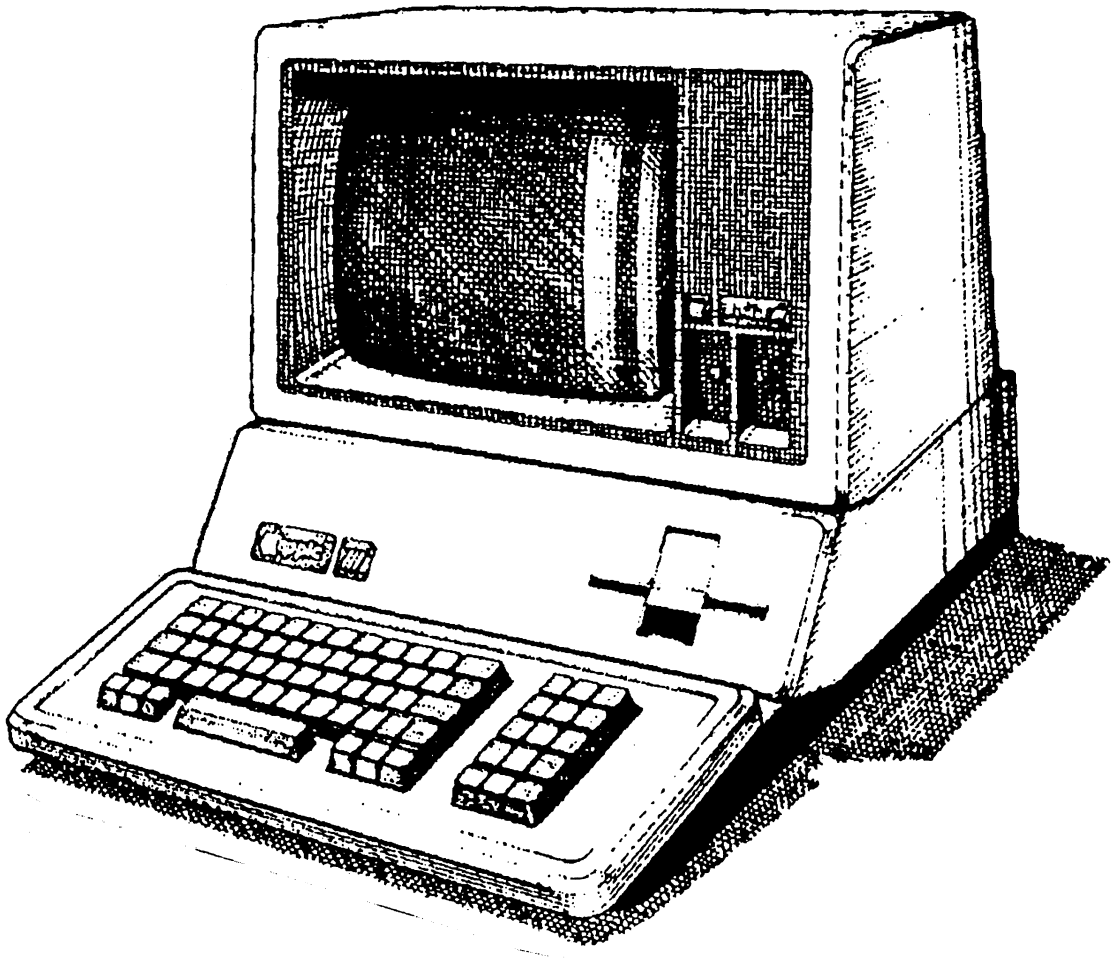
Apple /// Computer Information



DOCUMENT NAME		#
Apple /// Owner's Guide Pre-Print Editim	Apple 09 July 1980	229

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"_012.PICT" 748 KB 2001-08-20 dpi: 600h x 600v pix: 4388h x 5893v

