OS-9
Level Two
Operating
System

Getting Started
With
OS-9

About This Manual

Using Your OS-9 Handbook

If you feel that starting a new computer *operating system* is a "scary business," relax. This handbook is designed to put you at ease when using OS-9. It is divided into two parts—each part has a different purpose.

What is in Part 1

"Part 1" of this handbook is designed to show you, step by step, how to set up and use your computer with OS-9. Follow the steps as they are described, and OS-9 is your obedient servant. The few instructions in "Part 1" are all that many OS-9 users ever need.

What is in Part 2

"Part 2" is for the more adventurous. OS-9 has an extensive repertoire of commands and functions to create and manage data and to make use of *peripherals* (devices you can connect to your computer, such as disk drives and printers). If you want to learn more about the operating system, and if you like to explore, "Part 2" is for you. You learn other useful OS-9 commands that prepare you to make use of all the functions and commands described in *OS-9 Commands*.

Contents

Part 1

What You Need to Know About OS-9

What is an Operating System?

OS-9 is a disk *Operating System* (that's what OS stands for). An operating system is a group of programs acting as a message center and an interpreter. Using your instructions, an operating system manages the computer's working circuits.

In fact, thinking of OS-9 as your computer manager is helpful. The boss (that's you) gives orders. OS-9 (the manager) sees they get done.

To operate OS-9 you need at least one floppy disk drive attached to your computer. OS-9 is originally configured to recognize two floppy disk drives. Later, this handbook describes how to let OS-9 know if you have more than two floppy disk drives, or if you have other hardware (printers, modems, hard disks, and so on) you want it to recognize.

Instructing Your Operating System

You give your commands to OS-9 by typing them. Because OS-9 does exactly (and only) what you tell it, your entries must be precise and have perfect *syntax* (spelling and form). You must also be sure to give OS-9 every detail it needs to perform a task.

For instance, if you told your office manager to, "Make a phone call," what can the manager do? Obviously, not much that is helpful to you. The manager must know who to call, the phone number, and what to say. OS-9 is the same. It must have all the details before it can carry out your commands properly.

To show you how to instruct your operating system, the handbook asks you to type characters, words, and lines on your keyboard. When you do, you are issuing *commands* to OS-9. Technically, a command is only one word that describes the action you want OS-9 to perform. A *command line* is a command with all of its qualifiers.

In this manual, command lines usually contain words in boxes, such as ENTER. These indicate keys that you press.

The manual also asks you to **press** key sequences. For instance, when asked to press CTRL C, hold down the key marked CTRL, and while holding down CTRL, press C.

Characters that are not in boxes are typed individually. For instance, if you are asked to type the command line format /d0 ⌈ENTER⌉, press each key individually (⌈F⌉ ⌈O⌉ ⌈R⌉ ⌈M⌉ ⌈A⌉ ⌈T⌉ ⌈ ⌉ ⌈/⌉ ⌈d⌉ ⌈0⌉ ⌈ENTER⌉).

If you make a mistake while typing, use ⌈←⌉ to move back to the error. Then retype that portion of the line.

Using Application Programs and Computer Languages

A computer *application* is a program designed to accomplish specific tasks. There are application programs to help you write letters or documents (word processors), keep a mailing list (data managers), and keep financial records (accounting packages). There are also programs to help you study for a test, play a game, play music, draw a picture, and much more.

Such application programs usually require that you use OS-9 to start your computer. A few application programs let you start directly from the application diskette. Different programs can require different procedures, and you should check your application program's documentation for specific instructions.

Application programs have special screen displays and *menus* to instruct you, or that require you to perform a particular action, such as press a key. When you are operating from an application program, that program passes your instructions to OS-9. OS-9 manages the computer's operations in the background, and its functions are invisible to you.

You can also use computer *languages* to write your own application programs. BASIC is a language. If you read the *Color Computer Disk System* manual, you already know a bit about it. There are languages you can purchase to use with OS-9 to create programs, such as assembly language, Pascal, C, and BASIC-09.

Like application programs, each language has its own startup method. The manuals that come with the languages tell you how to get them running on your Color Computer 3.

Using Peripherals

OS-9 lets you control much more than your computer's operations. It also gives you control over other hardware devices such as disk drives, a printer, modems, windows, other terminals, and so on.

Each device has a "System Name," an abbreviation preceded by a slash (/). OS-9 can only recognize a device if you type its name exactly as shown below. See Chapter 7, "Customizing Your System" for information on how to tell OS-9 what devices you want it to handle.

System Name	Description
/P	A printer connected through your computer's RS-232 port. The RS-232 port is a *serial* port, and you must have a printer with a serial connection, such as the Radio Shack® DMP 430.
/T1	A data terminal or another computer acting as a terminal, connected through the RS-232 port of your computer. If you are using another computer as a terminal, it must run a terminal program that makes it perform as a terminal.
/T2	Another data terminal or another computer acting as a terminal, connected to an optional RS-232 communications pak in a Multi-Pak Interface. If you are using another computer as a terminal, it must run a terminal program that makes it perform as a terminal.
/T3	Another data terminal or another computer acting as a terminal, connected to the optional RS-232 communications pak in a Multi-Pak Interface. If you are using another computer as a terminal, it must run a terminal program that makes it perform as a terminal.
/M1	A modem using an optional 300-baud modem pak in the optional Multi-Pak Interface. A modem allows you to communicate with other computers either directly or over phone lines.

System Name	Description
/M2	Another modem using an optional 300-baud modem pak in the optional Multi-Pak Interface.
/D0	A floppy disk drive.
/D1	Another floppy disk drive
/W, /W1, /W2, /W3 /W4, /W5 /W6, /W7	Windows that you can establish on your OS-9 system. You use [CLEAR] to *page* among windows you create. See "Using Windows" in Chapter 7 and *OS-9 Windowing System Owner's Manual* for information on creating windows.

Why Use OS-9?

You now know that OS-9 is an operating system for your Color Computer. You might also have heard that, in the world of computer operating systems, OS-9 is a leader. Perhaps that is why you bought it. OS-9 stands out for several reasons. Some of its strong points are:

- *File* managing capabilities.

- *Multi-user* features. With OS-9, more than one person can use the same computer at the same time.

- *Multi-tasking*. OS-9 can handle several jobs at the same time.

- *Window* functions that let you divide your display screens into sections in which you can have one or more operations running, all at the same time.

- *Input/Output* capabilities. OS-9 can communicate with TVs and monitors, disk drives, printers, and other computers.

- A sophisticated repertoire of commands.

- Sophisticated programming languages.

If you are not familiar with such terms as files, multi-user, multi-tasking, and commands, don't worry. The handbook explains these terms and more.

Programmers like OS-9 because of its powerful features. It lets them show off all of their skills. As a result, another OS-9 feature is the wide range of excellent programs that you can use with the system.

How Much Do You Need to Know About OS-9?

You might wonder how much you really need to know to use OS-9. The answer varies with your needs, and with the application programs you intend to use.

However, regardless of how you intend to use your computer, there are some OS-9 procedures you must know. For instance, you must know how to load OS-9, how to prepare diskettes to store data, and how to make copies of data or entire diskettes. This part of your handbook makes these jobs easy.

Regardless of how careful you are, there are times when things go wrong. When this happens, OS-9 displays an *error message* on the screen. This part of the manual also helps you to understand error messages and what to do about them.
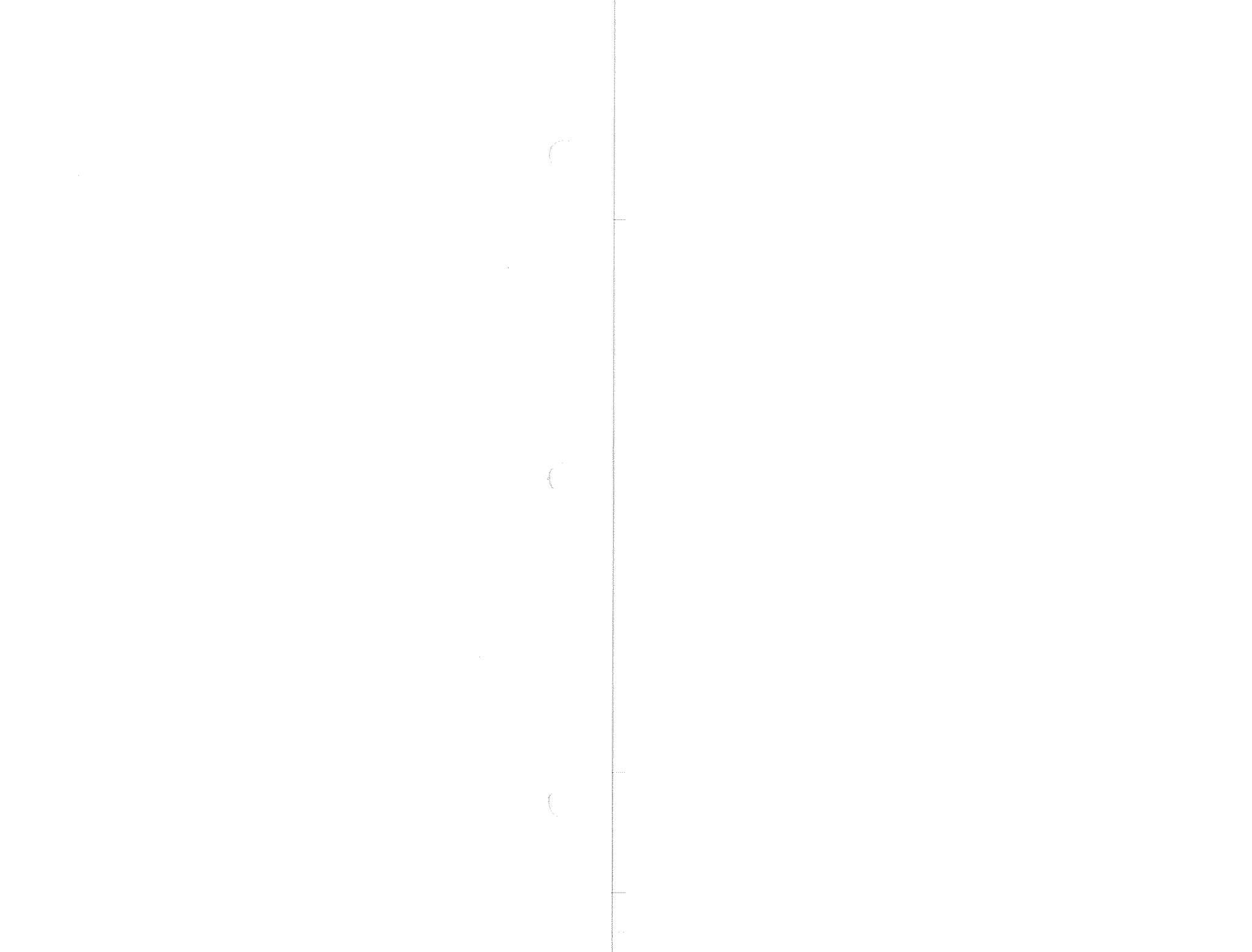
How to Start and Exit Your System

Starting your computer and initializing an operating system is called *booting*. In a sense, the computer is pulling itself up by its bootstraps.

