.

The *CP/M Plus User's Guide* discusses logical devices and how to reassign them with the CP/M **DEVICE** command. A note on terminology is necessary here: In the *CP/M Plus User's Guide*, the term 'physical device' is used the way we have used the term 'device driver'. We have chosen 'device driver' to lessen confusion and because it is the more commonly used term.

As a consequence of CP/M being a disk-based operating system, there are no logical devices or device drivers to associate with the two disk drive ports or the Winchester port. Therefore, these ports are "dedicated" to the above uses; they cannot be used for other external devices.

The Role of the Utility Manager

If you need to run the CP/M DEVICE command, you may do so from the Utility Manager through the **SET UP COMM** ("short for set up communications options") menu, which is accessible from the **SET UP SYSTEM** menu. When you select the **SET DEVICE** option from the **SET UP COMM** menu, the program DEVICE.COM will be run, assuming that it is available on the diskette. (DEVICE.COM has been included on the **CP/M Plus** distribution diskette.) Also accessible from the **SET UP COMM** menu are several other menus associated with the communications parameters of the Visual 1050.

If you connect a device to the RS-232 serial port, you must set up the communications parameters of the Visual 1050 so that it can "talk" to it. The parameters which may be set through the **SET UP COMM** menu include **Baud Rate** (300, 600, 1200, 2400, 4800, 9600, 19200, with the default being **9600**); **Character Length** (5, 6, 7, or 8 bits, with the default being **8**); **Stop Bits** (1, 1.5, or 2, with the default being **1**); and **Parity** (even, odd, or none, with the default being **none**). The terms 'baud rate', character length', 'stop bits', and 'parity' are explained in the *Visual 1050 Communications Program User's Guide* .

Telecommunications

As indicated above, the RS-232 serial port allows the Visual 1050 to be connected to a host computer equipped with an RS232 port; with the aid

of an auxiliary modem, it can communicate over telephone lines to a remote computer or information service. The communications program **TTY1050** has been provided on the **CP/M Plus** distribution diskette. Instructions for using **TTY1050** are provided in the *Visual 1050 Communications Program User's Guide.*

Note that, although you may use the Utility Manager to set up the communications characteristics for serial printers and other serial devices, **you must use the TTY1050 program** to set up the characteristics if you are using TTY1050 to telecommunicate. Any values which have been assigned through the Utility Manager **are reset** once TTY1050 is run.

Parallel Port Pin Configuration

The port which has been assigned to the CP/M logical device **LST:** is the parallel interface port. The port is fitted with a thirty-six pin female Centronics-type connector. The signals which are assigned to the pins of the connector are provided in the table below:

Pin	Signal	Pin	Signal	Pin	Signal
1	STROBE/	13	Not Used	25	Signal Ground
2	Data Bit 0	14	Not Used	26	Signal Ground
3	Data Bit 1	15	Not Used	27	Signal Ground
4	Data Bit 2	16	Not Used	28	Signal Ground
5	Data Bit 3	17	Not Used	29	Signal Ground
6	Data Bit 4	18	Not Used	30	Signal Ground
7	Data Bit 5	19	Signal Ground	31	Not Used
8	Data Bit 6	20	Signal Ground	32	Not Used
9	Data Bit 7	21	Signal Ground	33	Not Used
10	Not Used	22	Signal Ground	34	Not Used
11	BUSY	23	Signal Ground	35	Not Used
12	PAPER END	24	Signal Ground	36	Not Used

RS232 Serial Port Pin Configuration

The port which has been assigned to the CP/M logical devices **AUXIN:** and **AUXOUT:** is the RS232 serial interface port. The port is fitted with a twenty-five pin DB-25S connector. It is a DTE port. The signals which are assigned to the pins of the connector are provided in the table below:

Pin	Signal	Pin	Signal	Pin	Signal
1	Shield	11	Not Used	21	Not Used
2	TXD	12	Not Used	22	Not Used
3	RXD	13	Not Used	23	Not Used
4	RTS	14	Not Used	24	Not Used
5	CTS	15	Not Used	25	Not Used
6	DSR	16	Not Used		
7	Signal Ground	17	Not Used		
8	Not Used	18	Not Used		
9	Not Used	19	Not Used		
10	Not Used	20	DTR		

In Conclusion

We hope that, through the discussion of the Visual 1050 ports, you have a sense of why and how your system can be expanded. In addition, the pin configurations of the parallel and serial port connectors have been provided for your reference if you wish to connect devices.

6 Installing Software

Introduction

Although your Visual 1050 has been provided with a useful and powerful set of programs, the chances are that you will wish to acquire additional programs in the future.

Programs today are dramatically improving in flexibility, ease of use, and attractive display formats. However, the more elaborate the program, the more intimately it must understand various aspects of the computer it runs on. Unfortunately, it is generally the case that no two computer designs perform in the same ways, so there is no standard way that computers respond to the program's commands. For example, WordStar displays menus on the Visual 1050 in a certain way. It has to know many details about how the display works before it can do this properly. Likewise, to function properly on another computer, WordStar would have to be told lots of details about how that computer's display works. In short, a program knows what it wants to do **with a computer** (such as display menus) but it must be told how to get **the computer it's running on** to do what it wants it to do. Therefore, most programs will have to be installed.

Unfortunately, most installation programs are somewhat confusing. Some are extremely confusing. Thus, we are providing this section as a distillation of our rather extensive experience in software installation, so that you need not make the mistakes we have made. If you are already an expert installer you will not need this section. For those of you who are not experts, we hope to provide insight into the logic which underlies all installation programs. Having that, you will be able to handle the most cryptic or poorly presented installation procedures.

Be reassured that although installations seem difficult, this is largely because they are poorly presented. All installation programs require the same kinds of information, and it is for the most part not all that complicated. With that in mind, let us first look at the kinds of information that an installation program may need, then discuss various ways in which the program may ask for that information.

What Installation Programs Want

For the purpose of our discussion here it is convenient to divide the operation of your computer into five functions: processing, storage, input, display, printed output.

Processing Section: Installation programs do not require much here, as the processing must be basically very similar or the program will not run at all. However, some computers have special features. For example, the Visual 1050 has an internal clock which is part of the processing section used for time and date stamping of files. Some programs may wish to know about such a feature. As internal clocks become more common, more and more programs will be prepared to accept the time and date directly from the computer, instead of asking the operator for it. Such programs will have to be installed to know where and how to find the clock, and in what format the time/-date information is maintained.

Storage Section: There is not much needed here. CP/M takes care of allocating storage so that most application programs need not worry about it at all. However, certain programs (notably accounting packages) wish to know ahead of time how much space they may use on the disk. Also, many programs will wish to know which diskette(s) to use for data files and internal working files.

Input Section: In the past, if a program provided special functions which could be accessed, the program's author would assign keys in a manner he or she felt was logical or desirable, and that was that. If you did not like the choice there was nothing you could do. However, programs are now being written which allow the user to choose which keys will activate the various commands. Multiplan is such a program.

Display Section: Things get a little complicated here. If a program is to provide attractive displays without taking all day to do it, that program has to work in close harmony with the display section of the computer. Unfortunately, as stated above, each computer design handles the display section differently. The display section of a computer is known to installation programs as a "terminal." The typical installation program deals with the variety of display sections by providing a list of "supported" terminals (which the program knows

about) along with a facility for the user to describe those not on the list. The Visual 1050 obeys many of the same commands as the DEC VT100 terminal, so choosing VT100 or Visual 100 on an installation menu will often work very well. If not, you must tell the installation program how to achieve the effects that it wants.

Below are the major commands which an installation program may want to know about, along with a short explanation of what each one does:

Clear Screen: This means to make the entire screen blank. It almost always also means to leave the cursor at the top left corner of the screen afterwards (hence it is often called **Clear Screen and Home Cursor**).

Address Cursor: Also called **Absolute Cursor Address(ing)**. It means to send the cursor to a particular place on the screen, without regard for its current position. It is probably the most complicated screen command, and gives the most trouble in installations.

Read Cursor: The Visual 1050 does not have this function, but some programs may ask about it. It means that the program is asking where the cursor is right now, and the terminal responds with a sequence containing the answer. (This is one of the major differences between the 1050 and the VT100, but few programs for microcomputers use this function.)

Clear EOP: That is, **Clear to the End Of Page**. From the present cursor position, clear everything following it on the screen. Do not move the cursor.

Clear EOL: That is, **Clear to the End Of Line.** From the present cursor position, clear everything following on that line (but not on subsequent lines). Do not move the cursor.

Cursor (Up, Down, Left, Right): Move the cursor one position in the indicated direction. Do not delete any characters.

Backspace: Move the cursor one position left. It usually also means to delete the character under the new cursor position.

Insert (Delete) Line: Insert (remove) a line at the cursor position. Leave the cursor at the beginning of the new line (or at the beginning of the line which was previously below the deleted line).

Highlighting or **Inverse Video** or **Video Attributes:** Cause subsequent characters to be emphasized in some way. The methods available on the Visual 1050 include making the characters extra bright, extra dim, reversing them to show black letters on a light field, underlining them, and blinking them bright and dim. (Most programs will only use one form of emphasis, and you can generally choose the one you prefer.)

Cursor On/Off: Show or hide the cursor.

Cursor Blink On/Off: Show a steady or blinking cursor.

Keyclick On/Off: Have keys click or be silent.

Auto Newline On/Off: When the cursor reaches the end of a line, it will either move to the beginning of the next line, or stay at the end of the current line.

Printed Output: Here again we run into complications. Modern printers have as wide a range of diverse capabilities as modern terminals, and (if that were possible) even less agreement among them as to how features are to be requested. Fortunately, many software packages today will allow you to choose among a number of printer types which the software understands. Often, however, the more general of these choices (such as "Standard Printer" or "Teletype-like Printer") will not allow the full range of performance of which the software is capable. In this case you will often be able to improve the performance by specifying the installation parameters yourself. Because the range of printer capabilities is so broad, we cannot do more here than to suggest some of the most common abilities:

Form Feed Character: Most printers can keep track internally of where they are on a page. The Form Feed command will cause them to advance the paper to where they believe the top of the next page is. (This is also called TOF, or Top Of Form.)

Auto Line Feed: Most printers have an operating mode in which, when a command is received to return to the beginning of the line, they will automatically advance to the next line. If this capacity is present, it is usually wise to disable it. That way the computer can decide whether to advance the carriage or not (for underlining, for example). A few printers require physical modification to disable this feature.

Auto Newline: This generally refers to what happens when the printer receives more characters than will fit on a single physical line. If Auto Newline is enabled, the printer will put the extra characters on the next line. Otherwise it will place them on top of each other at the end of the original line.

Page Length or **Lines Per Page:** This command tells the printer how long each page has been set to, so that Form Feed commands will advance to the proper place on the next page. Some printers keep track of inches, some the number of lines, and some both. (Standard forms have 66 lines per page.)

Character Pitch, Alternate Character Set, others: Most matrix printers can print in more than one size or style of character. Such printers will have commands to switch to and from these various character sets. Note that most word processing software will not be able to justify a line if you switch character sizes in the middle of it. Also, many printers have features which work only with a particular character size or type, so you have to be careful moving back and forth.

Proportional Character Set: This means that the printer has a set of characters whose width is adjusted for each character, so that narrow characters like 'I' don't take as much space as a wide character like 'M'. Very few word processing packages can properly justify text in this mode, although unjustified text can be printed very attractively.