APPLE III OWNER'S GUIDE

PRE-PRINT EDITION FOR

APPLE DEALERS Rev. 0.1

July 9, 1980

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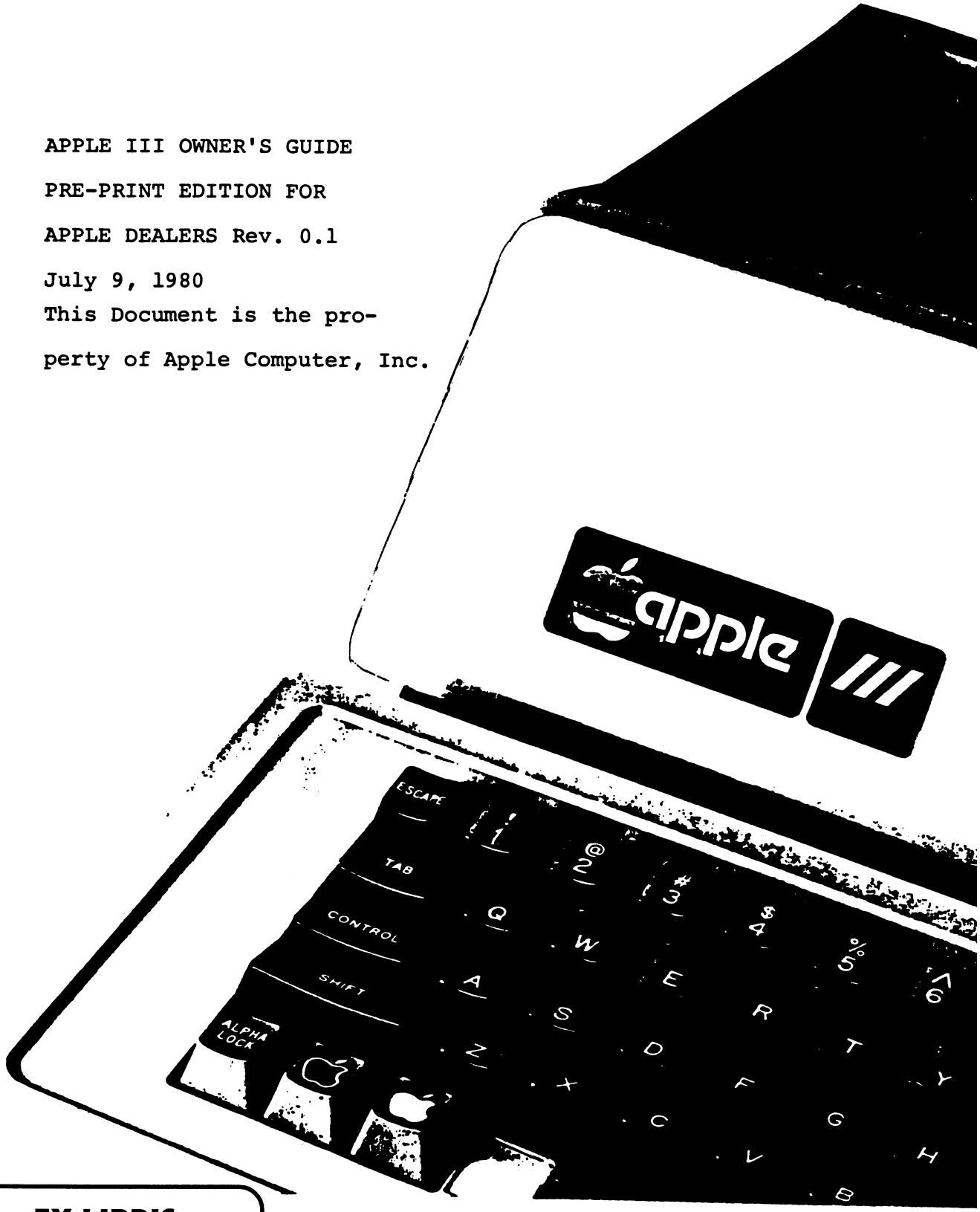

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Apple Product #A3L0001
030-0121-00

Title Page

APPLE III @@@

OWNER'S GUIDE @@@

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PREFACE@@

Congratulations on your purchase of an Apple III, the professional desktop computer system that will revolutionize the way you work.