To run OS-9, Level II, you must have a Color Computer 3 with at least one floppy disk drive. Your OS-9 system diskette includes modules to support the following Color Computer hardware:

- Up to 512K RAM

- A Keyboard

- An Alphanumeric Video Display

- A Color Graphics Display

- Floppy Disk Drives (one or two)

- Joysticks (one or two)

- A Serial Printer

- An RS-232C Communications Port

If you connect a Multi-Pak Interface to your computer, and use the CONFIG utility from your BASIC09/CONFIG diskette (see Chapter 7), OS-9 can support the following devices:

- As many as two external RS-232 communications cards

- As many as two modem paks

- As many as two additional floppy disk drives

    Note: The Multi-Pak Interface has four cartridge slots. A floppy disk controller must be in Slot 4. You can put modem paks, or RS-232 paks in Slots 1, 2, or 3.

Booting OS-9

Use the instructions in the *Color Computer Disk System* manual to turn on your computer system. After you do, the video screen displays a copyright message followed by the letters, ᴏK. This is Disk Extended Color BASIC's way of telling you that it is ready to get to work. It is waiting for your commands.

To load OS-9, follow these steps:

1. Insert the OS-9 System Master diskette into Drive 0.

2. At the ᴏK prompt, type:

   DOS ENTER

   OS-9 starts. If the DOS command returns a syntax error (SN? ERROR), be sure you entered the command correctly. If DOS still returns the error, check to make sure you have installed your disk cartridge properly.

3. After OS-9 displays its startup message, this prompt appears:

   yy/mm/dd hh:mm:ss
   Time?

4. Type the year, month, date, hours, minutes, and seconds in the format requested; then press ENTER. For instance, if the date and time is September 3, 1986, 1:22 p.m., type:

   86/09/03 13:22 ENTER

   Note that the time is entered in 24-hour notation and that the seconds (:SS) are optional.

   You can bypass this time and date prompt by only pressing ENTER. However, if you do, OS-9 cannot provide the correct date when you create and save data on disk. Also, it cannot provide the correct date and time for application programs that require them.

   After you enter the date and time, the OS-9 prompt appears and OS-9 is now in control and ready to accept a command.

   You should always keep the OS-9 System diskette in Drive 0 (/D0) while running OS-9 unless you have a hard disk containing your system files. An OS-9 System diskette is a backup copy of the OS-9 System Master diskette. The instructions for making copies are in the next chapter.

Rebooting OS-9

If you need to reboot OS-9 after the initial startup, press your computer's reset button (located at the right rear of the computer). Pressing the reset button one time causes the OS-9 boot message to reappear. The system then loads as it did originally. Be sure the System Master diskette is in Drive /D0 when you reboot.

Pressing the reset button twice returns the computer to Disk BASIC.

Exiting OS-9

In the same manner that you use OS-9 to start operations, you should use OS-9 to exit or close operations. For instance, if you are in the middle of a process, it is unwise to suddenly turn off your computer. Doing so can destroy files or garble disks.

You can usually terminate an operation by pressing [BREAK] or [CTRL] [E]. In some instances, you must let an operation complete its function before you can regain control of OS-9. If you are using an application program, that program's manual tells you how to exit the program to the OS-9 command level.

You should always be at the OS-9 command level to turn off your computer. Then follow these steps:

1. Be sure the OS-9 system prompt and cursor are displayed.

   Note: You can *turn off* the OS-9 cursor. If you or an application program has done so, the cursor does not display at the command level.

2. Take out any floppy diskettes from the disk drives, put them back in their protective envelopes, and store them in a safe place.

3. Turn off all the equipment attached to your computer such as a printer or disk drive(s); then turn off your TV or monitor. Last of all, turn off your computer and Multi-Pak Interface (if you have one). If you plug your equipment into a power strip, you can use the power strip switch to turn off all equipment at one time.

Upper- and Lowercase Characters

OS-9 can display both upper- and lowercase letters. However, you can tell it you want to use only uppercase. To do this, type:

    tmode upc [ENTER]

If you do this, you cannot type lowercase letters, and the system displays all uppercase letters. To switch back to both uppercase and lowercase, type:

    tmode -upc [ENTER]

Even when you are in the upper-/lowercase mode, you can switch to typing all uppercase by pressing [CTRL] [0]. Everything you type is now uppercase, but the computer can display both upper- and lowercase. Press [CTRL] [0] to switch back to upper-/lowercase.

If you want to type only one uppercase letter, hold down [SHIFT] while you press that letter.

It does not matter to OS-9 whether you type in uppercase or lowercase letters, or any combination of upper- and lowercase letters. For instance, instead of typing TMODE UPC, you can type tmode upc or Tmode UPC.

OS-9 Error Messages

Everyone makes a mistake now and then when typing commands. If you type something the operating system doesn't recognize, or if you ask it to do something it cannot do, it displays an *error message*. This message is a number that refers to the type of problem that OS-9 has encountered. For instance, if you type xxxx [ENTER] (which is nonsense to OS-9), the system displays:

    ERROR #216

If you don't know the meaning of the system error number you have two options: (1) you can look up the reference in *OS-9 Commands* under Appendix A, "Error Codes" or, (2) you can type:

    ERROR 216 [ENTER]

Either method shows you that Error #216 means "Path Name Not Found." OS-9 thought you wanted it to execute a command but it could not find one named xxxx.

Other OS-9 error messages tell you if you have used all of a disk's storage space, if the computer's memory is full, if you try to create two files with the same name, and so on.
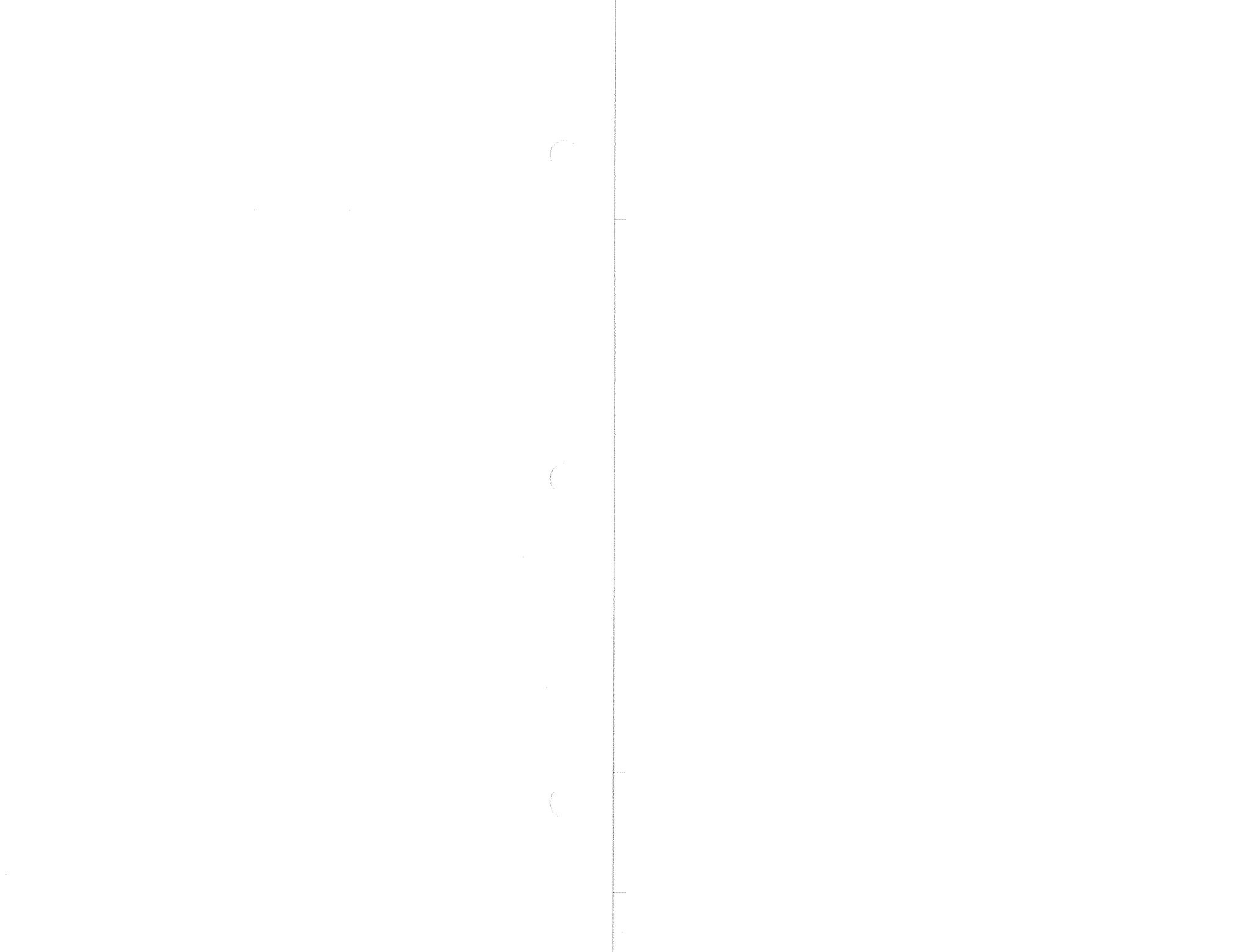
What You Need to Know To Use Floppy Drives

Floppy diskettes require careful handling. You might already be familiar with how to take care of diskettes from reading your *Color Computer Disk System* manual. If not, or as a reminder, review the following points:

- Always make copies of important diskettes. The price of a diskette is small compared to the time it can take to replace destroyed data.

- Copy data you are working with regularly. If you experience a power failure while using your computer, the data on any diskettes you have in a drive can be destroyed. Other accidents can happen as well.