Emphasized Print: This is a feature of some matrix printers. It produces a more solidly filled-in character by printing each dot in the character twice so that they overlap. It also cuts the printing speed in half.

Double Print: The same printers having Emphasized Print often have this also. It generally means that the printer will print an entire line, then space down half a dot and print the line again. It also produces a more solid looking character, and may be combined with Emphasized Print for an extremely dense character. Its main advantage is that word-processing functions like boldface, which causes the line to be printed several times, may cause the text to slowly creep down the page.

Shadow Print: This is sometimes found on daisywheel printers. It means that the printer will print the character, then space over a fraction and print again. The result is a broadened character which stands out on the paper. Most software cannot use this function, although word processors may do the same thing themselves: WordStar calls the equivalent function Bold printing.

VMI (Vertical Motion Index) and **HMI (Horizontal Motion Index):** These are found on fancy daisywheel printers. They mean that the printer can move its head in any direction under precise control from the computer. They are also called **Relative (Vertical or Horizontal) Tab**. WordStar requires a printer with this capability in order to "micro-justify" text (that is, to spread the extra white-space evenly across the line, instead of bunching it between words).

VFU (Vertical Format Unit): This means that the printer is capable of storing the characteristics of a form, and automatically advancing to the proper place on the form when commanded. This feature is generally usable only by custom software written with a specific printer in mind.

There are many other printer features, but these are the most common or important ones. When installing software for a particular printer, a little experimentation with different ways of doing things will often produce very good results. Remember that if an installation does not work to your satisfaction, you can change it.

Default Values Within Installation Programs

Before we get involved with the specifics on how installation programs request information, it is important to note that such programs often

already have values for some or all of their questions. These values may have been assigned the last time the program was installed, or may be default values, in which case they are assigned automatically by the installation program. These values are handled differently from one installation program to another. Each installation program in effect makes two choices:

1. Whether or not to show you the previously assigned value
2. Whether, upon receiving an empty line from you as input, to maintain the previously assigned value, or to assign no value at all

The choices are independent: some programs will use the old value without showing it to you; some will show it to you without using it; and so on. If this becomes an issue, our recommendation is to experiment with the values and see how it is handled in the given installation program.

On a related note, if an installation program wants a filename and expects a particular extension (.COM for example), it may or may not supply the extension itself. If both you and the program supply the extension, the installation program or the installed program may crash.

Wait, I Didn't Mean It

Polite installation programs will give you the chance to say "Yes, this is the sequence I want" or "No, change it." They will also give you a chance to test the installation before you make it final. Unpleasant installation programs will do neither, forcing you to go back through the entire installation in order to fix a mistake. Both types exist in this less than perfect world.

How Installation Programs Ask For Information

We have looked at various features which installation programs may wish to know about. Now let us examine some of the ways in which installation programs may go about requesting information. The first (and most important) issue is the representation of characters. Printer and terminal installation programs in particular concern themselves primarily with defining exactly which sequences of characters will cause the printer or terminal to perform as directed.

ASCII Characters

Characters are represented in many computers as non-negative integers. The standard correspondence of those integers to characters of a font is called *ASCII* (pronounced Ask-ee). You can look up the name in the Glossary, but for now just remember that it is simply a list of 128 characters, numbered 0-127. The 128 characters include all the upper- and lower-case letters, the digits from zero through nine, the blank space, punctuation marks, various symbols, and a set of special invisible characters called control characters. The 128 characters can be roughly divided into four groups of thirty-two each. The first group (0-31) is made up of the 32 control characters. The second group (32-63) comprises numbers and symbols. The third and fourth group comprise upper-case and lower-case letters respectively, as well as a few more symbols.

For orientation purposes, a partial ASCII chart is provided below. Study it for a moment.

ASCII	Dec	Hex	Octal	ASCII	Dec	Hex	Octal	ASCII	Dec	Hex	Octal	ASCII	Dec	Hex	Octal
NUL	0	00	000	SP	32	20	040	@	64	40	100	`	96	60	140
SOH (^A)	1	01	001	!	33	21	041	A	65	41	101	a	97	61	141
STX (^B)	2	02	002	"	34	22	042	B	66	42	102	b	98	62	142
ETX (^C)	3	03	003	#	35	23	043	C	67	43	103	c	99	63	143
EOT (^D)	4	04	004	$	36	24	044	D	68	44	104	d	100	64	144
ENQ (^E)	5	05	005	%	37	25	045	E	69	45	105	e	101	65	145
ACK (^F)	6	06	006	&	38	26	046	F	70	46	106	f	102	66	146
BEL (^G)	7	07	007	'	39	27	047	G	71	47	107	g	103	67	147
BS (^H)	8	08	010	(	40	28	050	H	72	48	110	h	104	68	150

Notice that adding 32 to the number representing an upper-case letter will give you the corresponding lower-case letter, while subtracting 64 from a given upper-case letter will give you the corresponding control character. Note that the control characters are represented as a letter preceded by a caret symbol (^). This is a common way of showing them (the other is to write "CTRL-" and the letter) but it does not mean that they are two characters. On the contrary, control characters are single characters offset (or shifted) from their ordinary counterparts, just as the upper-case letters are shifted from their associated lower-case letters.

Thus, the CTRL key on the keyboard is an offset key, similar to the more familiar one labeled 'SHIFT'. The relationships between characters noted above may give you a hint of the underlying structure of ASCII. A complete ASCII chart comprises Appendix A of this Guide.

Printing Characters

The ASCII printing characters are undoubtedly quite familiar to you, with the possible exception of the tilde (~), back slash (\), and vertical bar (|). Curiously, the space is a printing character, although it does not make a physical mark. It takes up memory space as do the "regular" printing characters, and is otherwise treated like the other printing characters by the computer and printers. The space character is labeled SP on the ASCII chart, and is represented by the number 32.

Control Characters

The ASCII control characters may not be familiar to you. They are not printing characters. Rather, as the name implies, they are used to control the operation of devices, such as terminals, printers, or computers. As you may have noticed from the partial ASCII chart, the control characters have names as well as ^A, ^B and so on. These names reflect the original usage of these characters in teletype operations. A number of them are still generally used for their original purpose, such as the Carriage Return (CR,^M), Line Feed (LF,^J), Backspace (BS,^H), Form Feed (FF,^L), Horizontal Tab (HT,^I), Bell (BEL,^G), and the Escape character (ESC,^[). The functions of the other control characters will vary widely from one device to another.

The Carriage Return is used to indicate the ends of things, such as lines on paper, lines on the terminal, entries to the computer and so forth. On a printer or terminal it means "return to the left side of the line," but it does **not** mean "go to the next line." That is the job of the Line Feed character. The reason for separating these functions is that the computer may very often need to do one of them without the other. The others are generally interpreted pretty much as their name would indicate, except for the Escape character.

The Escape character is special. That is because it is usually used to introduce a string of characters which are to be used as a command

instead of being printed. For that reason it is often called a Lead-In character. It also generally has its own special key on the keyboard, even though you can get it by pressing **CTRL-[**. (Modern software sometimes uses the Escape key to let you abort operations which you don't wish to continue, but that is a completely different application of the Escape character. It occurs simply because of the suggestive name.)

Numbers and Bases

When we introduced the partial ASCII chart above, we stated that there are 128 ASCII characters, numbered 0 through 127. The chances are that you are accustomed to numbering things starting from the number 1. There is, however a technical reason why it is very inconvenient for computers to do the same, so that while you are used to the first item in a list being number one, the first item in most computer lists is number zero. That is confusing enough, but to make it a little worse, this is **not entirely consistent**. Sometimes programs will try to make it easier for those accustomed to counting "in English," and will apply the correction internally. Sometimes they will say what they are doing and sometimes not. All you can do is to be aware of these possibilities, and prepare to add or subtract one as the situation warrants.

There are several ways to express the number which represents a given character in the ASCII list. In the partial chart above, decimal (base 10) values are used. In addition to decimal, the two other common ways are hexadecimal (base 16, often called "hex") and octal (base 8). Since different installation programs ask for values in different bases, it is very helpful to have a table which relates the ASCII characters to their representations in several different bases. Appendix A provides this correlation between different bases.

And now a gentle warning: Sometimes an installation program will rudely switch number bases on you without telling you. This usually occurs when you are entering codes in hex, and the program requests a numerical value. If the program were consistent, it would accept the number in hex, but it may not be consistent.

Other Methods Used To Request Information

We said earlier that there are several ways used by installation programs to request characters. We have discussed the use of numbers. Some

installation programs will allow you to enter characters by typing their names. For example, an installation program may expect you to enter **FF** for Form Feed, or to type in **A** for an 'A'. Some installation programs may request a "picture" of the character. For example, a program may have you enter the caret (^) character when describing a control character. Some installation programs may allow you to simply press the key for the character in question. This last facility is very convenient, but has a few quirks of its own. The reason is that the installation program itself is watching for certain characters to tell **it** what to do (like the Carriage Return, for example), and there will be a conflict if you need to enter those same characters as part of the installation. There are three common ways installation programs use to get around this problem. One is to require that you give the codes for those characters instead of pressing the keys directly. Another is to set up special combinations of characters (like &CR for Carriage Return) to represent the problem characters. The third is to have a so-called "quote" character (^ Q is often used) which means "pass the next character through, no matter what is is, and don't interpret it as a command." To enter the quote character itself, you would enter it twice; once to tell the program not to interpret it as a command, and once to actually enter it as a character. In the example above, you would enter **^Q ^Q**.

An installation program may want to know the length of a command ahead of time, so that it can prepare space for the command. If it asks "How many bytes?" or "Character count?," that is what it wants to know. In most cases there is a maximum allowable command length. The program will **usually** tell you about such limits.

How Installation Programs Deal With Cursor Addressing

Back near the beginning of this section we stated (during the discussion of the Display Section in the paragraph "What Installation Programs Want") that the cursor addressing command is one of the most complicated ones, and can make the most trouble during installations. Therefore, we will devote some time to this topic.

The 1050 can address its cursor by either of the two common methods; they are known generically as the binary method, and the ANSI (also called ASCII) method. These methods are diagrammed on the following page, using the actual Visual 1050 command sequences.

Method	Lead In	Row	Separator	Column	Terminator
Binary	**ESC =**	1 character	**none**	1 character	none
ANSI	**ESC [**	0-2 digits	**;**	0-2 digits	**f** or **H**

Notice that the overall form of the command is the same in each case. The major difference is that in the binary method, the row and column numbers are always one character each, whereas in the ANSI method there may be different numbers of digits. The ANSI method, therefore, requires the separating and terminating characters so that the terminal will know when each parameter ends.

How can the binary method get away with using a single character to express numbers like 47 and so forth? The ANSI method in this circumstance would send the character '4' and the character '7', but that clearly is more than one character. The answer is that the binary method **sends the forty-seventh character in its list**. This list is in fact the list of ASCII characters, but the 1050's terminal applies an offset of 32 (decimal) so that the first character on its internal list is the space character (32 decimal, 20 hex). The forty-seventh character, therefore, is ASCII (32+46), which is an uppercase 'N'.

As an illustration, to send the cursor to the top left corner of the screen (position 0,0) you would issue **ESC = (space) (space)** if you were using the binary method, or **ESC [1 ; 1 H** (or **ESC [1 ; 1 f**) if you were using the ANSI method. To send the cursor to position (46,22) (remember, because we're counting from zero that's the **forty-seventh** column and **twenty-third** row) you would send **ESC = N 6** or **ESC [47 ; 22 H**.