This is the Owner's Guide for the Apple III. This Guide has three functions. First, it will introduce you to your Apple III: how to unpack it, set it up, and start it working. Second, it will introduce you to some fundamental operating procedures you will follow whenever you use your Apple. Third, it will tell you about the structure and operation of the Apple and its operating system.

You should read the first chapter as you unpack your Apple. It not only tells you how to unpack, set up, and start up your Apple, but it also contains important information about the care and handling of your computer.

The second chapter leads you through the standard procedures you will follow whenever you use your Apple. Here you will learn how to use the standard programs supplied with your Apple, and the usual procedures for using your Apple in most other applications. The information in this chapter is important and helpful; you should read this chapter carefully and follow all the examples it gives.

The next two chapters describe in some detail the operation and structure of the computer. Chapter 3 describes the Apple's Operating System, which is the means of control and communication between you and the machine. Chapter 4 describes the parts which make up the machine itself. Both of these chapters are informative, but if you're not familiar with the terminology in this chapter, or you're not really interested in the mechanical and programmatic details of your Apple, don't worry--you can get along just fine without this information.

At the end of this Guide are several appendices that summarize important information. There's also a Glossary that explains any terms that may be unfamiliar to you, and a Bibliography that lists some books you may enjoy.

If your dealer has not already done so, please take a few minutes to complete your Apple III Warranty Registration card

and drop it in the mail. This will ensure that you receive the newsletters and other information frequently mailed to Apple owners.

CHAPTER 1@@

INTRODUCTION@@@

UNPACKING@@

Your Apple III is packed in a large cardboard shipping carton. This manual was packed in a small shipping carton attached to the Apple's carton. Enclosed with each carton is a packing list; make sure that each carton you received contains everything named on its list.

The envelope containing the packing list for the Apple's carton also contains instructions on how to unpack your computer, so you don't damage it or the packing materials. Save the packing materials in case you wish to transport your Apple--or in the unlikely event that you must return it to your dealer or the factory for service.

To start using your Apple you will need only the contents of the Apple's carton, the contents of the box in which this manual was packed, and a video display. If you are using a video display other than Apple's recommended black and white video monitor, ask your Apple dealer to assist you in connecting it to your computer.

SYMBOLS AND LABELS@@

Occasionally in this Guide you will see the symbol

&HAND
This means the following paragraph contains information that will give you a "helping hand". The symbol

&EYE
informs you that you should be alert: the next paragraph describes a special or unusual feature of your Apple. When you see the symbol

&STOP
read carefully--the next paragraph warns you of a potentially irreversible situation in which you could lose some information you've stored, or possibly damage your Apple.

PLUGGING IN@@

Almost everything you will connect to your Apple III will plug directly into the back of the computer. Place the Apple on a flat surface and turn it around so that the back is facing you.

(Photo 1)

The Back of the Apple III

Now find the six-foot-long power cord and the video cable, which are included in the Apple III carton. These are the only two things you need to connect to the Apple at this time. If you have purchased any other peripheral devices for your Apple III (such as additional disk drives), please wait until you finish this chapter before you install them.

THE POWER CORD@

The power cord plugs into the right side of the back of the Apple. The power switch is right next to the power plug. It has two positions: to the left (marked "0") is OFF and to the right (marked "1") is ON. Make sure the power switch is OFF before you plug in the power cord. Plug the other end of the power cord into a standard three-prong grounded wall outlet.

&STOP

For safety and protection against static charges, you should always make sure that your Apple is grounded. If you cannot connect your Apple to a three-prong grounded wall outlet, then use a proper three-prong-to-two-prong adaptor, making sure to connect the ground wire on the adaptor to the mounting screw on the wall outlet. If you must use your Apple on an extension cord, make sure it is a three-wire grounded one.

CONNECTING THE MONITOR@

Attach one end of the video cable to the connector marked B/W VIDEO on the back of the Apple. Attach the other end of the connector to the video monitor, into the jack marked VIDEO IN. Make sure all connectors fit firmly. After you connect the video cable, plug the monitor's power cord into a wall outlet.