- Always keep the protective paper or cardboard envelope on your diskette when it is not in use.

- Your drive accesses a diskette through the oblong slot in the diskette's jacket. **Never** touch the diskette through this hole. The oil from even the cleanest hand can destroy data, making the diskette useless.

- Do not bend diskettes.

- Store diskettes away from excessive heat, dust, and any magnetic source. Even components in disk drives, video displays, TVs, and electric motors can garble the data on diskettes.

- If you must write on a diskette label after placing it on the diskette, use only a soft felt pen.

- Do not switch your computer, disk drive(s), or Multi-Pak interface on or off while you have a diskette in a disk drive.

Write Protection for Diskettes

Write-Protect Notch

Tab
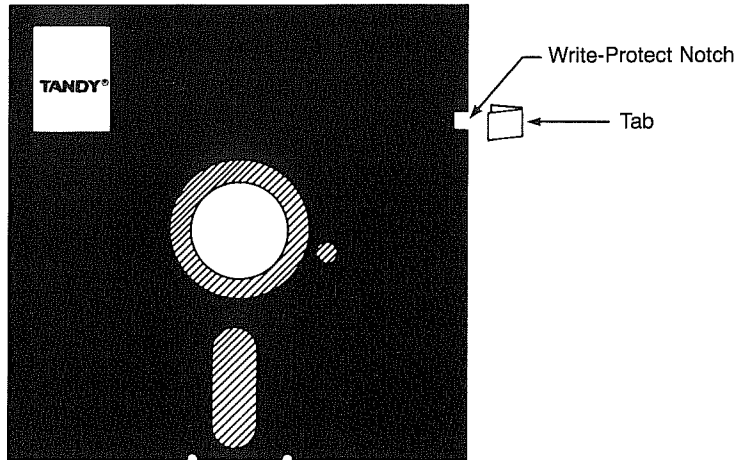
Most diskettes have a square notch cut from one corner. This is a *write protect* notch. If you place a special adhesive tab (supplied with diskettes) over both sides of this notch, your computer can no longer write (store) data on it. This feature protects diskettes from inadvertent destruction of data.

Removing the tab again lets you write data onto the diskette.

Disk Drive Names

OS-9 has its own method of referring to your disk drives. What your *Color Computer Disk System* manual calls Drive 0, OS-9 calls Drive /D0. This is your first drive if you have more than one floppy disk drive connected to your system. Subsequent drives are named /D1, /D2, and so on.

If you have a hard disk attached to your system, OS-9 refers to it as Drive /H0. A second hard disk drive is named /H1.

Making Copies of Diskettes

Before you can store information on a diskette, you must *format* it. Formatting is the process of magnetically arranging a disk's surface so that OS-9 can store and locate information. The following steps tell you how to format a diskette. Format at least two diskettes at this time to use in making backups (copies) of your two OS-9 system diskettes. If you have other important diskettes to backup, format as many diskettes as you require.

Formatting With One Disk Drive

1. If you have not already done so, place a write-protect tab on your System Master diskette. Then, turn on and boot your computer as described in Chapter 2.

2. With the OS-9 System Master diskette in your drive, type:

       load format [ENTER].

3. Select a diskette that does not contain data or that contains data you do not want to keep. Make sure it does not have a foil tab covering the write-protect notch. Put it in your disk drive (Drive /D0) in place of your OS-9 System Master diskette and type:

       format /d0 [ENTER]

   The following prompt appears:

       COLOR COMPUTER FORMATTER
       Formatting drive /d0
       y (yes) or n (no)
       Ready?

4. Press [Y] to begin formatting. OS-9 asks you for a Disk Name:. Type any name, using a maximum of 32 characters. For example, you can type s [ENTER] to name the diskette "s."

   Next OS-9 verifies that the diskette is formatted properly. The screen shows each *track* number in hexadecimal notation during verification. A track is a concentric ring around the diskette on which information is stored.

5. When formatting is complete, OS-9 shows you the Number of good sectors. This number depends on the type of disk drive you are using. For a 35 track, single-sided drive, the number should be $000276 (hexadecimal 276 sectors). The OS-9 prompt and cursor reappear. Remove the newly formatted diskette from the drive, and store it in a safe place until you are ready to use it.

Format as many diskettes as you need by following Steps 3 through 5.

Formatting With Two Disk Drives

1. If your computer is off, turn it on, and boot OS-9 as outlined in Chapter 2.

2. At the system prompt (OS9:), type format /d1 [ENTER]. The screen shows:

```
COLOR COMPUTER FORMATTER
Formatting drive /d1
y (yes) or n (no)
Ready?
```

3. Insert a blank disk, or one which does not contain data you want to keep, into Drive /D1, and close the latch. Be sure the diskette does not have a foil tab covering the write-protect notch. Press [Y].

4. OS-9 formats the diskette; then asks you for a Disk Name:. Type any name, using a maximum of 32 characters. For example, you can type s [ENTER] to name the diskette "s."

   Next OS-9 verifies that the diskette is formatted properly. The screen shows each *track* number in hexadecimal notation during verification. A track is a concentric ring around the diskette on which information is stored.

5. When formatting finishes, OS-9 shows you the Number of good sectors. This number depends on the type of disk drive you are using. For a 35-track, single-sided drive, the number should be $000276 (hexadecimal 276 sectors). The OS-9 prompt and cursor reappear. Remove the newly formatted diskette from the drive, and store it in a safe place until you are ready to use it.

Format as many diskettes as you need by following the same procedure.

Using the Backup Command

BACKUP is one OS-9 command that you can expect to use frequently. It is the command you use to make copies of your diskettes. **We strongly recommend that you now use the following instructions to make copies of your OS-9 system diskettes.** You can only copy diskettes that are created in the same type of disk drive you are using. Your OS-9 system diskettes are 35 track, single sided.

BACKUP uses two terms you need to understand. They are *source* and *destination*. A source diskette is the diskette that contains the program, file or data that you want to backup. The destination diskette is the blank formatted diskette you prepared to receive the copied data.

> **Note:** Some application programs you buy do not let you make copies of their diskettes. Check the program manual for information on protecting the data on these diskettes.

Making Copies With One Disk Drive

1. If your computer is off, turn it on, and boot OS-9 as outlined at the beginning of Chapter 2.

2. At the system prompt (OS9:), type:

   ```
   backup /d0 #32K [ENTER]
   ```

   This tells OS-9 to make a backup of the diskette in Drive /D0. The screen displays the following prompt:

   ```
   Ready to backup from /d0 to /d0
      ?:
   ```

3. Leave the System Master diskette in Drive /D0 to make a backup of it. To back up one of your other diskettes, for example the BASIC09/CONFIG diskette, remove the System Master diskette and replace it with the diskette you want to copy.

4. Press [Y] when you are ready to continue. The screen displays:

   ```
   Ready Destination, hit a key:
   ```

5. Replace the source diskette with the destination diskette. Then, press the space bar to continue BACKUP.

   When you back up one diskette to another, any data previously existing on the destination diskette is *overwritten* (destroyed). OS-9 gives you a chance to make sure you have inserted the proper destination diskette by displaying the message:

   ```
   DISK NAME
       is being scratched
   Ok ?:
   ```

   "Scratched" means that OS-9 is going to replace any data on the diskette with new data from the source diskette. BACKUP also gives the destination diskette the same name as the source diskette—the destination becomes a duplicate of the source.

6. Press Y to keep going. The screen asks you to:

   ```
   Ready Source, hit a key:
   ```

7. Remove the formatted diskette from Drive /D0, and replace it with the source diskette that contains the data you want to copy. Press the space bar.

   In a moment, a prompt asks you to:

   ```
   Ready Destination, hit a key:
   ```

8. Remove the source diskette and replace it with the destination diskette. Press the space bar.

9. Continue switching diskettes as the screen instructs you until you see:

   ```
   Sectors    copied: $0276
   Verify pass
   ```

   Followed in a moment by:

   ```
   Sectors verified: $0276
   OS9:
   ```

The diskette now in your drive, the destination diskette, is a duplicate of the source diskette. If you copied the System Master or the BASIC09/CONFIG diskette, store it in a safe place, and use the copy as your *working* diskette. Reserve the original diskette for making future backups.

> **Note:** For computers with 512K of memory, OS-9 can backup a diskette faster if you replace #32K in Step 2 with #56K.

Making Copies With Two Disk Drives

1. If your computer is off, turn it on, and boot OS-9 as outlined at the beginning of Chapter 2.

2. At the system prompt (OS9:), type:

   ```
   backup /d0 /d1 #32K ENTER
   ```

   This tells OS-9 to make a backup of the diskette in Drive /D0.

   The screen displays the following prompt:

   ```
   Ready to backup from /d0 to /d1
   ?:
   ```

3. Leave the System Master diskette in Drive /D0 to make a backup of it. To back up one of your other diskettes, for example the BASIC09/CONFIG diskette, remove the System Master diskette and replace it with the diskette you want to copy.

4. Press Y when you are ready to continue.

   When you back up one diskette to another, the process *overwrites* or destroys any data previously existing on the destination diskette. OS-9 gives you a chance to make sure you have inserted the proper destination diskette by displaying the message:

   ```
   DISK NAME
      is being scratched
   Ok ?:
   ```

   "Scratched" means that OS-9 replaces any data on the destination diskette with new data from the source diskette. As well, BACKUP gives the destination diskette the same name as the source diskette—the destination becomes an exact duplicate of the source.