Now a cursor addressing sequence can be completely defined by answering the following six questions. We have included the responses (in both ANSI and Binary methods) which apply to your Visual 1050:

1. Is the row and column information sent in binary, or as strings of ASCII characters?

   For Binary method: binary
   For ANSI method: ASCII strings

2. What is the lead-in string?

   For Binary method: **ESC =**
   For ANSI method: **ESC [**

3. Is there a separator (sometimes called delimiter) between the row and column numbers?

   For Binary method: no separator
   For ANSI method: **;**

4. Is there a terminator (or trailing string)?

   For Binary method: no terminator
   For ANSI method: **f** or **H**

5. Is the row sent before the column, or after?

   For Binary method: before
   For ANSI method: before

6. Is there a constant offset to row, column, or both?

   For Binary method: Yes, 20 hex (32 decimal) to both
   For ANSI method: Yes, 1 hex (1 decimal) to both

Installation programs uniformly ask these questions, but the phrasing differs considerably from one to the next, and some of them will ask more than one question at once. Here are examples of some types that we have found:

Input Cursor command string: Phrased this way, it almost always means to put in the Lead-in string (only). It will be followed by the two commands below.

Input Separating character if any and **Input terminating character** (or **trailing character**) **if any**.

Input Cursor command character: This appears together with two other questions, one before and one after. The earlier question, probably asked at the beginning of the installation, is **Input Lead-In character** (which will then be used throughout the installation). For the 1050 that is the Escape character (Decimal 27, Hex 1B). The question which follows will be **Use lead-in character?** and the answer

for the 1050 is **Yes**. The command character itself would be either [or =, depending on which cursor sequence you choose.

Input Cursor sequence, using zeroes to represent the row and column positions: This means to put in the entire positioning sequence, except that you must put a zero in the position where the row information will appear, and another for the column position. This is usually followed by the questions below.

Input position in sequence for row number and **Input position in sequence for column number:** This means that you should look at the command sequence and count the number of characters from the left that the row or column information appears, and answer with that number. This is simply the long way of finding out which of the zeroes you put in earlier means the row, and which the column. It could just as well be asked directly, but generally is not.

Input Cursor sequence, using the base cursor position: This is a variation on the previous way, and avoids having to ask separately about cursor offsets. It means that you should put in the entire sequence to position the cursor at the top left corner of the screen. This approach will also ask where in the sequence it should find the row and column numbers.

Input 1 if column is before row: This is just another way of asking which comes first.

Input terminal type: This is a way of finding out various things by having you pick a combination from a list. The list may appear on the screen, or be in the manual, or in extreme cases you may have to call the software publisher to find out what it is. A typical list might be:

1. Binary X-Y (column-row)
2. Hazeltine
3. ASCII Y-X (row-column)
4. Binary Y-X
5. ASCII X-Y

The 1050 would be type three or type four on this list, depending on which cursor sequence you choose.

Send nulls after command? or **Delay after command?:** This is to accommodate some terminals which may lose characters if they are sent immediately after certain commands. The answer for the 1050 is **0** or **No**. The null, incidentally, is a character which does nothing except take up time. It is represented in ASCII by the number zero.

Lines on Screen?: This means "How many lines of text can the terminal display at a time?" The answer for the 1050 is **25**.

Words of Warning

You should never run installation programs on or make any other changes whatsoever on your original program disks (usually called "distribution disks"). In general, when you buy software, you should immediately copy the disks, put the originals safely away, and do all further work on the copies. If you destroy your distribution disk through accident or a mistake, it will be your loss, not the software vendor's.

In addition, it is prudent to carefully segregate each installation program with the uninstalled version of its associated main program, instead of jumbling installation programs together on the same disk. The major reason is that many (if not most) such programs are named "INSTALL.COM" and their associated files are likely to be named "INSTALL.DAT" or "INSTALL.OVR." It is impossible to tell from the outside just what it is that a particular program expects to install, or what extra files it needs to do its job. Also, CP/M will only tolerate one file having a given name on each disk; the one that survives will be the last one placed on the disk.

In Conclusion

We have presented various ways in which installation programs may ask for their information. There are undoubtedly others, but if you remember that they all want essentially the same information, you will find yourself able to accomplish even difficult- and cryptic-looking installations.

Detailed explanations of the commands used to control the display screen of the Visual 1050 comprise Appendix B of this Guide.

A ASCII Conversion Table

ASCII Conversion Table (Decimal, Hex, Octal)

ASCII	Dec	Hex	Octal	ASCII	Dec	Hex	Octal	ASCII	Dec	Hex	Octal	ASCII	Dec	Hex	Octal
NUL	0	00	000	SP	32	20	040	@	64	40	100	`	96	60	140
SOH (^A)	1	01	001	!	33	21	041	A	65	41	101	a	97	61	141
STX (^B)	2	02	002	"	34	22	042	B	66	42	102	b	98	62	142
ETX (^C)	3	03	003	#	35	23	043	C	67	43	103	c	99	63	143
EOT (^D)	4	04	004	$	36	24	044	D	68	44	104	d	100	64	144
ENQ (^E)	5	05	005	%	37	25	045	E	69	45	105	e	101	65	145
ACK (^F)	6	06	006	&	38	26	046	F	70	46	106	f	102	66	146
BEL (^G)	7	07	007	'	39	27	047	G	71	47	107	g	103	67	147
BS (^H)	8	08	010	(	40	28	050	H	72	48	110	h	104	68	150
HT (^I)	9	09	011	)	41	29	051	I	73	49	111	i	105	69	151
LF (^J)	10	0A	012	*	42	2A	052	J	74	4A	112	j	106	6A	152
VT (^K)	11	0B	013	+	43	2B	053	K	75	4B	113	k	107	6B	153
FF (^L)	12	0C	014	,	44	2C	054	L	76	4C	114	l	108	6C	154
CR (^M)	13	0D	015	-	45	2D	055	M	77	4D	115	m	109	6D	155
SO (^N)	14	0E	016	.	46	2E	056	N	78	4E	116	n	110	6E	156
SI (^O)	15	0F	017	/	47	2F	057	O	79	4F	117	o	111	6F	157
DLE (^P)	16	10	020	0	48	30	060	P	80	50	120	p	112	70	160
DC1 (^Q)	17	11	021	1	49	31	061	Q	81	51	121	q	113	71	161
DC2 (^R)	18	12	022	2	50	32	062	R	82	52	122	r	114	72	162
DC3 (^S)	19	13	023	3	51	33	063	S	83	53	123	s	115	73	163
DC4 (^T)	20	14	024	4	52	34	064	T	84	54	124	t	116	74	164
NAK (^U)	21	15	025	5	53	35	065	U	85	55	125	u	117	75	165
SYN (^V)	22	16	026	6	54	36	066	V	86	56	126	v	118	76	166
ETB (^W)	23	17	027	7	55	37	067	W	87	57	127	w	119	77	167
CAN (^X)	24	18	030	8	56	38	070	X	88	58	130	x	120	78	170
EM (^Y)	25	19	031	9	57	39	071	Y	89	59	131	y	121	79	171
SUB (^Z)	26	1A	032	:	58	3A	072	Z	90	5A	132	z	122	7A	172
ESC (^[)	27	1B	033	;	59	3B	073	[	91	5B	133	{	123	7B	173
FS (^\)	28	1C	034	<	60	3C	074	\	92	5C	134	|	124	7C	174
GS (^])	29	1D	035	=	61	3D	075	]	93	5D	135	}	125	7D	175
RS (^^)	30	1E	036	>	62	3E	076	^	94	5E	136	~	126	7E	176
US (^_)	31	1F	037	?	63	3F	077	_	95	5F	137	DEL	127	7F	177

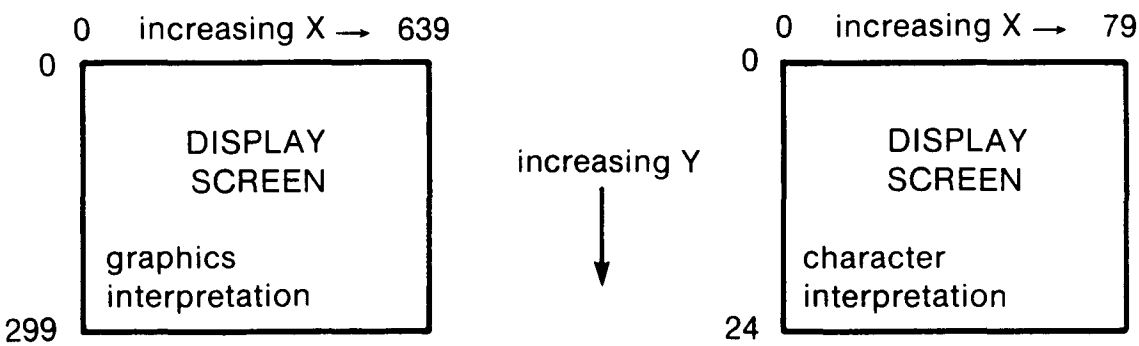
B Software Interface to the Display Screen

Display Section Software

This system is supplied with a standard display section software program which is stored in the display section's bootstrap EPROM and is immediately accessible when the computer is turned on. This program supports both graphics and character display on the display screen. All of the display features can be "called up" from the processing section by sending display commands via the character-stream interface built into the Z-80A operating system. Some of the display commands are a subset of those specified in the American National Standards document ANSI X3.41-1974 and ANSI X3.64-1979; these are generally agreed to be industry-standard specifications. The major features of the display program include 256 soft characters, a soft cursor, true overstrike capability, "phosphor saver", and smooth scrolling.

Coordinate System

All display commands view the display screen as a 2-dimensional (X,Y) cartesian coordinate system. For graphics related commands, coordinates are between 0 and 639 horizontally and between 0 and 299 vertically; any point on the screen may be individually addressed. For character related commands, the coordinates are 0-79 horizontally and 0-24 vertically; each character to be displayed can be visualized as existing within a graphics "cell" 8 dots wide and 12 dots high. The figure below shows how the coordinates map to the display screen in both graphics and character oriented use:



Character Response

The display section can either be accessed directly or (more commonly) through the standard CP/M system calls for the console. The display response to all character codes from 00H to FFH is presented in the table below:

ASCII	Hex	Function
CR	0DH	Carriage Return — Move the cursor to the beginning of the current line.
LF	0AH	Line Feed — No scrolling region present — If the cursor is not on the bottom line, move the cursor down one line staying in the same horizontal column. If the cursor is on the bottom line, leave it there, scroll the screen up one line, and clear the full bottom line. The scroll is performed "smooth" or "quick" depending on the scrolling mode. Line Feed — Scrolling region present — If the cursor is above the scrolling region, or within the scrolling region but above the bottom line (of the scrolling region), move the cursor down one line in the same column. If the cursor is on the bottom line of the scrolling region, leave it there, insert a line at the cursor, and repaint the scrolling region. (The time required for this increases with the size of the scrolling region.) The line which was at the top of the scrolling region is lost. If the cursor is below the the bottom of the scrolling region, then the cursor, upon reaching the bottom of the screen, will wrap to the top of the screen.