If you are using a monitor or television other than the Apple-recommended black-and-white video monitor, please see your dealer for assistance in connecting it to your Apple.

&HAND

The video cable is tightly coiled for shipping purposes. Sometimes the coils in the cable set up a magnetic field that kills the video signal before it can get to your monitor. Be sure to uncoil and straighten your video cable before connecting it.

+ +

(Photo 2)

+ +

Connecting the Monitor

HANDLING DISKETTES@@

Now you're ready to start using your Apple. Most of the programs you will use are stored on diskettes. These are specially coated plastic disks on which the Apple can store information and read it back later. The Apple records information on the surface of a diskette just as a tape recorder records music on the surface of a magnetic tape.

Each diskette is protected by a square black covering, about five inches on a side. This covering is sealed shut and should never be opened. The Apple can get at the information on the diskette through the oval slots in one end of the covering. YOU SHOULD NEVER TOUCH THE SURFACE OF THE DISK ITSELF; handle it only by its black protective covering. For more information on the use and care of diskettes, please see Appendix B.

INSERTING AND REMOVING DISKETTES@
Turn your Apple around so that the keyboard is facing you, and find the disk drive (on the right side of the face of the Apple, over the keyboard). Open the door to the disk drive by pulling up on the door's bottom edge.

(Photo 3)

Opening the Disk Drive

One diskette is included in your Apple carton; others are included in the box which contained this manual. Find the diskette labeled APPLE III DEMONSTRATION DISKETTE and slide it out of its paper sleeve. Hold it in your right hand, between your thumb and forefinger, with the label upwards.

A Good
RULE OF THUMB:

Hold a diskette with the label on top
and your right thumb on the label.
This pretty much ensures the correct orientation
when you put the diskette in the disk drive.

Insert the far edge of the diskette (the edge with the oval cutout) into the slot in the disk drive. The oval cutout should

enter the disk drive first, and the label (and your thumb) should enter the drive last. Push the diskette gently until it is entirely into the drive. Do not bend the diskette! If you push the diskette too hard, you may damage it permanently.

(Photo 4)

Inserting a Diskette

Close the disk drive door by pushing its front down; it should click into place. If you can't close the door, the diskette isn't inserted all the way; try removing it and inserting it again.

When you remove a diskette, pull it straight back out of the drive, without bending it. Place it immediately back into its protective paper sleeve.

STARTING UP@@

Now that the diskette is in the drive, you're ready to go! First turn on your video monitor (place it on top of the Apple, if you like). Now reach back behind the Apple and turn the power switch ON. Immediately the "ON" light on the keyboard (to the left of the spacebar) will light up, the screen will flash briefly, and the red light under the door of the disk drive will come on. The first light tells you that your Apple is on and running; the second, that it is spinning the diskette.

&STOP
You should not open the drive door, insert or remove a diskette, or turn the Apple's power off while the red light under the disk

drive door is on. When this light is on, the Apple is using the diskette; you should not disturb it.

The screen should display something like this:

(Photo 5)

Demonstration Diskette
Startup Screen

&HAND
If the screen shows the word RETRY in the upper left-hand corner, make sure you've inserted the diskette correctly, then hold down the key marked CONTROL on the left side of the keyboard and at the same time press the flat button marked RESET on the back of the right side of the keyboard. Release both buttons. If RETRY appears again, or if the word DIAGNOSTIC appeared in the upper left-hand corner, see Appendix A.

Adjust the brightness and contrast controls on your monitor so that the image is clear and sharp; use the horizontal and vertical controls to stabilize the picture in the middle of the screen.

THE APPLE III DEMONSTRATION DISKETTE@@

The Demonstration diskette contains programs that demonstrate the features and capabilities of your Apple III. The demonstrations are continuous and cyclic; once you have started the programs, they will repeat until you stop them or turn off the Apple.