6. Press Ⓨ to keep going.

Copying continues. When the procedure ends, you see:

```
Sectors    copied: $0276
Verify pass
```

Followed in a moment by:

```
Sectors verified: $0276
OS9:
```

The diskette in Drive /D1 is now a duplicate of the source diskette. If you copied the System Master or the BASIC09/ CONFIG diskette, store it in a safe place, and use the copy as your *working* diskette. Reserve the original diskette for making future backups.
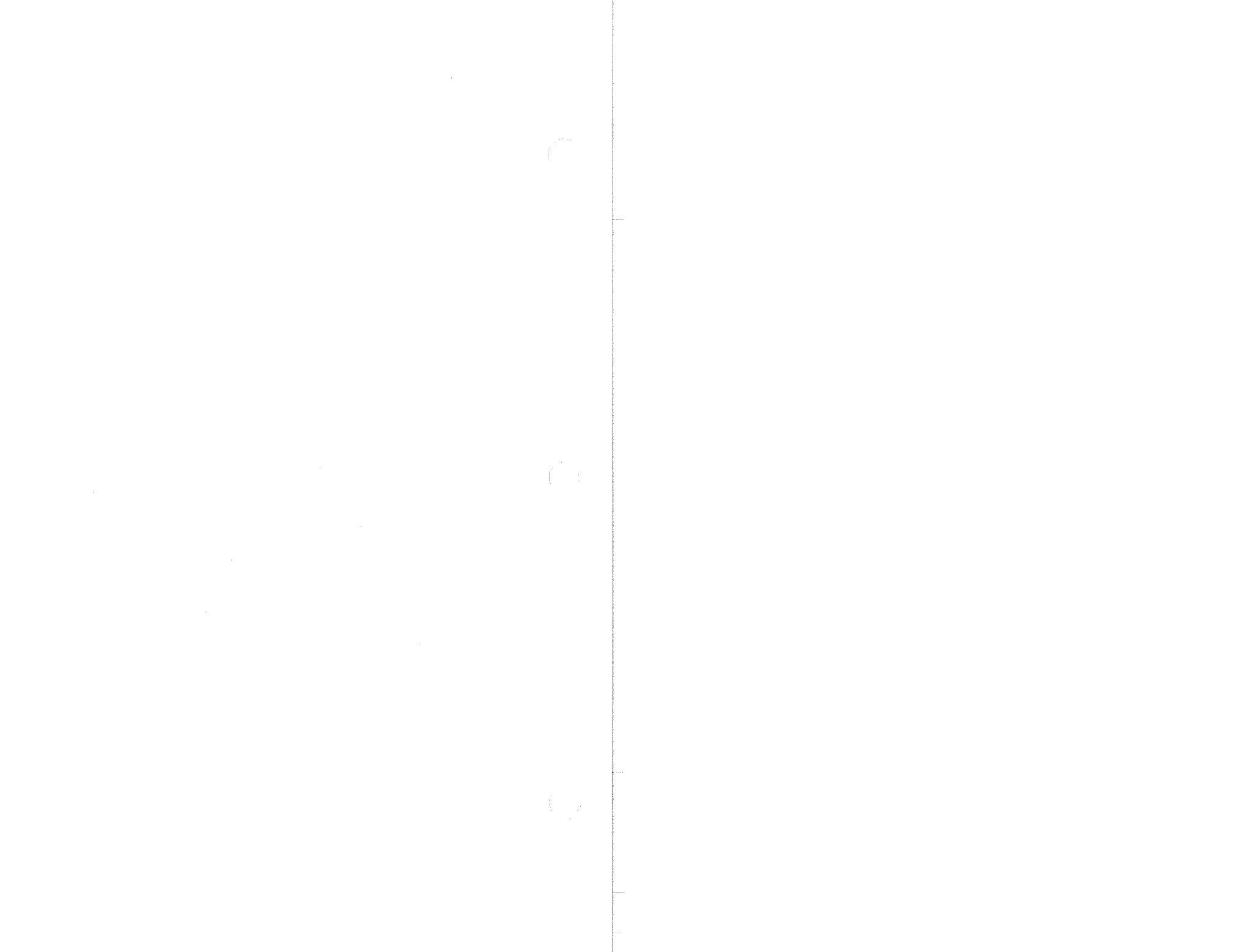
Note: For computers with 512K of memory, OS-9 can backup a diskette faster if you replace #32K in Step 2 with #56K.

Part 2

Organization, Commands, and Keys

Files and Directories

Before you can use OS-9 extensively, you need to know how the system organizes and stores data on disk. The information in this section is true for both floppy diskettes and hard disks. However, because of the greater storage capacity of a hard disk, it is of particular importance to hard disk users.

About Files

Consider the information stored on disks to be of two basic types, programs and data. A program is *code* that causes your computer to execute a task. Data is information that a program uses or that a program creates.

All the information that OS-9 stores on disks, whether program or data, is stored in units called *files*. Whenever a program creates a file, OS-9 defines a portion of your disk to store it. It keeps the location of the file in a special list (called a *directory*), also located on the disk, so that it knows where to find your program or data the next time you want it.

About Directories

A directory is a storage space for filenames, other directory names, or both.

After you format a disk, it contains one directory called the ROOT directory. However, a disk can have many directories. For instance, besides the ROOT directory, your System Master diskette contains the CMDS and SYS directories. The ROOT and CMDS directories are especially important to you.

When you boot OS-9, you automatically begin operation from these two directories. The ROOT directory becomes your current *data directory* and the CMDS directory becomes your current *execution directory*.

Whenever you ask OS-9 to store a file on a diskette, it automatically stores it in the current data directory (the ROOT directory), unless you tell it otherwise. If you ask OS-9 to execute a command or program, it automatically looks for that command or program in the execution directory (the CMDS directory), unless you tell it otherwise.

Every OS-9 directory can also contain other directories, called *subdirectories*. For instance, SYS, and CMDS are established as subdirectories of the ROOT directory. Put in chart form, your ROOT directory with its subdirectories looks like this:

```
        ┌────────── ROOT DIRECTORY ──────────┐
        │                                     │
        ▼                                     ▼
      CMDS                                   SYS
```
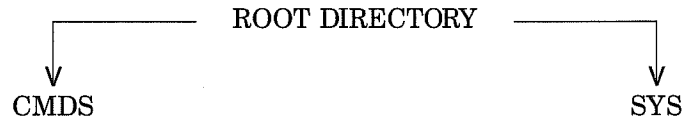
Figure 4.1

But there are also files in the ROOT directory, OS9Boot and Startup are two. The full ROOT directory might look like this:

```
        ┌────────── ROOT DIRECTORY ──────────┐
        │                 │                   │
        │                 ▼                   │
        │              OS9Boot               │
        │              Startup               │
        │                                     │
        ▼                                     ▼
      CMDS                                   SYS
```
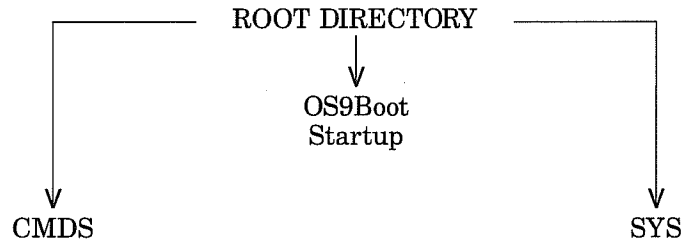
Figure 4.2

You can create another subdirectory of the ROOT directory if you want. For instance, if you created a directory named FAMILY, the chart of the ROOT directory looks like this:

```
        ┌────────── ROOT DIRECTORY ─────────┬─────────┐
        │                 │                 │         │
        │                 ▼                 │         │
        │              OS9Boot              │         │
        │              Startup              │         │
        │                                   │         │
        ▼                                   ▼         ▼
      CMDS                               FAMILY      SYS
```

Figure 4.3

After you create the FAMILY directory, you can also create other directories in it. Suppose you create two subdirectories named PLEASURE and WORK. The chart organization is as follows:

```
         ROOT DIRECTORY  ───────────────────────────┐
   ┌───       │                        │             │
   │          ▼                        │             │
   │        OS9Boot                    │             │
   │        Startup                    │             │
   │                                   │             │
   ▼                                   ▼             ▼
  CMDS                    ┌──  FAMILY ──┐           SYS
                          ▼             ▼
                      PLEASURE         WORK
```

Figure 4.4

The directories you create also can hold files. If you created three files each in the PLEASURE and WORK directories, the chart might look like this:
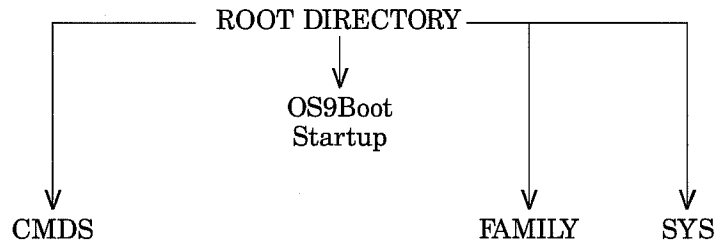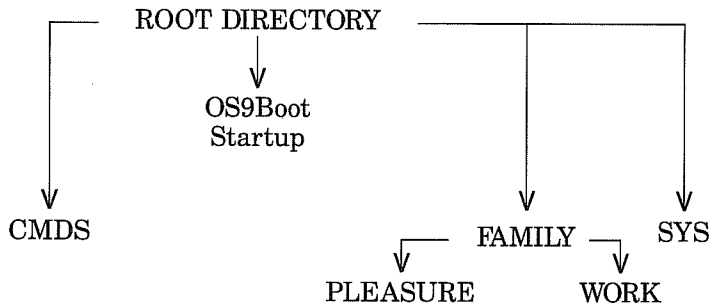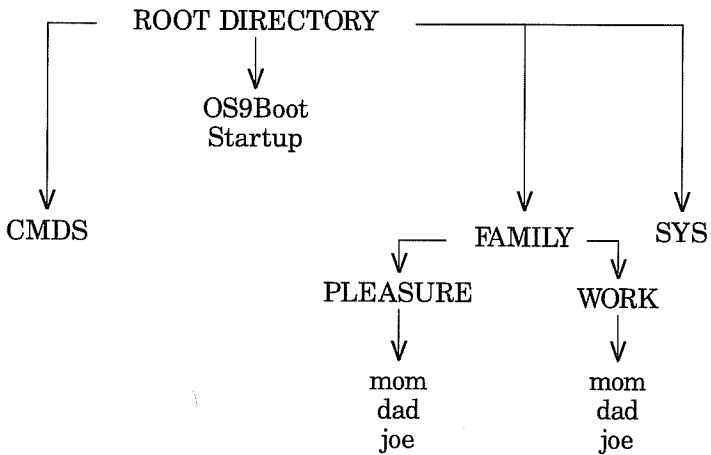
```
         ROOT DIRECTORY  ───────────────────────────┐
   ┌───       │                        │             │
   │          ▼                        │             │
   │        OS9Boot                    │             │
   │        Startup                    │             │
   │                                   │             │
   ▼                                   ▼             ▼
  CMDS                    ┌──  FAMILY ──┐           SYS
                          ▼             ▼
                      PLEASURE         WORK
                          │             │
                          ▼             ▼
                        mom           mom
                        dad           dad
                        joe           joe
```

Figure 4.5

You can continue to create files and subdirectories in any or all of your disk's directories until you fill the disk's storage space.