Table Continued

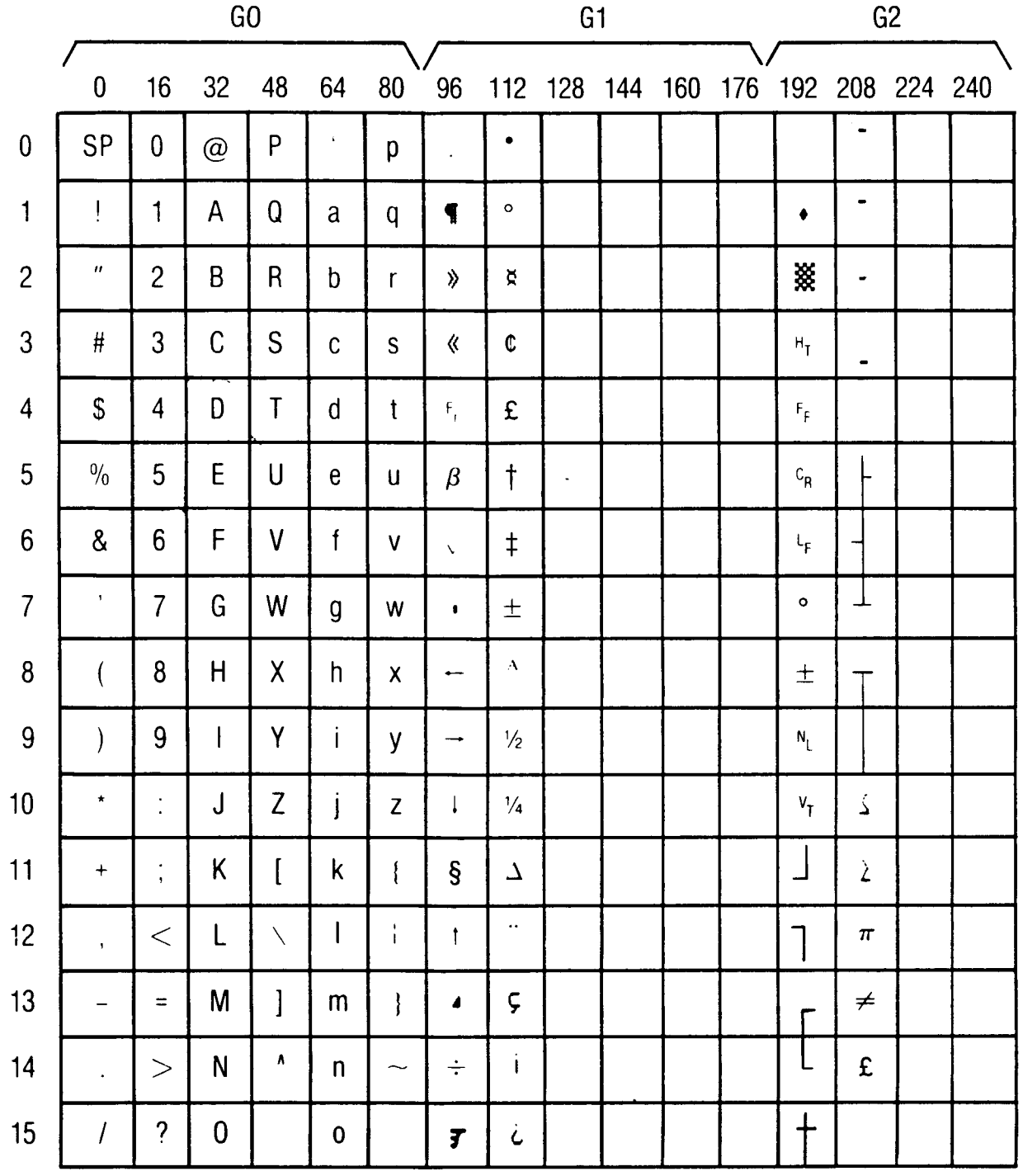
ASCII	Hex	Function
BS	08H	Backspace — Move the cursor one position to the left. If the cursor is already at the beginning of the line, move it to the end of the previous line.
HT	09H	Horizontal Tab — Write spaces to the next horizontal position which is a multiple of eight. If that would put the cursor beyond the end of the line, and if Auto Newline is engaged, drop the cursor to the first position of the following line.
SO	0EH	Shift Out — Enter a mode causing codes in the range 20H-7FH to be written as the 96 characters of the extended font. This mode is useful in order to access the extended character set when only 7-bit characters can be sent to the display. In shift-out mode, characters in the range A0H-FFH are also written from the extended character set.
SI	0FH	Shift In — Exit the shift-out mode, reverting 7-bit codes back to the normal font. In this mode the extended font can still be written, but 8-bit character codes must be used, i.e. codes in the range A0H-FFH.
FF	0CH	Form Feed — Move the cursor to the beginning of the top line, erase the entire screen, and turn off all the attributes.
BEL	07H	Bell — Sound the audible alarm for a short time.

Table Continued

ASCII	Hex	Function
ESC	1BH	Escape — This character signals the start of an "escape sequence" which will execute an extended command. The characters immediately following the ESC character determine the specific type of command, and may include command parameters, as required. See the list of escape sequences for each extended command's format.
CSI	9BH	Command String Introducer — This single character can replace the 2-character sequence ESC [in the escape sequences.
(others)	00H through 1FH, 80H through 9FH	Null — Perform no function.
(others)	20H through 7FH, A0H through FFH	Normal Characters — Write the character on the display screen at the cursor position and advance the cursor one position to the right. The character written will be from the extended font if the code is A0H–FFH; for codes 20H–7FH, the character will be from the normal font if not in shift-out mode, or from the extended font if in shift-out mode. The character written will either replace the original character already on the screen or overstrike it, depending on the writing mode. If Auto New-Line is enabled, the cursor upon reaching the end of the line will continue to the first position of the next line. Otherwise it will stay at the end of the current line, overwriting the last character as each additional character is received.

Character Fonts

There are 256 soft characters available in the standard display driver program. Upon power-up the characters default to those shown below:



	G0						G1						G2			
	0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
0	SP	0	@	P	`	p	.	•						-		
1	!	1	A	Q	a	q	¶	°					♦	-		
2	"	2	B	R	b	r	»	¤					▒	-		
3	#	3	C	S	c	s	«	¢					H_T	-		
4	$	4	D	T	d	t	F_I	£					F_F			
5	%	5	E	U	e	u	β	†					C_R	├		
6	&	6	F	V	f	v	\	‡					L_F	┤		
7	'	7	G	W	g	w	'	±					°	┴		
8	(	8	H	X	h	x	←	^					±	┬		
9	)	9	I	Y	i	y	→	½					N_L	│		
10	*	:	J	Z	j	z	↓	¼					V_T	Ś		
11	+	;	K	[	k	{	§	Δ					┘	ż		
12	,	<	L	\	l	¦	↑	¨					┐	π		
13	-	=	M	]	m	}	◢	Ç					┌	≠		
14	.	>	N	^	n	~	÷	¡					└	£		
15	/	?	O		o		₹	¿					┼			

(Sum of row and column numbers is internal number for font peek and poke, not the ASCII code.)

As can be seen, there are three groups of characters, named G0, G1, and G2. For the internal purposes of the Visual 1050, the characters in the G0 set are numbered 0 through 95, those in the G1 set 96 through 191, and those in the G2 set (which contains only 64 characters) 192 through 255. The cursor is assigned internal number 256. Upon power-up, the G0 set is filled with the 96 printing characters of the ASCII set. The first thirty-two characters of each of the other sets are filled with various special symbols and a line-drawing font, while the rest are unassigned. (Note that upon power-up, the unassigned portion of the G1 character set contains code for the display RAM diagnostics. This appears as random salt-and-pepper patterns when these characters are viewed. The unassigned portion of the G2 set, however, displays as blanks.) Note that characters requested from the nonexistent portion of the G2 character set (internal character numbers greater than 256) will be displayed as the corresponding characters for the first thirty-two characters of the G0 set.

At any given instant, one of these groups can be assigned to be the "normal" font, written via received codes 20H-7FH in shift-in mode, and another can be assigned to be the "extended" font, written via received codes A0H-FFH in either mode and 20H-7FH in shift-out mode. The choice of G0, G1 or G2 for normal or extended fonts is made with a font escape sequence. Upon power-up, the defaults are G0 for both normal and extended fonts.

All 256 characters are "soft" and can be altered with a font poke escape sequence. However, it is recommended that the G1 and G2 fonts be used first for any additional special characters needed in a given application.

Like the 256 soft characters, the cursor is user-programmable via the font poke escape sequence; it is assigned internal number 256. The cursor defaults to a filled triangular shape, but can be changed to a solid block, a single underline, or any other desired shape.

Escape Sequences

When an ESC character is received, the display recognizes the start of an escape sequence which will execute an extended command.

Most escape sequences which require parameters accept these parameters in a common format. The exceptions to the common format are binary cursor position, two sequences for font selection, and some of the

miscellaneous escape sequences. These are explained in their individual sections.

In the common format, each individual parameter is a decimal number string consisting of zero or more ASCII-encoded decimal numbers. Any number of leading zeros may be present. Only the hex codes 30 to 39 are permitted in a parameter; spaces are not permitted. Each parameter must be terminated by a semicolon (hex 3B) or by the last character of the command string, as listed in the command sequences table. If a parameter is omitted completely, its value is taken as zero.

A custom, non-ANSI 3.64 compatible extension has also been included. Wherever a normal decimal number string parameter is expected, a two-byte binary number can be sent instead. First an equal sign (=, hex 3D) is sent to indicate that binary follows; then the least significant 8 bits of the parameter is sent as a single character followed by the most significant 8 bits as another character.

The terminal commands are divided into groups and defined below. A summary of commands is provided at the end of this Appendix.

Sequences for Cursor Movement

The Cursor Up, Down, Right, and Left escape sequences move the cursor one position in the indicated direction. If the cursor reaches a screen boundary, it "wraps around" to the other side of the screen. Each complete escape sequence is 3 characters long.

The Cursor Home escape sequence moves the cursor to the first character position on the display screen, character coordinate (0,0). The complete escape sequence is 3 characters long.

The Cursor Position escape sequence moves the cursor to a specified character oriented (X,Y) coordinate on the display screen; characters sent after a cursor position command will be written starting at the specified position. The (X,Y) coordinate for this command is specified using the character oriented coordinate system.

There are two alternate escape sequences which perform the cursor position function. In the binary version, which is not ANSI 3.64 compatible, the desired coordinates are transmitted immediately following **ESC** = as two binary numbers. Both the X and Y coordinates are sent with 20H

added to each; the Y coordinate is sent first, followed by X. There is no terminating character following the parameters. Thus the character string **ESC** = followed by two spaces moves the cursor to the home position. The complete escape sequence is 4 characters long.

In the ANSI version of the cursor position escape sequence the desired coordinates are transmitted immediately following **ESC [** as two parameters, separated by a semicolon and terminated with either **f** or **H** as desired. The Y coordinate is sent first, followed by X. Both coordinates are variable length decimal numbers; if the number is zero or missing completely, the value 1 is used. Also, if the X coordinate is missing, the semicolon need not be sent. Thus the character strings **ESC [f** and **ESC [0 1 ; 0 f** have the identical effect of moving the cursor to the home position. The complete escape sequence is from 3 to 8 characters long.