There are other demonstration programs on the diskette that are not part of the main cycle. These programs are interactive--they need you to control their operation. To use these interactive programs, press the key marked ESCAPE in the upper-left corner of the keyboard. The main demonstrations will immediately cease and you will be shown a display similar to this:

(Photo 6)

Demonstration Menu

This list of numbered descriptions is called a menu. It works like a breakfast menu at a cafe. If you want scrambled eggs with hash brown potatoes you can just say, "I'll have a number 5". If you want to set the clock on the Apple, you tell the Apple that you want demonstration number 2 by pressing the key marked "2".

Try the demonstration programs. Each one contains instructions on what it does and how you can use it. Some demonstrations are referred to in the next chapter. For now, you can experiment with various demonstrations. If you want to leave a demonstration and go back to the main menu, press ESCAPE.

TURNING IT OFF@@

When you're through with your Apple for the day, you might want to turn its power off to conserve energy. But if you're going to be using your Apple again soon (within the next few hours), then you should not turn it off. Turning the power off and on strains the electronics inside the Apple, and too much strain will reduce its reliability and lifespan. The Apple doesn't use much energy, so if you're going to be using it again in a few hours, leave it on (you should, however, turn off the

monitor; leaving it on will shorten the life of its picture tube).

&STOP

You should remember that the Apple's main memory is volatile--that is, whatever you've stored in it will disappear when you turn off the power. This usually means that you shouldn't turn your Apple off when you've just entered a lot of information and haven't saved it anywhere. So when you put information into your Apple, make sure you save it onto a diskette before you turn the computer off. The manual for the particular application or system you're using will tell you how to do this.

INSTALLING OTHER DEVICES@@

If you have additional disk drives, a printer, or other peripheral devices for your Apple III, now is a good time to install them.

&STOP

*** IMPORTANT ***

Before connecting or disconnecting
ANYTHING
on the Apple III,
TURN OFF THE POWER.
This is a MUST.

Many devices will plug directly into the back of the Apple, as the video monitor does. The QUME letter-quality printer connects directly to the plug marked "PORT C" on the back of the Apple; the Silentype" plugs into "PORT B".

Other devices attach to peripheral interface cards, which you must plug into the inside of the Apple itself. See the manual accompaning each device to see how it should be installed, or see your dealer for assistance.

For devices that plug directly into the back of the Apple, see the section "The Back" in chapter 4. For devices that must be installed inside the Apple, see the section "Inside the Apple", also in that chapter.

Many devices, especially those which plug into the inside of the Apple, will be supplied with a diskette containing programs to operate that device. These programs, called device drivers, must be "plugged into" your Apple III diskettes just as the hardware is plugged into your Apple. The Apple III Standard Device Drivers manual, which accompanies this manual, describes how to install these programs.

INSTALLING DISK DRIVES@

Your first additional disk drive plugs directly into the back of the Apple. Unpack the disk drive and unwrap the long, flat cable attached to it. Look at the connector at the end of this cable: one side has a small rectangular bump on it. Hold the connector with this bump on top and plug the connector in to the "FLOPPY DISKS" connector on the Apple. The bump should slide into the matching notch in the Apple's connector. Press the connectors together until they are firmly seated.

If you have a second additional disk drive, plug it into the back of the first disk drive in exactly the same way as you plugged that drive into the Apple. A third additional drive plugs into the second in the same manner. Your Apple can support up to three additional disk drives.

&STOP

Do not attempt to attach more than three additional disk drives to your Apple! Even though you can physically attach more, the electronics in the Apple cannot handle more than three additional drives. Attaching more drives may damage the Apple, the drives, or both.

CHAPTER 2@@

USING YOUR APPLE III@@@

STANDARD PROCEDURES@@

This chapter lets you get hands-on experience with the Apple and learn how to use its standard operating procedures. The techniques explained in this chapter will be useful to you every time you use your Apple, no matter what language or application you are using.

A note about the examples: parts of this chapter will ask you to run a program on the Apple and try the commands given in the book. It's important that you actually try the examples, to get a feel for what they do and how they can be useful to you. The examples were written with the assumption that you have the Apple set up and running, and that you are doing the examples as they are presented. If you read the manual without actually trying everything on the Apple (or try to learn how to use the Apple without reading the manual), you might pick up some of the simpler commands, but it's unlikely that you'll master the more powerful functions of the Apple.