Multiple Directories

There is nothing wrong with storing all your files in the ROOT directory. Doing so makes it easy to access them because they are always in your data directory.

However, creating multiple directories makes it easy to keep your data organized when you have many files, or if more than one person is using the same disk. Such a multiple-directory organization is especially helpful when using hard disks, which can store hundreds of individual files.

Also, when you have multiple directories, you can store files having the same name in different directories without conflict, such as in the PLEASURE and the WORK directories of Figure 4.5.

About File and Directory Names

The file and directory names shown so far consist only of letters of the alphabet, but you can use other characters and symbols in a file or directory name as long as each name begins with a letter. The following is a complete list of acceptable characters:

- Uppercase letters: (A-Z)
- Lowercase letters: (a-z)
- Decimal digits: (0-9)
- The underscore character (__) and the period (.)

You can include as many as 29 characters in a file or directory name.

Examples of Filenames

The following are samples of filenames that OS-9 can recognize:

mydata	samfile
mydata1	Dollar_gifts
records.srt	help.file
XXX.xx	file#1.txt
prog1.bas	program.sourcecode
prog2.bas	program.opcode

Examples of invalid filenames are:

his*hers ....because * is not a valid character for names

.DATA ....because the name does not begin with a letter

COST + INT ....because + is not a valid character for names

100_dollar_gifts ...because names cannot begin with a digit

About Pathlists

Because you can organize OS-9 disks into multiple levels, you need a way to tell the system where to find directories and files. The directions you give are called *pathlists*.

A pathlist is exactly what its name implies—a path (or route) to the device, directory, or file you want to access. For instance, if you are in the ROOT directory (see Figure 4.5) and want to look at the contents of a file in the WORK directory, you must tell OS-9 how to get there. The pathlist from the ROOT directory to the Dad file is family/work/dad. OS-9 expects you to separate the junctions of pathlists with slashes. To look at the contents of Dad, you type:

    list family/work/dad [ENTER]

Because you are accessing a file on the current disk, you do not need to specify a drive name. Because every disk contains a ROOT directory, and all other directories and files branch from it, ROOT is always implied in a pathlist. If Figure 4.5 represented the diskette in Drive /D1, the pathname to the Dad file would be /d1/family/work/dad.

Depending on the location of the directory or file you want to access, a full pathlist need not contain any more than the name of a drive, the name of a directory, or the name of a file. For instance, the complete pathlist from the ROOT directory of Figure 4.5 to the Startup file is startup. To look at the contents of Startup, type:

    list startup [ENTER]

Anonymous Directory Names

To save time, or if you do not know a full pathlist, you can refer to the current directory, or to a higher-level directory, using an *anonymous* name, or name substitute, as follows:

- One period (.) refers to the current directory

- Two periods (..) refer to the *parent* of the current directory (the next highest-level directory).

- Three periods (...) refer to the directory two levels up, and so on.

You can use an anonymous directory name in place of a pathlist or as the first name in a pathlist. Some examples are:

dir .. [ENTER]   lists names in the current data directory's parent directory.

del ../temp [ENTER] deletes the file called Temp from the current data directory's parent directory.

Anonymous names can refer to either execution or data directories, depending on the context in which you use them.

About Device Names

In the same manner that OS-9 has names for its commands, it also has names for its devices. These names are abbreviations of actual device names. For instance, instead of typing Disk Drive 0 to refer to your first disk drive, you only need to type /D0. To refer to your printer, type /P. OS-9 windows are named /W through /W7.

All of OS-9's device names are preceded by a slash—this is how OS-9 can tell you are referring to a device rather than a directory or file. When you purchase your System Master diskette, OS-9 is configured to recognize two disk drives, a printer, and one terminal port. For information on how to configure your system to recognize other devices, see Chapter 7.

Commands and Keys

You already put OS-9 to work with commands such as FORMAT and BACKUP. In these cases the manual told you exactly what to do to accomplish a very specific task. If you want to strike out on your own, you should know some additional background information.

Typing Commands

As explained earlier, some OS-9 files are programs. You tell OS-9 to execute these programs by typing the program (file) name and pressing [ENTER]. You are then issuing a command to OS-9. That's all a command is, the name of a program for the system to execute. The following are some rules about commands:

- You can enter a command whenever the screen displays the system prompt (OS9:).

- A command consists of one word, the command name. A *command line* consists of one or more command names and their associated *parameters* and *modifiers*. Parameters and modifiers are special information you include with a command that provide necessary data for the command to operate, or that affect the command's operation.

- A command line can have a maximum of 198 characters including any combination of upper- or lowercase letters. To execute a command, press [ENTER]. For example, to clear the screen, type:

      display 0c [ENTER]

Editing Commands

OS-9 is very particular about the commands you type. If you make any mistake, OS-9 either does not understand (and tells you so with an error message) or does the wrong thing.

If you see that you made a mistake before you press [ENTER], you have two choices: (1) use [←] or [CTRL] [H] to move the cursor to the mistake, and retype that portion of the line, or (2) press [CTRL] [X] or [SHIFT] [←] to erase the line you are typing, and start over.
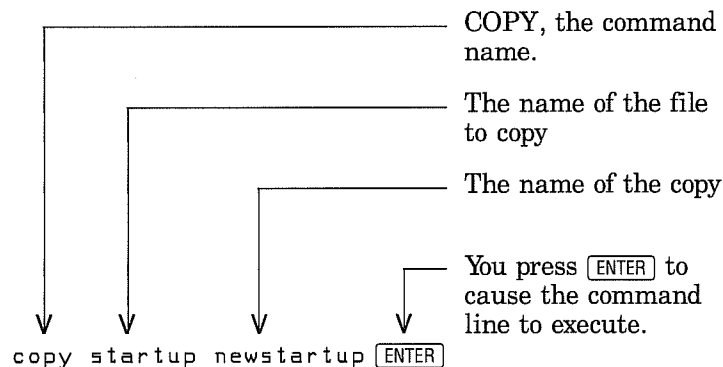
Command Parameters

You can follow a command name with one or more parameters that give OS-9 more specific instructions. For example, in the command line:

```
list file1 [ENTER]
```

LIST is the name of the command that displays the contents of a text file. *File1*, the specified parameter, is the name of the file that you want displayed.

> Note: In a command line, always use spaces to separate parameters from their command, and from each other. Parameters cannot contain spaces. Chapter 6 discusses parameters for each OS-9 command.

Some commands have more than one parameter. For instance, COPY requires two parameters: the name of the file being copied, and the name of the new file you want COPY to create. If you want to copy a file called Startup, and call the copy Newstartup, your command line reads:

COPY, the command name.

The name of the file to copy

The name of the copy

You press [ENTER] to cause the command line to execute.

```
copy startup newstartup [ENTER]
```

Using Options

Command lines can also contain another type of parameter, called an *option*. An option changes the way a command performs. For instance, the command DIR, without parameters, shows the name of all files in the current data directory.

However, if you add the E option as a parameter to the command, like this:

```
dir e ENTER
```

the output includes not only the names of the files, but also complete statistics about each file—the date and time created, size, security codes, and so forth.

To display complete information about each file in SYS, type:

```
dir sys e ENTER
```

Using Commands

As described in Part 1, OS-9 acts in much the same manner as an office manager. It looks after the operation of your computer and equipment. Because OS-9 is only a manager, it expects you to make the necessary decisions.

For example, suppose you have an important file named Hotstuff that you want to copy. Before giving it to your office manager (OS-9), you must make executive decisions, such as:

- Do you want the copy on disk, paper, or the computer screen?

- If you want the copy on disk, which disk?

- If you want the copy on the same disk, what name do you want to give the second copy so OS-9 is not confused?

- If you want the copy on the computer screen, do you want the display to pause when it fills the screen?

You make the decisions, OS-9 manages the job. For instance, if your decision is to copy Hotstuff from one diskette to another, you might type the following command line:

```
copy /d0/hotstuff /d1/hotcopy ENTER
```

This is how OS-9 sees your command:

```
                                    ── The name of the
 ┌─────────────────────────           command
 │         ┌───────────────────── The disk drive
 │         │                         containing the file to be
 │         │                         copied
 │         │      ┌─────────────── The name of the file to
 │         │      │                  copy
 │         │      │     ┌────────── The disk drive that is to
 │         │      │     │             receive the new file
 │         │      │     │   ┌────── The name of the copy
 ▼         ▼      ▼     ▼   ▼
 copy /d0/hotstuff /d1/hotcopy
```
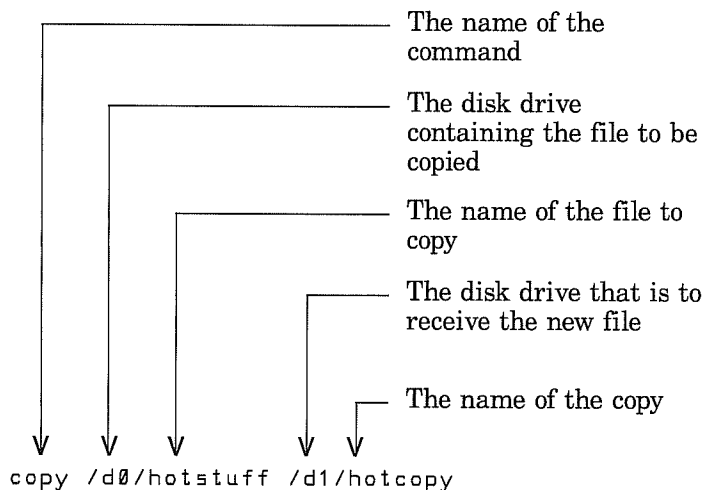
This command line tells OS-9 to copy a file named Hotstuff from your floppy disk Drive /D0 to a second floppy Drive /D1. The file copy is given the new name, Hotcopy.

You only need to know the name of the file you want to copy, on which disk it is located, and the disk on which you want the new copy. OS-9 manages the operation for you.

Accessing Commands

OS-9 has two ways to access commands. Some commands reside on a disk. When you type the command name and press ENTER, OS-9 must look on the disk, load the program into the computer's memory, and then execute it.