Sequences for Erasing

The Erase to End Of Line escape sequence replaces characters on the cursor's line with blanks, starting from the cursor's current position and extending to the end of the line. The cursor is not moved. The complete escape sequence is 3 characters long.

The Erase Entire Screen escape sequence replaces all characters on the screen with blanks. The cursor is not moved. The complete sequence is four characters long.

The Erase to End of Screen escape sequence replaces characters on the screen with blanks, starting from the cursor's current position and extending to the end of the display screen. The cursor is not moved. The complete escape sequence is 3 characters long.

Sequences for Editing

The Insert Line escape sequence causes a blank line to be inserted at the current cursor position. The cursor line and all lines below it are shifted downward to make room for the new line. The data on the bottom line is lost. The cursor is moved to the beginning of the new line. The complete escape sequence is 3 characters long.

The Delete Line escape sequence causes the cursor line to be removed, and all following lines to be shifted up one. A blank line is placed at the

bottom of the screen, and the cursor is placed at the beginning of the line which formerly followed the deleted line. The complete escape sequence is 3 characters long.

For both insert line and delete line sequences, if a scrolling region has been established and if the cursor is within or above the scrolling region, then the "bottom" referred to above would be the bottom of the scrolling region, and not of the physical screen. If the cursor is below the scrolling region, no action will be taken.

Video Highlighting Escape Sequences

The entire screen may be reversed so as to show dark characters on a light background.

When a character in the range 20H-7FH or A0H-FFH is sent to the display it is written on the display screen and the cursor advances. However, the exact appearance of the character can be modified by sending an attribute escape sequence before the character is sent. These attributes are available:

Intensity — The illuminated dots of the character will appear either more or less intense than normal, depending on the state of the Set Intensity Attribute command.

Underline — The character will appear normally, but an additional short horizontal line will appear beneath it.

Blink — The illuminated dots of the character will alternate between two different intensity levels.

Reverse — The complete 8 x 12 dot cell in which the character appears will be displayed inverted, i.e. the cell will be illuminated and the dots of the character will not.

Once an attribute is selected, all of the following characters will take on that attribute until the attribute is cancelled; however, previously written characters already on the display are not affected. Multiple attributes may be pre-selected; in that case the effect on subsequent characters will be the combination of each individual attribute.

The attribute escape sequence used to select attributes is variable in length. The appearance of the attribute escape sequence with no

parameters or a parameter of 0 turns off all attributes currently in effect; the presence of any other attribute parameters in the sequence turns on those specified attributes. Individual attributes are selected by a single numeric digit from the following table:

Attribute Parameter	Hex Code	Meaning
0	30H	Turn off all attributes
1	31H	Change intensity level
4	34H	Turn on underline
5	35H	Turn on blink
7	37H	Turn on reverse

Multiple attributes may be specified. They must be separated by semicolons in the usual fashion. The last parameter must not be followed by a semicolon, but by the terminating character m. The complete escape sequence is from 3 to 12 characters long.

It is not possible to selectively turn off attributes. This effect must be achieved by turning off all attributes and then turning on only those attributes still wanted.

The Set Brightness Attribute commands reverse the sense of the intensity attribute; that is, whether the intensity attribute makes the characters appear brighter or dimmer than normal. The default upon power-up is that characters with the intensity attribute set will be brighter than those without.

Font Escape Sequences

The font escape sequences permit the arbitrary selection of any two of the G0, G1, or G2 character sets as the normal and extended character fonts. These character fonts are then used during the screen update process as follows:

1. If a character in the range A0H to FFH is received, use the extended font.
2. If a character in the range 20H to 7FH is received, use the normal font if in shift-in mode or the extended font if in shift-out mode.

3. Enter shift-out mode when a SO (0EH) is received; all subsequent characters are affected. Enter shift-in mode when a SI (0FH) is received; all subsequent characters are affected.

In a font escape sequence, the selection of G0, G1, or G2 as the desired character set is specified by a single numeric digit from the following table:

Font Parameter	Hex Code	Effect
0	30	Use G0 set
1	31	Use G1 set
2	32	Use G2 set

Unlike other escape sequences, leading zeros may not be used in the font parameter. Also, there is no terminating character following the parameter. The complete escape sequence is 3 characters long.

Miscellaneous Escape Sequences

The Reset Display escape sequence is used to return the display section to its power-on state.

After the execution of this command the terminal will be in the following state:

Cursor at top left
Cursor Blink on
Auto Newline on
Light-on-Dark Video
Screen Saver on
Cursor on
Smooth Scroll on
Character Replace (vs. overstrike)
Video Attributes off
Intensity attribute will make characters brighter.

The Scrolling Region escape sequences establish the top and bottom, respectively, of the scrolling region at the current cursor position. To completely get rid of the scrolling region one may either reset the display, or set the top and bottom of the scrolling region to be the physical top and bottom of the screen.

The Return Version Number escape sequence returns the version number of the 6502 firmware to the Z80. The sequence is three bytes long.

The other miscellaneous escape sequences control the on/off state of several functional modes of the display section. Leading zeros are not permitted with the parameter and there is no terminating character.

The key click may be turned on or off, as may the automatic repetition of keys which are held down.

The screen saver causes the display to be turned off if 15 minutes passes without a character being written to the display. No characters are lost, and the display is turned back on upon receipt of any displayed character. Note the requirement for a **displayed** character; characters which cause no change on the display will not restore the display.

Two writing modes are available. In Replace mode a newly written character erases any older character that might be at the cursor position. Most display terminals operate in this manner. In Overstrike mode a newly written character leaves any older character; the operator thus sees a combination of the two as would occur on any paper-and-ink based printing terminal such as a teletype. This action is particularly useful for implementing accented characters by use of a backspace sequence. Replace mode is the default.

The Auto Newline on/off escape sequences control the action of the display when the cursor is in the last position of a line and another character is received. With Auto Newline on, the character is written and the cursor moves to the beginning of the next line. If the cursor was already on the last line, then a scroll is performed. In either case the cursor is left at the beginning of a new blank line and further characters received will all be visible. Thus lines longer than 80 characters can be read, albeit not all on one display line. With no Auto Newline the eightieth character is written at the end of the display line as are all following characters until a CR LF is received. Only then does the cursor advance to the beginning of the next line. Thus lines longer than 80 characters are effectively truncated after the seventy-ninth character. Auto newline is the default mode.

The Smooth Scroll/Jump Scroll escape sequences control the operation of the ASCII LF (line feed) character when the cursor is on the last line of the display screen. In either case, a line feed will move the characters on the screen upwards by one line and clear the last line. With jump scroll, the movement upwards is instantaneous; however, this renders the screen difficult to read especially if new text is being continually dis-

played. With smooth scroll, the movement upwards is slower and smoother, permitting the screen to be read even during scrolling. The complete escape sequence is 3 characters long.

The Cursor On/Off and Cursor Blink/No Blink escape sequences control the display of the character oriented cursor. The complete escape sequence is 3 characters long.

The Enter Transparent Mode escape sequence is used as a diagnostic tool to examine all characters being sent to the display section. In transparent mode, control characters in the range 00H-1FH and 80H-9FH are not executed, but merely written as their uppercase ASCII equivalents, bolded. For example, 0DH will will appear as a bold M. In addition, characters with their most significant bit (bit 7) high, i.e. in the range 80H-FFH, are displayed in reverse video. The transparent mode can be exited only by receiving a Reset Display command.

The User Command escape sequence is a means of expansion at the system programmer level. Execution of this escape sequence transfers control in the display section to address 1FF7H, where an RTS instruction is placed by default. Using the memory poke escape sequence command (described below) it is possible to overlay a three-byte JMP at this address to transfer control to a user program in the display section RAM. This program must have been previously poked into display section RAM, using the same memory poke command. All locations between 0E00H and 1F66H inclusive are available for this purpose. The program must end with an RTS instruction. The command sequence is two characters long, but it is the programmer's option to continue to parse incoming characters in order to form extended commands of the same type used elsewhere in this section. There are several routines provided in ROM which will facilitate this, and the addresses of the vectors to these routines will not be changed. Programmers wishing to use these routines must purchase the 6502 ROM listing.

Character Set Selection Sequences

Any of four keyboard maps may be selected. The four are US/UK, AZERTY, Scandinavian, and Portuguese/Spanish. The default is US/UK.

Memory Related Escape Sequences

The Poke Data escape sequences are used to load data directly into the RAM of the display section. The data is typically a new display routine or a new character in the soft character font.

To support these two types of pokes, two commands are defined. The Poke Data to Address escape sequence is used to poke an 8-bit data byte directly to an absolute 16-bit address. The address and data are transmitted as two parameters separated by a semicolon and terminated by M. The complete escape sequence is 3 to 12 characters long.

The Poke Data to Font escape sequence is used to change the soft fonts for any of 256 characters or the cursor. The character number, line number within the character, and data are sent as three parameters separated by semicolons and terminated by **F**. Characters are numbered according to the internal number shown in the figure of the font sets above. Each character is one byte wide by twelve bytes (or lines) high. The lines are numbered 0-11. The complete escape sequence is 3 to 13 characters long.

The Peek escape sequences are used to read data directly from the RAM of the display section hardware. The commands work similarly to their poke counterparts. When the display section recognizes a peek command it will respond by outputting the data byte at the specified location to the processing section as a single 8-bit character. The complete escape sequence is 3 to 9 characters long; the response to the escape sequence is 1 or 2 characters long, and appears at the interface between the 6502 and the Z80.

Graphics Escape Sequences

The graphics escape sequences control the drawing of points, markers, lines, circles, or arcs on the display screen. Coordinates for these commands are specified using the graphics oriented coordinate system. The specification of the graphics commands is facilitated by the concept of an invisible graphics cursor. This cursor is independent from the normal character oriented cursor, and is not actually displayed; it merely keeps track of the last graphics coordinate position referenced.

The X and Y graphics coordinates, radius, and other information are sent as normal parameters: ASCII coded decimal number strings separated by a semicolon. The parameters are used for different purposes depending on the graphics escape sequence. When an (X,Y) coordinate is sent, the X coordinate is sent first, followed by Y. X may be from 0 to 639 and Y from 0 to 299. Both coordinates are variable-length decimal numbers; if the number is 0 it may be completely omitted. Also, if the last parameter is missing, the semicolon need not be sent. Thus the characters strings **ESC ? 0 6 3 9 C** and **ESC ? 6 3 9 ; 0 C** have the identical effect of moving the graphics cursor to the upper right corner of the display screen.

For all graphics drawing commands, the Set Drawing Mode and Type escape sequence are used to specify the method of drawing and the line type, respectively. The drawing mode parameter has the values in the table below:

Drawing Mode Parameter	Hex Codes	Drawing Method
0	30	Turn the dots of the line "on" (normal draw)
1	31	Turn the dots of the line "off" (erase)
128	31 32 38	Reverse the dots of the line (exclusive-or)

The type parameter is used to create various line effects. The type selector is interpreted as an 8-bit binary number by the display program. Each time a dot is to be drawn, the program checks the most significant bit (the eighth bit, bit 7); if the bit is on, the dot is drawn; if off, the dot is not drawn. Then the type selector byte is rotated left in preparation for the next dot. This action allows drawing with dotted, dashed, dotted-dashed, or other fancy effects. The table on the following page presents examples of types which may be used.