Even though the manual will show you many ways to use the features of the Apple, there are still more features to use and an infinite number of ways to use them. So, experiment! Feel free to try new and different things. It's the only way you'll learn the true power of your Apple.

THE USUAL STARTUP PROCEDURE@@

You'll use the same general procedure to start up your Apple each time you turn it on. It's the same procedure you used to start up the Demonstration diskette in the last chapter. This procedure is called a bootstrap operation, or "booting the system". The term dates back to the early days of computing and refers to the computer's attempts to pull itself up into operation by tugging on its own bootstraps.

The usual procedure for booting your Apple is to insert a diskette in the Apple's built-in disk drive, close the drive door, and turn the power switch on. If the power is already on, the procedure for booting is to hold down the CONTROL key while pressing the RESET button behind the keyboard:

(Photo 7)

Booting Up

As soon as you release either button, the disk drive's red light will come on and the drive will start to whirr. In a matter of moments the computer will have loaded the information it needs from the diskette and started running.

BOOT DISKETTES@

You must boot your Apple using a diskette which has been specially prepared for that purpose. Such a diskette is called a boot diskette. A boot diskette is just like any other diskette, except that it contains three special things:

* An operating system. This is a large program written in the Apple's native machine language which controls the flow of information throughout the machine.

* A set of device drivers. These are smaller programs which allow the operating system to communicate with peripheral devices such as the keyboard, screen, and printer.

* An interpreter. This is the heart of the computer language in which the programs you use are written. The most common interpreters are Apple Business BASIC and Appple Pascal (Apple FORTRAN uses the Pascal interpreter).

Every boot diskette must contain these three items. If you try to boot your Apple using a diskette that lacks one or more of these, the Apple will respond with the message

FILE 'SOS.KERNEL NOT PRESENT'

or something of that nature. It will then "hang" (do nothing) until you insert a proper boot diskette and try again.

&HAND

Whenever you boot a diskette, you automatically boot a language. The only way to switch from one language to another is to reboot the system with the other language's boot diskette.

TURNKEY SYSTEMS@

Most boot diskettes will also have a fourth important item: a program specially designated to be run automatically whenever you boot the Apple using that diskette. Such diskettes are called turnkey diskettes. Suppose a doctor has created a program to schedule patients' appointments. Ideally, the office staff should simply turn on the Apple and immediately begin using the appointment system. The office users wouldn't need to know anything about the program or languages, just how to use the appointment system. The computer would become an appointment maker: to the office workers it would have no other function.

This is the essence of a turnkey system: from the user's point of view the computer is simply a device for one particular application, and getting it started is simply a matter of turning a key in a lock. Here, the "key" is the Apple's power switch. You do not need any computer expertise to operate a well-designed turnkey system.

The Demonstration diskette you used in the first chapter is a turnkey diskette; so is the Apple III Utilities diskette, which you will use later on in this chapter. Most of the programs that you will purchase for your Apple will be on turnkey diskettes. If you are going to be writing your own programs, you can learn how to create turnkey diskettes by reading the language manual for the programming language you will be using.

OTHER USES OF RESET@

The RESET button can do things other than boot the system. Each program and language can have its own way of responding to the

RESET button. In BASIC, it can stop an errant program that seems to have no end; in another program it may be used to stop a cycle and send you to a fixed point. Often the RESET button is simply ignored. To find out how the language or application you're using responds to the RESET button, please see the manual for that language or application.

USING THE CONSOLE@@

The Apple's video display and typewriter-like keyboard are called the console. Through the console, you enter information into and receive information from the program or application you are using. Like the dashboard of a car, the console of the Apple is the major means of communication with your computer.

There are standard ways that the console allows you to enter information and standard ways it will display information on the screen. Whatever application you are using, you will usually use the console the same general way. It's like driving your car: even though you drive along different roads, the way you drive is pretty much the same.