Other commands are loaded into your computer's memory at startup, or you can load them into memory later. When you call a command that is in memory, it is executed immediately. There is no delay while OS-9 finds it on disk.
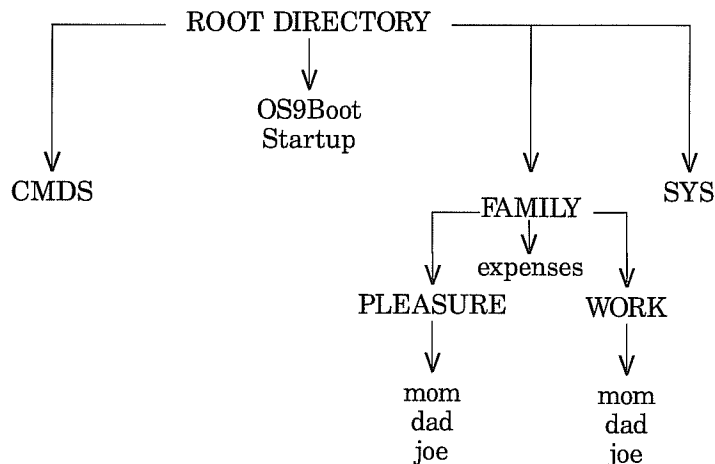
Commands from Disk

When you give OS-9 a command that it cannot find in memory, it looks for the command in the current execution directory. If it cannot find it there, it checks the current data directory. If it still cannot find it, the system issues Error Message #216, Path Name Not Found. If the command you want executed is in a directory other than the current directory, you must tell OS-9 where to find it. Remember, when initialized, OS-9 sets the CMDS directory of the system disk to be the execution directory.

For instance, suppose you booted your system using a diskette configured like the example we used in Chapter 4:

```
┌──────────── ROOT DIRECTORY ───────────┬──────────┐
│                    │                   │          │
│                    ↓                   │          │
│                OS9Boot                 │          │
│                Startup                 │          │
↓                                        ↓          ↓
CMDS                                                SYS
                   ┌─────FAMILY ──────┐
                   ↓                  ↓
              PLEASURE              WORK
                   │                  │
                   ↓                  ↓
                 mom                mom
                 dad                dad
                 joe                joe
```
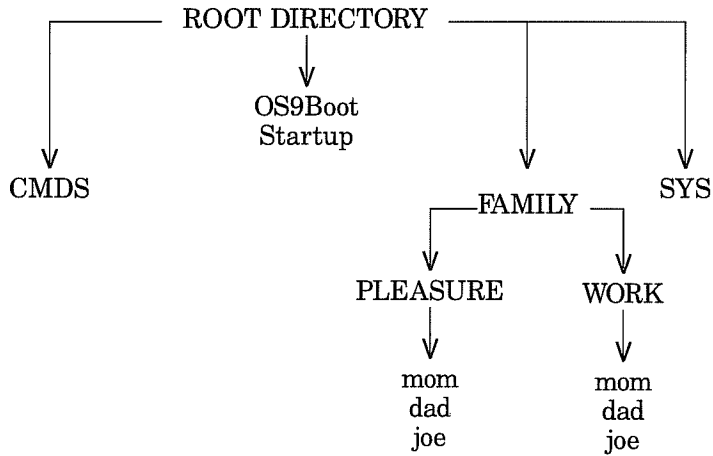
When the system starts, the ROOT directory is the data directory, and the CMDS directory is the execution directory. Now, suppose you had a program named Expenses in the family directory:

```
┌──────── ROOT DIRECTORY ──────┬───────────┐
│                   ↓           │           │
│                OS9Boot        │           │
│                Startup        │           │
↓                               ↓           ↓
CMDS                      ┌──FAMILY──┐      SYS
                          │    ↓     │
                          ↓ expenses ↓
                      PLEASURE     WORK
                          ↓          ↓
                         mom        mom
                         dad        dad
                         joe        joe
```

(Remember that a program and a command are really the same thing.)

You can now access (use) the expenses program in two ways. One way is to specify a pathlist from the ROOT directory to execute Expenses, such as:

```
/d0/family/expenses [ENTER]
```

Another way is to change the execution directory.

Changing the Execution Directory

To change the execution directory to the FAMILY directory, type:

```
chx /d0/family [ENTER]
```

Or specify a pathlist relative to the current execution directory, such as:

```
chx ../family [ENTER]
```

To execute the Expenses program, you now only need to type expenses [ENTER].

However, after you change the execution directory, to use a command in the COMMANDS directory, you must tell OS-9 where to find it. For example, to format a new diskette in Drive /D1, type:

```
/d0/cmds/format /d1
```

Changing the Data Directory

Suppose that the Expenses program keeps track of work and pleasure expenses for Mom, Dad, and Joe. Unless you tell OS-9 otherwise, it looks for data files in the current data directory, the ROOT directory. To tell OS-9 to look for data files in the PLEA-SURE directory, type:

```
chd family/pleasure [ENTER]
```

The slash between FAMILY and PLEASURE tells the system that PLEASURE is a branch of FAMILY. Subordinate directories and files are always separated from their parent in this way.

Now, when Expenses needs data, it knows to look in the PLEA-SURE directory.

Changing System Diskettes

Although it is preferable to leave the system diskette in place while the system is running, particularly with multiuser systems, there might be times when you need to use another diskette. Only remove the current diskette when the screen displays the OS-9 prompt, followed by the cursor. If you do remove the system diskette and begin to use another one, use the CHD and CHX commands to tell OS-9 where you want to be located on the new diskette. (For directions, see Chapters 2 and 6.) Those commands set both directory pointers, data and execution, for the new diskette.

While using a program or command, do not remove a diskette and insert another unless the program or command asks you to. You can lose data, or entire files, if you do.

Video Display and Keyboard Functions

OS-9 has many features that expand the capability of the Color Computer's video display and keyboard.

- The video display has upper-/lowercase, screen pause, graphics functions, and 80 column displays if you have a monitor connected.

- The [ALT] key provides an alternate key function. Holding down [ALT] while pressing another key sets the *high order bit* of the character pressed. That is, it adds 128 to the normal ASCII value produced by that key. Holding down [ALT] while pressing any other key produces a graphics character on the standard VDG screen. If you are using windows, [ALT] lets you produce international characters. (See *OS-9 Windowing System Owner's Manual* for more information).

- The keyboard has an auto-repeat function. Holding down a key causes the character to repeat until you release the key. This function operates properly only when the disk drives are not in use by a program.

- You can deal with the video display and keyboard together as though they are a file. You can receive input from the keyboard and send output to the video screen using the device name /TERM.

Special Keys

The following keys and key sequences have special significance to OS-9.

[ALT]	Produces graphic characters on a standard VDG screen or international characters with windows. Press [ALT] *char* (where *char* is a keyboard character).
[CTRL]	A control key.
[BREAK] or [CTRL][E]	Stops the current program execution.
[←] or [CTRL][H]	Moves the cursor to the left one space.

CTRL —	Generates an underscore character.
CTRL ,	Generates a left brace ({).
CTRL ·	Generates a right brace (}).
CTRL 3	Generates a tilde (˜).
CTRL /	Generates a backslash (\ ).
CTRL BREAK	Performs an ESCAPE function, and sends an end-of-file message to a program receiving keyboard input. To be recognized, CTRL BREAK must be the first thing typed on a line.
SHIFT BREAK or CTRL C	Performs a CONTROL C function by interrupting the video display of a program. The program runs as a background task.
CLEAR *	Selects the next video window.
SHIFT CLEAR *	Selects the previous video window.
	* You must have established windows for this function key to have any effect. See "Using Windows" in Chapter 7.
CTRL CLEAR	Toggles the *keyboard mouse* on and off. The keyboard mouse uses the arrow keys and the two function keys (F1 and F2) to simulate an external mouse. When keyboard mouse is on, the normal functions for the arrow and function keys is suspended.
SHIFT ← or CTRL X	Deletes the current line.
CTRL 0	Activates or deactivates the shift lock function.
CTRL 1	Generates a vertical bar (|).
CTRL 7	Generates an up arrow (ˆ).
CTRL 8	Generates a left bracket ([).

CTRL 9	Generates a right bracket ( ]).
CTRL A	Redisplays the last line you typed and positions the cursor at the end of the line, but does not process the line. Press ENTER to process the line, or edit the line by backspacing. If you edit, press CTRL A again to display the edited line.
CTRL D	Redisplays the current command line.
CTRL W	Temporarily halts video output. Press any key to resume output.
ENTER	Performs a carriage return or executes the current command line.

OS-9 Toolkit

You now know about a number of OS-9 commands that can help you set up and use your computer system. There are many more commands available. This chapter contains information about a few of the most helpful commands. Becoming acquainted with these makes it easy for you to use other commands and functions. *OS-9 Commands* contains more information and a complete reference to all OS-9 commands (including those you have already discussed).

Viewing Directories

To look at your disk directories use the DIR command. For example, to view the contents of the current data directory, type:

        dir [ENTER]

If your data directory contains more filenames than can display on the screen at one time, the display pauses. Press the space bar to cause additional files to scroll onto the screen.

You can also view your execution directory in a similar manner. This time you must include the command option, x. Type:

        dir x [ENTER]

If you want to look at a directory on a disk drive other than the current drive, specify a complete path for OS-9 to follow, including the disk drive name. For example:

        dir /d0/FAMILY/WORK [ENTER]

Creating Directories

Before you can store data in a directory other than the ROOT directory, you must create that directory with MAKDIR. For instance, to create a FAMILY directory on your Drive /D0 diskette, type:

        makdir /d0/FAMILY [ENTER]

Deleting Directories

You can also delete directories you create. **When you delete a directory you also delete any files or subdirectories it contains; so use this command with caution.** To delete a directory, follow these steps.

1. Use DIR to view the contents of the target directory and any of its subdirectories.

2. Copy any files you want to keep into a directory outside of the directory you want to delete.

3. Type:

        deldir *dirname* ENTER

   where *dirname* is the name of the directory you want to delete.

   The screen shows:

        Deleting directory file.
        List directory, delete directory, or quit ?
        (l/d/q)

4. You now have three options:

   a. To again confirm the contents of the directory before you delete it, press l ENTER.

   b. To initiate the deletion process, press d ENTER.

   c. To quit the process and leave the directory intact, press q ENTER.

If you try to delete directories other than the ones you create, OS-9 might display Error #214, No Permission (you do not *own* the directory or have write permission for it). For information on handling such directories, see the ATTR command in *OS-9 Commands*.