Drawing Type Parameter	Hex Codes	Effect
255	32 35 35	Solid lines
170	31 37 30	Dotted lines
240	32 34 30	Dashed lines
228	32 32 38	Dashed-dotted lines

Upon power-up, the drawing mode is set to "on" and the line type to solid. The complete escape sequence is from 7 to 10 characters long.

Line drawing is accomplished by specifying the new endpoint of the line, (X,Y). The line is drawn from the graphics cursor position to the new endpoint. The line command causes a line of the specified line type to be drawn, erased (or "drawn in black" if you prefer), or toggled. Of course, for an erasure to be effective, the specified coordinates must agree exactly with those specified when the original draw command was issued. After a line command, the graphics cursor is moved to the new endpoint. This permits a sequence of connected line segments to be easdrawn. The complete escape sequence is from 3 to 10 characters long.

Marker drawing is accomplished by specifying the center of the marker as (X,Y) and the marker type. The marker type is the internal character number of the character to be written as the marker. If a marker type is sent as 0 or omitted entirely, then a single point is drawn as the marker. The specified marker, centered on the given coordinate, is drawn, erased, or toggled depending on the drawing mode; the drawing type is ignored. Of course, if an erasure is attempted, the specified coordinates must agree exactly with those specified when the original draw command was issued. A few of the 256 marker type parameters which can be sent are presented in the table below:

Marker Type Parameter	Hex Codes	Marker
omitted	—	A single point
0	30	A single point
10	31 30	*
11	31 31	+
79	37 39	o
88	38 38	x

The complete escape sequence is 3 to 13 characters long.

The Draw Arc command has six parameters. They are, in order, radius, initial x, initial y, ending x, ending y, and aspect ratio. If only the radius is specified, a circle will be drawn centered on the cursor location. The circle will have an aspect ratio of 3:2, which will give the appearance of a true circle on the screen, and the drawing mode and type will be whatever was specified in a Set Drawing Mode and Type command (default is to draw a solid line). If the radius is specified, then followed by five semicolons and an aspect ratio parameter, the result will be a circle of the specified aspect ratio. The method of calculating the aspect ratio parameter will be explained below.

Specifying starting and ending coordinates will cause a circular arc to be drawn in a clockwise direction. The arc will start exactly on the specified starting coordinate, will be centered on the graphics cursor position, and will end as near as possible to the specified ending coordinate. A non-zero radius must be specified, but it is a dummy parameter having no effect. An aspect ratio may be specified if desired.

The method of calculating aspect ratio parameters is as follows: First express the desired aspect ratio in the form x:y. (Recall that 3:2 will give a visually correct circle, and will be used if you do not specify otherwise.) Square the y value and convert it to hex or binary. This is the low byte of the intermediate value. Square the x value and convert it. This is the high byte. Take the resulting two byte hex or binary number and convert it back to decimal, then insert that into the arc command as the usual string of ASCII digits.

An alternative method which may be easier is to square and convert to hex as described above, then insert the two bytes, low byte first, directly into the command, the bytes preceded by a single equals sign (= LO HI). This uses the alternate method of passing parameters which was described earlier.

Some sample values which may be used are presented in the table on the following page.

Aspect Parameter	Hex Codes	Effect
omitted	—	x:y :: 3:2 i.e. visually correct circle
0	30	x:y :: 3:2 i.e. visually correct circle
2308	32 33 30 38	x:y :: 3:2 i.e. visually correct circle
1033	31 30 33 33	x:y :: 2:3 i.e. visually 2:4.5 ellipse
1028	31 30 32 38	x:y :: 2:2 i.e. true circle

The Graphics Screen Peek escape sequence is used to read a byte of pixel data directly from the display memory. The peek sequence specifies the (X,Y) coordinate; two bytes are returned: the first byte is the pixel data value of the complete byte in which the (X,Y) coordinate lies; the second byte is a mask. ANDing the two bytes will retrieve the correct pixel. It is not possible to read the contents of the attribute memory; only the pixel memory is accessible.

The Graphics Screen Poke escape sequence is used to write a byte of data directly to the display memory. The poke sequence specifies the (X,Y) coordinate, a data byte, and an optional attribute value. The data byte is written to the display memory at the byte in which the (X,Y) coordinate lies. At the same time the least significant two bits of the attribute value will be written to the attribute memory, but only if bit 2 (that is, the third bit) of the attribute value is high.

Escape Sequence Summary

A summary of the escape sequence is provided in the table on the following pages.

Function	ASCII Chars	Hex Codes	Char Count
Sequences for Cursor Movement			
Cursor up	ESC [A	1B 5B 41	3
Cursor down	ESC [B	1B 5B 42	3
Cursor right	ESC [C	1B 5B 43	3
Cursor left	ESC [D	1B 5B 44	3
Cursor left	BS (same as AH)	08	1
Cursor home (top left)	ESC [H	1B 5B 48	3
Cursor tab right	HT (same as AI)	09	1
Cursor position (ASCII/ANSI)	ESC [y ; x f	1B 5B (y+1) 3B (x+1) 66	3-8
	or ESC [y ; x H	1B 5B (y+1) 3B (x+1) 48	3-8
Cursor position (binary)	ESC = y x	1B 3D (y+20) (x+20)	4
Sequences for Erasing			
Clear screen, turn off all high-lighting, and home cursor	FF (same as AL)	0C	1
Erase entire screen	ESC [2 J	1B 5B 32 4A	4
Erase to end of screen	ESC [J	1B 5B 4A	3
Erase to end of line	ESC [K	1B 5B 4B	3
Sequences for Editing			
Insert line	ESC [L	1B 5B 4C	3
Delete line	ESC [M	1B 5B 4D	3
Highlighting and Video Command Sequences			
Reverse screen	ESC ; Y	1B 3B 59	3
Normal screen	ESC ; Q	1B 3B 51	3
Start single attribute	ESC [s m	1B 5B s 6D	4
Start multiple attributes	ESC [s1 ; s2 ; . . . m		4-12
Parameters: Intensity	1	31	
Underline	4	34	
Blink	5	35	
Reverse	7	37	
None	0	30	
End all attributes	ESC [m	1B 5B 6D	3
Set Intensity attribute			
Normal dim, attribute bright	ESC ; P	1B 3B 50	3
Normal bright, attribute dim	ESC ; X	1B 3B 58	3

Table Continued

Function		ASCII Chars	Hex Codes	Char Count
Font Command Sequences				
Choose which font will be:				
Normal font		ESC (0,1 or 2	1B 28 30,31 or 32	3
Extended font		ESC) 0,1 or 2	1B 29 30,31 or 32	3
Remap normal to extended font		SO (same as ^N)	0E	1
Restore normal font		SI (same as ^O)	0F	1
Miscellaneous Command Sequences				
Reset display		ESC c NUL	1B 63 00	3
Screen saver	on	ESC ; E	1B 3B 45	3
	off	ESC ; M	1B 3B 4D	3
Set scrolling region				
Top		ESC ; t	1B 3D 74	3
Bottom		ESC ; \	1B 3D 5C	3
Key click	on	ESC ; Z	1B 3D 5A	3
	off	ESC ; R	1B 3D 52	3
Auto key repeat				
	on	ESC ; [	1B 3D 5B	3
	off	ESC ; S	1B 3D 53	3
Ring "bell"		BEL (same as ^G)	07	1
Turn selected mode on/off		ESC ; s	1B 3B selector	3
Modes:				
Overwrite	on	H	48	
	off	@	40	
Auto Newline	on	L	4C	
	off	D	44	
Smooth Scroll		K	4b	
Jump Scroll		C	43	
Cursor	on	I	49	
	off	A	41	
	blink	J	4A	
	no blink	B	42	
Enter transparent mode		ESC ; T	1B 3B 54	3
User command		ESC :	1B 3A ...	2 min.
Return Version Number		ESC ; v	1B 3B 76	3

Table Continued

Function	ASCII Chars	Hex Codes	Char Count
Character Set Sequences (60 font)			
US/UK	ESC ; U	1B 3B 55	3
AZERTY	ESC ;]	1B 3B 5D	3
Scandinavian	ESC ; V	1B 3B 56	3
Portuguese/Spanish	ESC ; A	1B 3B 5E	3
Memory Related Command Sequences			
Poke data to address	ESC > a; d M	1B 3E a 3B d 4D	3-12
Poke data to font char & line	ESC > c; l; d F	1B 3E c 3B l 3B d 46	3-13
Peek from address	ESC < a M	1B 3C a 4D	3-8
Peek from font char & line	ESC < c; 1 F	1B 3C c 3B l 46	3-9
Graphics Command Sequences			
Move graphics cursor to (X,Y)	ESC ? x; y C	1B 3F x 3B y 43	3-10
Set drawing mode and type	ESC ? m; t T	1B 3F m 3B t 54	3-10
Modes:			
Set dots on	0	30	
Set dots off	1	31	
Reverse dots	128	31 32 38	
Types:			
Solid	255	32 35 35	
Dotted	170	31 37 30	
Dashed	240	32 34 30	
See description for others			
Draw line from cursor to (X,Y)	ESC ? x; y L	1B 3F x 3B y 4C	3-10
Draw a point at (X,Y)	ESC ? x; y M	1B 3F x 3B y 4D	3-10
Draw marker i at (X,Y)	ESC ? x; y; i M	1B 3F x 3B y 3B i 4D	3-14
Draw circle at cursor, radius r	ESC ? r O	1B 3F r 4F	3-6
Draw arc from start (X,Y) to end (X,Y) with aspect ratio	ESC ? r; x; y; x; y; a O	1B 3F r 3B x 3B y 3B x 3B a 4F	3-27
Graphics screen peek at (X,Y)	ESC ? x; y R	1B 3F x 3B y 52	3-10
Graphics screen poke to (X,Y) of data d, attribute a	ESC ? x; y; d; a W	1B 3F x 3B y 3B d 3B a 57	3-16