The best way to learn about the console is to use it. There's a program on the Demonstration diskette that allows you to use the console alone, without using another application or program. This will give you practice in using the general features of the console. Think of it as a driving simulator. Once you learn to drive, you won't have to learn again for each new road you travel.

To use this program, first boot the Demonstration diskette. Place the diskette in the Apple's built-in disk drive and use the standard procedure for booting diskettes, described above. Once the demonstrations start, press the ESCAPE key on the Apple's keyboard. You should see the Demonstration menu:

(Photo 8)

The Demonstration Menu

Choose the CONSOLE DEMONSTRATION by pressing the number 1. Immediately the disk drive will start to whirr, and after some introductory instructions, the screen will become blank, with a small white square in the upper-left corner. Try typing something. As you press each key, its character will silently appear on the Apple's screen. (There are 128 different characters that the Apple can display on its screen; this is called its character set.)

This demonstration effectively detaches the console from the rest of the computer, and connects the keyboard directly to the screen. This is called echoing: each character you type on the keyboard is sent unmodified to the screen. The characters you type are neither processed nor stored in memory.

Most programs and applications do this, but they also interpret what you're typing. Many will wait until you hit a special key (such as RETURN or ENTER), or type a certain number of characters, before they look at what you've typed; others will examine each and every keystroke for meaning.

The purpose of the following exercises, then, is to acquaint you with the things you'll be doing most often: typing, erasing minor mistakes, and controlling the printing on the screen. Some of this may not be applicable in a particular situation, but much of it will be.

What's Happening Now What Usually Happens

THE KEYBOARD@

Look closely at the keyboard. You'll see that it looks much like the keyboard on an office typewriter. Type some more; when you get to the end of a line, press the RETURN key to move to the beginning of the next one.

(Photo 9)

Typing

You'll notice some differences between the Apple's keyboard and a typewriter's. First, it's all electronic, so the "feel" of the keys is much lighter. Second, the keycaps are curved and sloped for easier, more comfortable typing. There's also a little bump in the middle of the D and K keys, and one on the number 5 on the numeric keypad (to the right of the main

keyboard). If you're a touch-typist, just feel for those little bumps with your middle fingers and you'll know when you're in the home position.

The keyboard has many symbols that aren't usually available on a typewriter:

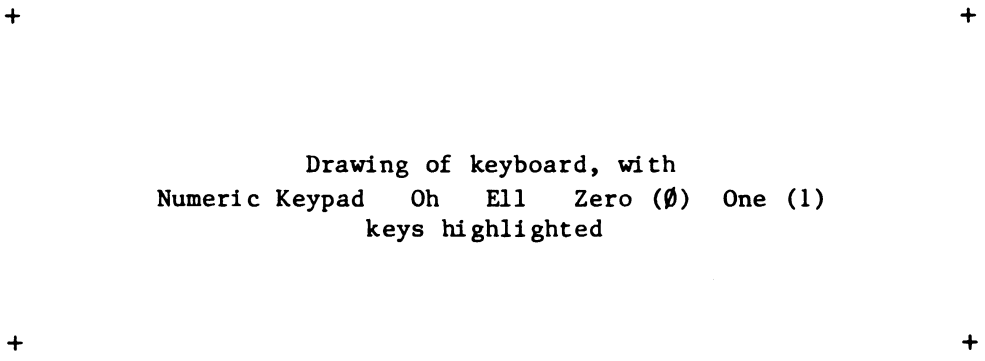
Vertical Bar	|
Backslash	\
Tilde	~
Grave Accent	`
Brackets	[ ]
Braces	{ }
Angle Brackets	< >
Circumflex	^

These symbols are included because many programming languages use them for simplicity and readibility. But the keyboard lacks two characters usually found on a typewriter: the cents sign and the plus-or-minus sign.

(Photo 10)

The Keyboard

The group of 13 keys to the right of the typewriter keyboard is called the numeric keypad. The keys on the keypad are grouped like those on an adding machine or calculator, to make it easier to enter large amounts of numerical data into the Apple. The keys on the numeric keypad usually work the same as their main keyboard counterparts (ENTER is the same as RETURN), but any program can redefine their meanings (as well as the meanings of most other keys) to make them different from the number keys on the main keyboard.