Displaying Current Directories

There are times when you need to know the names of your current data and execution directories. The PWD and PXD commands make this possible. To determine your current data directory, type:

        pwd ENTER

The command displays the path from the ROOT directory to the current data directory. For instance, if your current data directory is PLEASURE (see Figure 4.5 in Chapter 4) the display is:

```
/DØ/FAMILY/PLEASURE
```

To discover your current execution directory, type:

```
pxd  ENTER
```

The screen might display:

```
/DØ/CMDS
```

A standard convention of OS-9 is to capitalize directory names. If you follow this convention when creating directories, you can always tell which files are directories at a glance.

Copying Files

COPY, like BACKUP, provides file security. If something happens to one file, you can use a copy. Also, you might want to copy a command or program to use in more than one directory, or you might want to use the same data on more than one computer.

Suppose you are in the PLEASURE directory of a diskette configured as in Figure 4.5. Your execution directory is the FAMILY directory, where you are using the Expenses program. Because the FAMILY directory does not contain any OS-9 commands, you have to change the execution directories whenever you want to use them.

You can make your work easier by copying the Expenses program to the CMDS directory. To do this, first make the CMDS directory your data directory by typing:

```
chd /dØ/CMDS  ENTER
```

Then copy the Expenses file to the CMDS directory by typing:

```
copy /dØ/FAMILY/expenses expenses  ENTER
```

Now, Expenses is in the CMDS directory, and you do not need to change the execution directory to FAMILY to use it.

Likewise, if the ROOT directory is your data directory, and you want to copy the Mom file from the WORK directory to the ROOT directory, type:

```
copy family/work/mom mom [ENTER]
```

You can copy any file between directories and between disks. To do so, you must provide the COPY command with a pathlist for the location of the original file and for the destination of its copy.

Deleting Files

You can delete files in any directory using the DEL command, such as:

```
del myfile [ENTER]
```

You can delete a file in the current execution directory by using the −x parameter. For instance, to delete Myprogram from the current execution directory, type:

```
del -x myprogram [ENTER]
```

If the file you want to delete is in a directory other than the current data directory or the current execution directory, you must specify the full pathlist to the file. For instance, suppose you are in the ROOT directory of a diskette configured as Figure 4.5. To delete the Joe file in the WORK directory, type:

```
del family/work/joe [ENTER]
```

If the file you want to delete is on a drive other than your current drive, include the drive name in your pathlist, such as:

```
del /d1/family/work/joe [ENTER]
```

If you attempt to delete a file you did not create, OS-9 might display Error #214, No Permission. For information on deleting such files see the ATTR command in *OS-9 Commands*.

Renaming Files

OS-9 lets you change the names of files. Suppose Joe leaves home, and you now want to keep track of expenses for Sue. To change the name of the Joe file to Sue, type:

```
rename family/pleasure/joe  sue [ENTER]
```

Looking Inside Files

LIST is a command that lets you examine files that consist of text characters. For instance, to view the Dad file from the WORK directory, you might type:

```
list family/work/dad [ENTER]
```

The contents of the file appears on the screen.

If you use LIST to display a file that is not a text file, it produces a meaningless display.

Loading Command Modules into Memory

When using OS-9, you might notice that some commands begin execution immediately, while others require access to the disk drive before they execute. The OS-9 commands you need most often load into memory at startup, so they are available for immediate use. If you plan to frequently use a command that is not in memory, you can *load* it.

For instance, the DSAVE command lets you copy an entire directory from one disk to another. To place the DSAVE module into your computer's memory, first be sure your execution directory is the CMDS directory, then type:

```
load dsave [ENTER]
```

Now you can use DSAVE as many times as you want, without waiting for OS-9 to find it on disk.

Listing the Command Modules in Memory

At startup, OS-9 loads into memory the commands you use most often. If you are not sure whether a command already resides in memory, you can check using the MDIR command. To display a directory of the modules in your computer's memory, type:

```
mdir [ENTER]
```

A list of all the modules in your computer's memory appear on the screen. The names you see are of modules OS-9 uses to boot and handle system operations and the commands it loads into memory when you boot the system.

Deleting Modules from Memory

After you load a module into memory, you can also delete it. The process is called *unlinking*. To delete the DSAVE command from memory, type:

```
unlink DSAVE [ENTER]
```

Some modules might require unlinking more than once, depending on the number of times they were linked.

Do not attempt to unlink modules that you did not install in memory with the LOAD command.

Using Other Commands

OS-9 has nearly 50 commands and functions. This chapter has mentioned only a few. Not only are there other commands available through OS-9, several of the commands presented here have additional options.

The guidelines you learned in this handbook provide the background you need to make use of OS-9's many other capabilities.

By referring to *OS-9 Commands* you can learn how to create files, create *procedure files* to accomplish complicated tasks, send information to your printer, transfer data between devices, execute more than one task at the same time, and much more.

Customizing Your System

Your OS-9 operating system is originally configured in a certain way. For instance, it is set up to recognize two floppy disk drives, but no hard drives. It is set up to recognize a printer or one extra terminal. It does not recognize a modem. It assumes that you only want 32 characters across your computer's display screen. It provides all of the OS-9 commands.

Using the CONFIG utility from the BASIC09/CONFIG diskette that came with your OS-9 package, you can create system diskettes that match the computer system you have. Before proceeding further, be sure you have a working copy of the BASIC09/ CONFIG diskette and a blank, formatted diskette. You can use the instructions in "Making Copies of Diskettes" in Chapter 3 to create a working copy of the BASIC09/CONFIG diskette and to create a blank, formatted diskette.

Creating a New System Diskette

To create a new system diskette **make sure you have a newly formatted diskette on hand**, then follow these steps:

1. Take out the System Master diskette, and replace it with the BASIC09/CONFIG diskette. Type:

   ```
   chx /d0/cmds [ENTER]
   chd /d0 [ENTER]
   config [ENTER]
   ```

   The first question the screen asks is:

   ```
   HOW MANY DRIVES DO YOU HAVE:
    1 - ONE DRIVE ONLY
    2 - TWO OR MORE DRIVES
        SELECTION [1,2]
   ```

2. If you're using a single-drive system, press [1]. If you have more than one drive, press [2].

   If you indicated that you have two or more drives, CONFIG prompts:

   ```
   ENTER NAME OF SOURCE DISK:
   ```

and

```
ENTER NAME OF DEST. DISK:
```

Type the appropriate drive name (/D0, /D1, etc.) at each
prompt.

3. OS-9 informs you that it is:

```
BUILDING DESCRIPTOR LIST
    .... PLEASE WAIT
```

OS-9 is putting together a list of the various devices you
might want to use with your computer. When it finishes, it
shows you the list:

```
                  CONFIG
        ARROWS - UP/DOWN/MORE/BACK
    S - SEL/UNSEL H - HELP D - DONE
      ITEM              SEL
    -------------------------------
     →    P
          T1
          T2
          T3
          M1
          M2
          PIPE
          D0_35S        X
          D1_35S
          D2_35S
```

To view the rest of this menu, press ⟦→⟧. Now the screen shows:

```
              CONFIG
      ARROWS - UP/DOWN/MORE/BACK
   S - SEL/UNSEL H - HELP D - DONE
      ITEM              SEL
   -------------------------------
      →   D3_35S
          DDD0_35S
          D0_40D
          D1_40D
          D2_40D
          DDD0_40D
          D1_80D
          D2_80D
```

4. You can choose the various devices you plan to use with your computer from this list. To choose a device, use ⟦↑⟧ or ⟦↓⟧ to move to the device. The → shows the device you've chosen. Then, press ⟦S⟧ (for Select) to display an X in the SEL ("Selected") column. Pressing ⟦S⟧ again cancels the selection.

You can move back and forth between the first and second screens by pressing either ⟦→⟧ (from the first screen) or ⟦←⟧ (from the second screen). Here's a short description of each device listed on this screen. To display helpful information about a device, position the → on its line in the list, and press ⟦H⟧ for Help. Then, press the space bar to make the help information disappear. The devices on this screen are:

P   A printer that connects to the RS-232 serial port on your computer.

T1   A terminal using the standard RS-232 port (in addition to your main computer display).

T2   A terminal using the optional RS-232 communications pak in Slot 1 of the Multi-pak Interface. T2 supports a full baud rate range. Use T2 in addition to your main computer display alone, or in addition to your main computer display and a "T1" type terminal.

T3	Another terminal using the optional RS-232 communications pak in Slot 2 of the Multi-pak Interface.
M1	A modem using an optional 300 baud modem pak.
M2	A modem using an optional 300 baud modem pak.
PIPE	Lets you use the PIPE utility in OS-9 (a utility that takes the information a program puts out and uses it as input data in another command).
D0_35S	Floppy Disk Drive /D0, single sided, 35 tracks.
D1_35S	Floppy Disk Drive /D1, single sided, 35 tracks.
D2_35S	Floppy Disk Drive /D2, single sided, 35 tracks.
D3_35S	Floppy Disk Drive /D3, single sided, 35 tracks.
DDD0_35S	Default Disk Drive /DD using Drive /D0, single sided, 35 tracks. Select one default drive — the drive where you keep your system diskette.
D0_40D	Floppy Disk Drive /D0, double sided, 40 cylinders.
D1_40D	Floppy Disk Drive /D1, double sided, 40 cylinders.
D2_40D	Floppy Disk Drive /D2, double sided, 40 cylinders.
DDD0_40D	Default Disk Drive /DD using Drive /D0, double sided, 40 cylinders. Select one default drive — the drive where you keep your system diskette.
D1_80D	Floppy Disk Drive /D1, double sided, 80 cylinders.
D2_80D	Floppy Disk Drive /D2, double sided, 80 cylinders.

You must select a "D0" device as your first disk drive—use D1, D2, and D3 devices for additional floppy disk drives. Select the drive that matches the drives you have on your system. If you are not sure, check with your supplier. To use extra terminals and modems, you must connect them via a Multi-Pak Interface.

5. As you finish choosing among the devices on the first screen, press ⬜→ to display another screen of devices:

6. When you finish selecting devices, press ⬜D for Done. The screen asks:

```
ARE YOU SURE (Y/N) ?
```

7. Now's your chance to change your mind. Press ⬜N if you want to reselect your devices. If you're sure about the devices you selected, press ⬜Y.

The next part of the CONFIG process appears on the screen:

```
            CONFIG

        SELECT TERM DESCRIPTOR

        1  -  TERM_VDG
        2  -  TERM_WIN
                H  -  HELP
        SELECTION  [1,2]
```

8. These are Color Computer terminal I/O subroutine modules you can use. For a 32 character display, select 1 (TERM_ VDG). In order to have OS-9 windows and an 80 column display, select 2 (TERM_WIN).