C Keyboard Codes

US/UK ENCODING

Legend	NSNC	S	C	SC	Legend	NSNC	S	C	SC
HELP	C0	C1	C2	C3	RETN	0D	0D	0D	0D
F1	D4	D5	D6	D7	DEL	7F	7F	7F	7F
F2	D8	D9	DA	DB	CTRL				
F3	DC	DD	DE	DF	CAPS	80	80	80	80
F4	E0	E1	E2	E3	A	61	41	01	01
F5	E4	E5	E6	E7	S	73	53	13	13
F6	E8	E9	EA	EB	D	64	44	04	04
F7	EC	ED	EE	EF	F	66	46	06	06
F8	F0	F1	F2	F3	G	67	47	07	07
F9	FC	FD	FE	FF	H	68	48	08	08
F10	90	91	92	93	J	6A	4A	0A	0A
F11	F4	F5	F6	F7	K	6B	4B	0B	0B
F12	F8	F9	FA	FB	L	6C	4C	0C	0C
F13	94	95	96	97	; :	3B	3A	3B	3A
F14	C4	C5	C6	C7	' "	27	22	27	22
F15	C8	C9	CA	CB	\ |	5C	7C	1C	1C
F16	CC	CD	CE	CF	NO SCRL	84	85	86	87
F17	D0	D1	D2	D3	SHIFT				
ESC	1B	1B	1B	1B	Z	7A	5A	1A	1A
1 !	31	21	31	21	X	78	58	18	18
2 @	32	40	32	00	C	63	43	03	03
3 #	33	23	33	23	V	76	56	16	16
4 $	34	24	34	24	B	62	42	02	02
5 %	35	25	35	25	N	6E	4E	0E	0E
6 ^	36	5E	36	1E	M	6D	4D	0D	0D
7 &	37	26	37	26	, <	2C	3C	2C	3C
8 *	38	2A	38	2A	. >	2E	3E	2E	3E
9 (	39	28	39	28	/ ?	2F	3F	2F	3F
0)	30	29	30	29	SHIFT				
— _	2D	5F	2D	1F	LF	0A	0A	0A	0A
= +	3D	2B	3D	2B	SPACE	20	20	20	20
` ~	60	7E	00	1E	NUM LK †	81	81	81	81
BS	08	08	08	08	NUM LK	82	82	82	82
BREAK	88	89	8A	8B	7	B7	B7	B7	B7
TAB	8C	8D	8E	8F	8	B8	B8	B8	B8
Q	71	51	11	11	9	B9	B9	B9	B9
W	77	57	17	17	—	AD	AD	AD	AD
E	65	45	05	05	4	B4	B4	B4	B4
R	72	52	12	12	5	B5	B5	B5	B5
T	74	54	14	14	6	B6	B6	B6	B6
Y	79	59	19	19	,	AC	AC	AC	AC
U	75	55	15	15	1	B1	B1	B1	B1
I	69	49	09	09	2	B2	B2	B2	B2
O	6F	4F	0F	0F	3	B3	B3	B3	B3
P	70	50	10	10	ENTER	83	83	83	83
[{	5B	7B	1B	1B	0	B0	B0	B0	B0
] }	5D	7D	1D	1D	.	AE	AE	AE	AE

†Down position (other in up position)

SCANDINAVIAN ENCODING

US/UK Legend	Char	NSNC	S	C	SC
HELP	HELP	C0	C1	C2	C3
F1	F1	D4	D5	D6	D7
F2	F2	D8	D9	DA	DB
F3	F3	DC	DD	DE	DF
F4	F4	E0	E1	E2	E3
F5	F5	E4	E5	E6	E7
F6	F6	E8	E9	EA	EB
F7	F7	EC	ED	EE	EF
F8	F8	F0	F1	F2	F3
F9	F9	FC	FD	FE	FF
F10	F10	90	91	92	93
F11	F11	F4	F5	F6	F7
F12	F12	F8	F9	FA	FB
F13	F13	94	95	96	97
F14	F14	C4	C5	C6	C7
F15	F15	C8	C9	CA	CB
F16	F16	CC	CD	CE	CF
F17	F17	D0	D1	D2	D3
ESC	ESC	1B	1B	1B	1B
1 !	1 !	31	21	31	21
2 @	2 "	32	22	32	22
3 #	3 #	33	23	33	23
4 $	4 $	34	24	34	24
5 %	5 %	35	25	35	25
6 ^	6 &	36	26	36	26
7 &	7 /	37	2F	37	2F
8 *	8 (	38	28	38	28
9 (	9)	39	29	39	29
0)	0 =	30	3D	30	3D
— _	? +	2B	3F	30	3D
= +	` @	60	40	00	00
` ~	< >	3C	3E	3C	3E
BS	BS	08	08	08	08
BREAK	BREAK	88	89	8A	8B
TAB	TAB	8C	8D	8E	8F
Q	Q	71	51	11	11
W	W	77	57	17	17
E	E	65	45	05	05
R	R	72	52	12	12
T	T	74	54	14	14
Y	Y	79	59	19	19
U	U	75	55	15	15
I	I	69	49	09	09
O	O	6F	4F	0F	0F
P	P	70	50	10	10
[{	{ [	7D	5D	1D	1D
] }	~	7E	5E	1E	1E

US/UK Legend	Char	NSNC	S	C	SC
RETN	RETN	0D	0D	0D	0D
DEL	DEL	7F	7F	7F	7F
CTRL	CTRL				
CAPS	CAPS	80	80	80	80
A	A	61	41	01	01
S	S	73	53	13	13
D	D	64	44	04	04
F	F	66	46	06	06
G	G	67	47	07	07
H	H	68	48	08	08
J	J	6A	4A	0A	0A
K	K	6B	4B	0B	0B
L	L	6C	4C	0C	0C
; :	| \	7C	5C	1C	1C
' "	{ [	7B	5B	1B	1B
\ |	' *	27	2A	27	2A
NO	NO				
SCRL	SCRL	84	85	86	87
SHIFT	SHIFT				
Z	Z	7A	5A	1A	1A
X	X	78	58	18	18
C	C	63	43	03	03
V	V	76	56	16	16
B	B	62	42	02	02
N	N	6E	4E	0E	0E
M	M	6D	4D	0D	0D
, <	, ;	2C	3B	2C	3B
. >	. :	2E	3A	2E	3A
/ ?	— _	2D	5F	2D	1F
SHIFT	SHIFT				
LF	LF	0A	0A	0A	0A
SPACE	SPACE	20	20	20	20
NUM LK	NUM LK †	81	81	81	81
NUM LK	NUM LK	82	82	82	82
7	7	B7	B7	B7	B7
8	8	B8	B8	B8	B8
9	9	B9	B9	B9	B9
—	—	AD	AD	AD	AD
4	4	B4	B4	B4	B4
5	5	B5	B5	B5	B5
6	6	B6	B6	B6	B6
,	,	AC	AC	AC	AC
1	1	B1	B1	B1	B1
2	2	B2	B2	B2	B2
3	3	B3	B3	B3	B3
ENTER	ENTER	83	83	83	83
0	0	B0	B0	B0	B0
.	.	AE	AE	AE	AE

†Down position (other in up position)

SPANISH/PORTUGESE ENCODING

US/UK Legend	Char	NSNC	S	C	SC
HELP	HELP	C0	C1	C2	C3
F1	F1	D4	D5	D6	D7
F2	F2	D8	D9	DA	DB
F3	F3	DC	DD	DE	DF
F4	F4	E0	E1	E2	E3
F5	F5	E4	E5	E6	E7
F6	F6	E8	E9	EA	EB
F7	F7	EC	ED	EE	EF
F8	F8	F0	F1	F2	F3
F9	F9	FC	FD	FE	FF
F10	F10	90	91	92	93
F11	F11	F4	F5	F6	F7
F12	F12	F8	F9	FA	FB
F13	F13	94	95	96	97
F14	F14	C4	C5	C6	C7
F15	F15	C8	C9	CA	CB
F16	F16	CC	CD	CE	CF
F17	F17	D0	D1	D2	D3
ESC	ESC	1B	1B	1B	1B
1 !	1 !	31	21	31	21
2 @	2 "	32	22	32	22
3 #	3 #	33	23	33	23
4 $	4 $	34	24	34	24
5 %	5 %	35	25	35	25
6 ^	6 &	36	26	36	26
7 &	7 '	37	27	37	27
8 *	8 (	38	28	38	28
9 (	9)	39	29	39	29
0)	0 _	30	5F	30	1F
- _	— =	2D	3D	2D	3D
= +	~	5E	7E	1E	1E
` ~	@ `	40	60	00	00
BS	BS	08	08	08	08
BREAK	BREAK	88	89	8A	8B
TAB	TAB	8C	8D	8E	8F
Q	Q	71	51	11	11
W	W	77	57	17	17
E	E	65	45	05	05
R	R	72	52	12	12
T	T	74	54	14	14
Y	Y	79	59	19	19
U	U	75	55	15	15
I	I	69	49	09	09
O	O	6F	4F	0F	0F
P	P	70	50	10	10
[{	{ [	7B	5B	1B	1B
] }	; +	3B	2B	3B	2B
RETN	RETN	0D	0D	0D	0D

US/UK Legend	Char	NSNC	S	C	SC
DEL	DEL	7F	7F	7F	7F
CTRL	CTRL				
CAPS	CAPS	80	80	80	80
A	A	61	41	01	01
S	S	73	53	13	13
D	D	64	44	04	04
F	F	66	46	06	06
G	G	67	47	07	07
H	H	68	48	08	08
J	J	6A	4A	0A	0A
K	K	6B	4B	0B	0B
L	L	6C	4C	0C	0C
; :	¦ \	7C	5C	1C	1C
' "	{]	7D	5D	1D	1D
\ ¦	: *	3A	2A	3A	2A
NO -	NO -				
SCRL	SCRL	84	85	86	87
SHIFT	SHIFT				
Z	Z	7A	5A	1A	1A
X	X	78	58	18	18
C	C	63	43	03	03
V	V	76	56	16	16
B	B	62	42	02	02
N	N	6E	4E	0E	0E
M	M	6D	4D	0D	0D
, <	, <	2C	3C	2C	3C
. >	. >	2E	3E	2E	3E
/ ?	/ ?	2F	3F	2F	3F
SHIFT	SHIFT				
LF	LF	0A	0A	0A	0A
SPACE	SPACE	20	20	20	20
NUM LK	NUM LK†	81	81	81	81
NUM LK	NUM LK	82	82	82	82
7	7	B7	B7	B7	B7
8	8	B8	B8	B8	B8
9	9	B9	B9	B9	B9
—	—	AD	AD	AD	AD
4	4	B4	B4	B4	B4
5	5	B5	B5	B5	B5
6	6	B6	B6	B6	B6
,	,	AC	AC	AC	AC
1	1	B1	B1	B1	B1
2	2	B2	B2	B2	B2
3	3	B3	B3	B3	B3
ENTER	ENTER	83	83	83	83
0	0	B0	B0	B0	B0
.	.	AE	AE	AE	AE

†Down position (other in up position)

AZERTY ENCODING

US/UK Legend	Char	NSNC	S	C	SC
HELP	HELP	C0	C1	C2	C3
F1	F1	D4	D5	D6	D7
F2	F2	D8	D9	DA	DB
F3	F3	DC	DD	DE	DF
F4	F4	E0	E1	E2	E3
F5	F5	E4	E5	E6	E7
F6	F6	E8	E9	EA	EB
F7	F7	EC	ED	EE	EF
F8	F8	F0	F1	F2	F3
F9	F9	FC	FD	FE	FF
F10	F10	90	91	92	93
F11	F11	F4	F5	F6	F7
F12	F12	F8	F9	FA	FB
F13	F13	94	95	96	97
F14	F14	C4	C5	C6	C7
F15	F15	C8	C9	CA	CB
F16	F16	CC	CD	CE	CF
F17	F17	D0	D1	D2	D3
ESC	ESC	1B	1B	1B	1B
1 !	& 1	26	31	26	31
2 @	é 2	7B	32	7B	32
3 #	" 3	22	33	22	33
4 $	' 4	27	34	27	34
5 %	(5	28	35	28	35
6 ∧	- 6	5D	36	1D	36
7 &	è 7	7D	37	7D	37
8 *	! 8	21	38	21	38
9 (	ç 9	5C	39	1C	39
0)	à 0	40	30	00	30
— _	) °	29	5B	29	1B
= +	_ +	2D	5F	2D	1F
` ~	> <	3E	3C	3E	3C
BS	BS	08	08	08	08
BREAK	BREAK	88	89	8A	8B
TAB	TAB	8C	8D	8E	8F
Q	A	61	41	01	01
W	Z	7A	5A	1A	1A
E	E	65	45	05	05
R	R	72	52	12	12
T	T	74	54	14	14
Y	Y	79	59	19	19
U	U	75	55	15	15
I	I	69	49	09	09
O	O	6F	4F	0F	0F
P	P	70	50	10	10
[{	∧ ~	5E	7E	1E	1E
] }	\ *	60	2A	60	2A