   Note: You can use TERM.WIN with a TV rather than a monitor but it is difficult, if not impossible, to see characters on an 80-column window. When you later create text windows, select 40-column displays.

If you select 2 (Term_Win), CONFIG presents you with another menu of choices. This time, the display looks like this:

```
                CONFIG
      ARROWS - UP/DOWN/MORE/BACK
   S - SEL/UNSEL  H - HELP  D - DONE
           ITEM              SEL
   ------------------------------
               W               X
               W1              X
               W2
               W3
               W4
               W5
               W6
               W7
```

This list represents the pre-established windows you can open for use with OS-9. The next section in this chapter tells you how to open and use windows. For now, if you expect to open windows in which you can run mulitple tasks, select these items for your new diskette. (See "Using Windows" later in this Chapter.)

9. After you select the modules you want to use, press ⬚D⬚. As it did when you selected devices, the screen asks ARE YOU SURE (Y/N) ? Press ⬚Y⬚ if you're finished. Or, press ⬚N⬚ to keep working on this screen.

   OS-9 creates a file called Bootlist in Drive /D0's ROOT directory, using the information you've provided so far. It lets you know what it's up to by displaying:

   ```
   BUILDING BOOT LIST
      .... PLEASE WAIT
   ```

   Then, the screen asks:

   ```
   SELECT CLOCK MODULE:
     1 - 60 HZ (AMERICAN POWER)
     2 - 50 HZ (EUROPEAN POWER)
        SELECTION [1,2]
   ```

10. Press ⬚1⬚ if you live in the United States, Canada, or any other country that uses 60Hz electrical power. If you live in a country that uses 50Hz electrical power, press ⬚2⬚.

11. CONFIG is ready to begin creating your customized System Master diskette. If you have one drive, the screen tells you that the DESTINATION diskette is your blank, formatted diskette and that your SOURCE diskette is the BASIC09/ CONFIG diskette. Place your formatted diskette in the drive, and press [C]. You'll swap between the formatted diskette and the BASIC09/CONFIG diskette several times.

   If you have a two-drive system, place a formatted diskette in Drive /D1, and press the space bar. The screen tells you that OS-9 is:

   ```
   GENERATING NEW BOOT
        .... PLEASE WAIT
   ```

12. Following the boot file generation, a menu lets you select the commands you want to include on your system diskette. You have the following choices: none; the full set of commands; or a set consisting of commands you choose individually. The menu looks like this:

   ```
                    CONFIG

             DO YOU WISH TO ADD
          [N]O COMMANDS, STOP NOW
          [F]ULL COMMAND SET
          [I]NDIVIDUALLY SELECT
          [H] RECEIVE HELP
       SELECTION [N,F,I,H]
   ```

   Most people like to choose the individual commands they want to use. For the time being, press [F] to include the full set. Later, you can create another custom diskette that has only the commands you need.

13. Do one of the following:

    a. If you have one drive, the screen asks you to place your formatted diskette in Drive /D0. Do so, and press the space bar. Next, you'll place your "uncustomized" backup of the System Master diskette in Drive /D0. Swap the two diskettes as the screen asks you to. When the CONFIG program finishes, the OS9: message reappears. You now have a brand new, customized copy of the System Master diskette.

    b. If you have more than one drive, the screen asks you to place your system diskette in Drive /D0. CONFIG continues and in a few minutes, finishes its work. The OS9: message reappears, and you have a customized copy of the System Master diskette in Drive /D1.

14. Label the diskette so that you can distinguish between your working copy of the System Master diskette and the custom copy.

Monitor Types

OS-9 lets you set your system for different monitor types. The monitor options are for a RGB color monitor, a composite color monitor or TV, or a monochrome monitor or TV. To set your system for a particular monitor type, enter one of the following commands, or add it to your system Startup file:

Monitor Type	Command
RGB	montype r
Composite	montype c
Monochrome	montype m

Therefore, to set your system for a composite monitor, type:

    montype c [ENTER]

To save typing the command each time you start OS-9, put it in the Startup file in the ROOT directory of your system diskette.

If your system disk does not have an existing Startup file:

Create one by typing:

    build startup [ENTER]
    montype r [ENTER]
    [ENTER]

If your system disk already has a Startup file:

First rename the Startup file by typing:

    rename startup oldstart [ENTER]

Then create a file that contains the new command, such as:

    build newstart [ENTER]
    montype r [ENTER]
    [ENTER]

Now combine the two files into a new Startup file:

    merge oldstart newstart > startup [ENTER]

Use DEL to delete oldstart, newstart, or both, or leave them on your disk for future use.

Using Windows

If the window descriptors (W, W1, W2, W3, W4, W5, W6, W7) and the graphics interface and driver, GrfInt and GrfDrv, are in memory, OS-9 lets you set up windows on your display screen.

> **Note:** GrfInt and the window descriptors must be loaded as part of the boot operation. Your System Master diskette does this.

Once you have initialized windows, you can then move among them, initiating different tasks in each. You can even have different processes showing on different portions of your display screen at the same time.

Another advantage of using windows is that you can choose windows that give you displays of 40 or 80 columns across the screen, rather than only 32. However, unless you have a monitor connected to your computer, rather than a television, you might be unable to read the screen.

Establishing a Window

You can establish one or more windows after booting OS-9, or you can include the window creation process in OS-9's Startup file. Startup is a file containing commands you want your system to execute during startup.

To establish a window from the OS-9 prompt, type:

```
iniz wnumber [ENTER]
shell i=/wnumber& [ENTER]
```

In this example, *number* represents the window number to initialize. After you type these commands, you can select the window by pressing [CLEAR]. To return to the original screen, press [CLEAR] again.

The default values for the window descriptors /W1 through /W7 are:

Window device name	Text size in columns	Window's physical size Starts at:	Size:
/W1	40	0,0	27,11
/W2	40	28,0	12,11
/W3	40	0,12	40,12
/W4	80	0,0	60,11
/W5	80	60,0	19,11
/W6	80	80,0	80,12
/W7	80	0,0	80,24

Note: To initialize Windows /W2 and /W3, you must be operating from Window /W1. To create Windows /W5 and /W6, you must be operating from Window /W4.

The "Starts at" column, indicates the position on the screen of the top left corner of the window. On the screen grid, coordinates 0,0 are located at the top left corner.

The "Size:" column indicates the number of characters across each window and the number of character lines in each window.

Therefore, Window 1 displays 40 column text, begins in the top left corner of the screen, extends right for 27 characters and down for 11 lines. Window 5 displays 80 column text, begins at the top of the screen, 60 columns from the left, extends 19 columns to the right and 11 lines down.

Note that the coordinates for each window are based on the text size of the screen. Therefore, Window 1 (based on 40 column text) ends at column 27, while Window 5 (based on 80 column text) begins at column 60.

Using the information in the previous chart, you can now establish any, or all, of the seven windows.

> **Note:** You cannot establish all of the windows unless your computer has 512 kilobytes of memory.

For instance, to set up a full screen, 80-column window, type:

```
shell i=/w7& (ENTER)
```

After a short pause, the screen displays a message, such as:

```
&004
```

This means that OS-9 has opened a path to your new window and started a shell on the window with the process identification of 04. To move to the window, press (CLEAR). Your 32-column screen vanishes and you are now in Window 7. You can type commands or run programs from here in the same manner as before.

To set up three windows on the same screen, type these commands, then use (CLEAR) to move among the windows:

```
iniz w1 w2 w3 (ENTER)
shell i=/w1& (ENTER)
shell i=/w2& (ENTER)
shell i=/w3& (ENTER)
```

If you want, and your computer has enough memory, you can run different processes in all of the windows.

Changing Window Colors

Perhaps you don't like the color of the screen in one or more of your windows. You can change it using the display command. The following charts show you all of the colors available for the screen background, text, and border.

Background Code = 33
Text Code = 32
Border Code = 34

Color Codes

Codes	Color
00 or 08	White
01 or 09	Blue
02 or 0A	Black
03 or 0B	Green
04 or 0C	Red
05 or 0D	Yellow
06 or 0E	Magenta
07 or 0F	Cyan

To change a color, type DISPLAY 1b, followed by the background, text, border, or foreground code followed by a color code. Then, press [ENTER].

For instance, if you are in Window 7, you can change the background color to red, by typing:

```
display 1b 33 04 [ENTER]
```

Change the text color to black by typing:

```
display 1b 32 02 [ENTER]
```

To put a white border around the screen, type:

```
display 1b 34 00 [ENTER]
```

You can also type all the codes on one line, like this:

```
display 1b 33 04 1b 32 02 1b 34 00 [ENTER]
```

Pick the colors you want for each window, and change them using DISPLAY.

Eliminating a Window

In the command to establish windows (shell i=/wnumber&), "i" tells SHELL that the process being created is *immortal*. This means that you can only terminate it from the window in which it resides.

1b 3200 1b 3301 1b 34 00 0c

To kill a window in which you have established a shell, press [CLEAR] until the window you want appears on the screen. Type:

```
ex [ENTER]
```

Now press [CLEAR] to move to another window in which a shell is running. Then use DEINIZ to deinitialize that window. For instance, if the window you want to eliminate is Window 1, type:

```
deiniz w1 [ENTER]
```

Using Startup To Establish A Window

If you intend to use a window whenever you start OS-9, for instance if you want to use an 80 column screen, put the appropriate commands in the Startup file. This file must be located in the ROOT directory of your system disk.

If your system diskette already has a Startup file:

First rename the existing Startup file, such as:

```
rename startup oldstart [ENTER]
```

Then put your new commands into a temporary file. To initialize window Number 7 (80 columns, full screen) with white text on a black background, type:

```
build tempstart
iniz w7 [ENTER]
shell i=/w7& [ENTER]                    o/
display 1b 32 00 1b 33 02 1b 34 02 0c > /w7 [ENTER]
[ENTER]
```

Now combine your new commands with the original Startup file by typing:

```
merge oldstart tempstart > startup [ENTER]
```

You can remove the Tempstart file by typing del tempstart [ENTER], or you can leave it in your ROOT directory for future use.

If Startup does not already exist:

Create it by typing:

```
build startup [ENTER]
iniz w7 [ENTER]
display 1b 32 00 1b 33 02 1b 34 02 0c > /w7 [ENTER]
shell i=/w7& [ENTER]
[ENTER]
```

Now, after you boot OS-9, press [CLEAR] to operate in an 80-column, black and white screen.

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