US/UK Legend	Char	NSNC	S	C	SC
RETN	RETN	0D	0D	0D	0D
DEL	DEL	7F	7F	7F	7F
CTRL	CTRL				
CAPS	CAPS	80	80	80	80
A	Q	71	51	11	11
S	S	73	53	13	13
D	D	64	44	04	04
F	F	66	46	06	06
G	G	67	47	07	07
H	H	68	48	08	08
J	J	6A	4A	0A	0A
K	K	6B	4B	0B	0B
L	L	6C	4C	0C	0C
; :	M	6D	4D	0D	0D
' "	ù %	7C	25	7C	25
\ |	$ #	24	23	24	23
NO	NO				
SCRL	SCRL	84	85	86	87
SHIFT	SHIFT				
Z	W	77	57	17	17
X	X	78	58	18	18
C	C	63	43	03	03
V	V	76	56	16	16
B	B	62	42	02	02
N	N	6E	4E	0E	0E
M ,	, ?	2C	3F	2C	3F
, <	; .	3B	2E	3B	2E
. >	: /	3A	2F	3A	2F
/ ?	= +	3D	2B	3D	2B
SHIFT	SHIFT				
LF	LF	0A	0A	0A	0A
SPACE	SPACE	20	20	20	20
NUM LK	NUM LK †	81	81	81	81
NUM LK	NUM LK	82	82	82	82
7	7	B7	B7	B7	B7
8	8	B8	B8	B8	B8
9	9	B9	B9	B9	B9
—	—	AD	AD	AD	AD
4	4	B4	B4	B4	B4
5	5	B5	B5	B5	B5
6	6	B6	B6	B6	B6
,	,	AC	AC	AC	AC
1	1	B1	B1	B1	B1
2	2	B2	B2	B2	B2
3	3	B3	B3	B3	B3
ENTER	ENTER	83	83	83	83
0	0	B0	B0	B0	B0
.	.	AE	AE	AE	AE

†Down position (other in up position)

Glossary

ambiguous filename (afn): A filename in CP/M which, because it contains wildcard characters, can represent more than one unique file on a given diskette. See *unambiguous filename*.

application program: a program which manipulates data to achieve some end, such as word processing, graphing, generating financial spreadsheets, or telecommunication. An application program is said to run in the environment of a given operating system. See *operating system* and *system program*.

ASCII: The American Standard Code for Information Interchange; a standard correspondence of integers maintained within computers to characters within a font, or character set. The ASCII code includes 128 different characters, which can be represented in any base. Common bases include binary (base 2), octal (base 8) decimal (base 10) and hexadecimal (base 16). Because it is technically easier to handle telecommunications with base 2, ASCII is associated most frequently with its binary representations. The term 'seven-bit ASCII' refers to the representation of each of the 128 (base 10) different characters in a unique string of seven 1's and 0's. Eight-bit ASCII refers to this same string of seven, but with the addition of an eighth bit, called a parity bit. The parity bit is used in telecommunications for data error checking. See *telecommunications*.

bit: A contraction of "binary digit." A digit in the base 2 number system; that is, '0' or '1'. A bit is the most elemental unit of data which digital computers manipulate.

bit-mapped graphics: The method with which individual bits of screen data are stored and "mapped," or made to correspond, to individual pixels displayed on a video display device. The value of each bit may be individually set in order to control the presentation at the screen. See *pixel, display processor* and *random acccess memory*.

bootable: A diskette is said to be bootable when a cold boot may be accomplished from it; that is, the operating system has been written on

the diskette. Only if the operating system has been written onto a diskette can the computer load it into internal memory.

byte: A string of eight bits, or binary digits. Since there are eight bits in a byte, and a bit can be either a '0' or a '1', a byte can represent one of 2 raised to the power of 8, or 256 (decimal) different values.

central processing unit (CPU): The processor of the computer which performs the arithmetic operations on data moved into and out of central memory. It provides the "number-crunching" power of the computer. See *processor.*

Centronics-type parallel port: A parallel port which has become a de facto standard in the microcomputer industry. See *port* and *parallel port.*

cold boot: A series of steps undergone by a computer system in which the operating system is completely loaded into central memory. See *warm boot.*

command line: A syntactically correct entry of a system command, and any associated command tail, to the operating system. See *command tail.*

command tail: A parameter, filename, or other meaningful extension or modifier to a system command. See *command line.*

control character: A character which is interpreted by the operating system in a special way, insofar as the character specifies an action to be taken by or state change in a device.

cursor: A graphic symbol presented on a display screen which functions as a marker to indicate where the next character entered from the keyboard will be displayed. A cursor can also be used to mark a point of interest on a display screen.

data: A representation of an external thing such as a number, word, or picture which can be transmitted to and be manipulated by a computer system. See *instruction* and *information.*

default: A value or option provided by an operating system or program when none has been specified by the user.

default drive: The disk drive which is the currently selected drive relative to the operating system, indicated by the letter included in the system prompt presented to the display screen.

delimiter: A character or symbol which functions syntactically as a separator of components of command lines. See *command line*.

device: A component of hardware, or a functional unit of hardware. In this Guide, the term has been used in the latter sense. Printers, plotters, and modems are all devices.

device driver: A software code module which is used to "drive" or control an external (to the CPU) device such as a printer or keyboard. Referred to as a 'physical device' in the *CP/M Plus User's Guide*.

directory: A list of files stored on a diskette.

disk: See *diskette*.

disk drive: A peripheral device which uses one or more magnetic disks as the storage medium for data. Data is "written" on and "read" from a given disk with a "read-write head" which functions in a similar fashion to a magnetic head of a tape recorder. The term *disk drive* has been used in this Guide when discussing drives for flexible, or "floppy" disks or diskettes. See *Winchester disk drive*.

diskette: Referred to as a floppy disk. A flexible disk made of a plastic substrate coated with a magnetic medium, which is used for the storage of data and instructions. The disk proper is protected by a permanent plastic jacket; the disk/plastic jacket assembly is generally handled and stored within a disk envelope which must be removed prior to placing the diskette in a disk drive.

display processor: The processor of the computer which controls the operation of the video display of the computer. See *processor*.

environment: As used when discussing programs, the collection of resources made available by a given operating system.

file: A named, structured collection of data and/or instructions which can be transferred to, stored at, and retrieved from a peripheral device such as a disk drive or printer.

font: A character set considered in respect to a particular style and type size with which it is represented.

format: 1. The organization of data on a diskette. 2. To prepare a diskette so that it may hold data in an organized fashion.

hang: An element of computer slang which refers to an unplanned suspension of the normal flow of an application program or of the operating system.

information: That which is created through human analysis and interpretation of data.

instruction: An individual unit or element of a program which specifies an operation to be performed on data by a computer.

internal slot: A port of a CPU whose associated connecting hardware is positioned inside the physical cabinet of computer, and is therefore accessible only by removing a cover or panel of the cabinet.

interpreter: A program which translates the source code of a program (written in a specific computer language) one statement at a time, into a form executable by the computer. This executable form is immediately executed as it is generated.

kilobyte: One-thousand-twenty-four bytes, denoted as 1K.

logical device: A symbolic address or identifier within an operating system which may be associated with a device driver.

modem: A contraction of modulator-demodulator; an electronic device which allows a computer or terminal to transmit and receive data over telephone lines. When transmitting, a modem takes in electrical pulses representing data from the computer, provides a carrier wave for the data and modulates (changes in a way which can reflect data) the carrier wave. During reception, a modem takes in the modulated carrier wave and converts it into electrical pulses for the computer or terminal.

operating system: A set of interrelated programs which collectively control the hardware components of a computer; oversee the input and output of data; maintain and keep track of its own resources for applications programs; provide a software interface between the hardware of the computer and the human user of the computer.

parallel port: A port which is designed to pass data several bits (typically 8 bits) at a time, each bit through its own channel and associated wire. See *serial port*.

parse: To use software to break down an instruction written in a high level programming language into its fundamental elements, so that the instruction may be more readily executed. See *command line*.

pixel: A contraction of "picture element," sometimes referred to as 'pel'. A point on a video display screen which can be individually addressed. It also may refer to the storage cell or location within the memory apportioned for the video display data. See *display processor*, *random access memory* and *bit-mapped graphics*.

port: Hardware circuitry which functions as an interface to pass data between a CPU and external devices which are potentially connected to the CPU. A connector or similar hardware is often associated with a port so that external devices can be easily interchanged.

processor: A hardware component which executes machine instructions to manipulate data. See *central processing unit* and *display processor*.

program: A series of instructions to a computer. See *application program* and *system program*.

prompt: A message presented to the display screen which is generated by the operating system or by a program. The prompt signifies that an action has been completed, and that the operating system or program is awaiting further input from the computer user.

random access memory (RAM): Generally high speed, read-write media in which the access time for a given cell or location is virtually the same for any other location. RAM refers to the method of accessing data, not the media in which data is stored, although the term has come to be associated with physical semiconductor memory chips.

real time clock: Circuitry within a computer which maintains the calendar date and time of day (hence real time), as opposed to the circuitry which "clocks" or controls the cyclic function of a processor.

resident command: A system command which is an intrinsic part of the operating system, insofar as the command is immediately available from

internal memory whenever the user is interacting directly with the operating system. See *transient command* and *system command.*

serial port: A port which is designed to pass data sequentially, one bit at a time through a single channel and associated wire. See *parallel port.*

system command: A system program which is made available to the user of a computer system. See *system program.*

system program: A program which is a part of the operating system, insofar as it makes available operating system resources to the user or to an application program. See *application program* and *operating system.*

telecommunications: The transmission of data between geographically separated locations, often through the use of a telephone system and modems. See *modem* and *ASCII.*

transient command: A system command which is moved into and out of internal memory as necessary when invoked by the user who is interacting directly with the operating system. See *resident command* and *system command.*

unambiguous filename (ufn): A filename in CP/M which specifies one and only one unique file on a given diskette, since it contains no wildcard characters. See *ambiguous filename.*

utility: A module of system software which has been created because of a need to perform some commonly-required task. Some utilities are "built-in" to the operating system, while others are autonomous programs. For example, the DIR utility is a CP/M built-in command which is used to provide a list of the files on a given drive. The CP/M DIR.COM utility program is an autonomous program used to access "extended" directory information with a variety of options, such as information about the size and attributes of files on any or all drives. See *operating system.*

warm boot: The partial reloading of an operating system. See *cold boot.*

wildcard: A special character which can represent an indeterminate character or group of characters within a file specification. In CP/M, the '?' character is a wildcard which can represent any individual character in a file specification; the '*' character can represent a series of characters. Use of a wildcard creates an ambiguous filename. See *ambiguous filename* and *unambiguous filename.*

Winchester disk drive: A hard (rigid) disk drive design which has become the most popular used in the microcomputer industry. The drive may have one or more non-removable disks or "platters" which are continuously rotated when power is applied to the drive. A magnetic read-write head "takes off" and "lands" on the surface of each platter when power is applied and removed, respectively, from the drive. Each head is positioned from the periphery toward the center of each platter in order to read or write data. See *disk drive*.

write-protect tab: A piece of opaque removable tape which is used to cover the write protect notch of a diskette so that no data can be written onto the diskette.

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