Drawing of keyboard, with
Numeric Keypad Oh Ell Zero (Ø) One (1)
keys highlighted

Type a few zeros, using the zero keys both in the top row of the main keyboard and at the bottom of the numeric keypad, and look at the characters displayed on the screen. The slash through the zero is to distinguish it from the letter "oh". When the Hindus were inventing the number system we use, they used a symbol for zero which didn't interfere with any letter in their alphabet; but their zero happened to look the same as the Romans' letter O. Computers (and any clear-thinking individual) want to keep them separate, so we slash our zeroes when they might be confused with ohs.

Similarly, if you're a typist and you're accustomed to using the lowercase letter "ell" for the number one, you're going to have to readjust. There are two keys on the keyboard with the number 1; if you use an ell for a 1 the Apple will become confused. So use a Ø for zero and a 1 for one.

Besides the letter and number keys, there are some special keys on the keyboard. As on a typewriter, there are two SHIFT keys, one on either side of the keyboard. When you hold down one of the SHIFT keys, you change the meaning of other keys on the keyboard.

Some keys (mostly along the top row) have two symbols on them. When you press the key alone, the lower character on that key appears on the screen. If you hold down SHIFT while pressing the same key, you'll get the upper character on the key.

You've seen that when you press the letter keys on the keyboard, lowercase letters appear on the screen. By holding down SHIFT, you can type uppercase letters. Experiment with typing lowercase and uppercase letters and other shifted characters. Try pressing the ALPHA LOCK switch and typing letters and

numbers: it works like an automatic shift for letters only.

+ +

Drawing of keyboard, with
SHIFT
keys highlighted

+ +

Have you been noticing the little white square, which moves along the screen as you type? It's called the cursor, and it serves two purposes. First, it is an indication that the Apple is waiting for you to type something. When the Apple wants you to type something on the keyboard, it usually displays a cursor. Second, it is a "placeholder" that indicates the position on the screen where the next character you type will be placed. Each time you press a key, the cursor writes a character on the screen and advances to the right, like the printing element on a typewriter.

CORRECTING ERRORS@

Nobody's perfect. If you've been typing a fair amount it's likely that you have pressed a wrong key or two. You can move the cursor backwards to correct your mistakes; this is called backspacing, and the key you use is the backspace key, actually the left-pointing arrow in the lower-right corner of the keyboard. Type this line from William Shakespeare's Sonnet 30:

[When to the sessions of sweat silent thought[]

Immediately you see you've made a mistake. "Sweat" should be "sweet", of course. So use the backspace key to move the cursor back to the A. Now type an E, and the error is gone. The E replaces the A: this is called overstriking.

[When to the sessions of swee[t] silent thought

This is the general method of correcting typographical errors: backspace and overstrike. But each time you backspace over a character, you are actually telling the Apple to forget that you ever typed that character. If you press RETURN now to begin the next line, the remainder of the line you're on will be erased, because by backspacing over it you told the Apple to forget it. Before you press RETURN, you must get the cursor to the end of the word "thought".

There are two ways to do this: you can either type the rest of the line yourself (not very convenient if you blew the first word of a long sentence), or you can use the right-arrow key, called the retype key. Each time you press this key, the cursor will move one space to the right. To the Apple, it's as if you had typed the character under the cursor. Press the right-arrow key sixteen times, to move the cursor to the right of the word "thought". The Apple thinks you just typed "t silent thought", the sixteen characters you moved over.

[When to the sessions of sweet silent thought[]

You'll use this technique--backspace plus overstrike plus retype to where you left off--when you've made a minor mistake back in the middle of a line you're typing.

But what if while you're typing a line, you change your mind and want to delete the entire line and start again? You could backspace to the beginning and type what you originally meant to type, or you could tell the Apple to cancel the entire line (everything you've typed since you last pressed RETURN) by holding down the CONTROL key and typing the letter X.

Practice cancelling lines. Press RETURN to skip to a new line and type the next line to Sonnet 30:

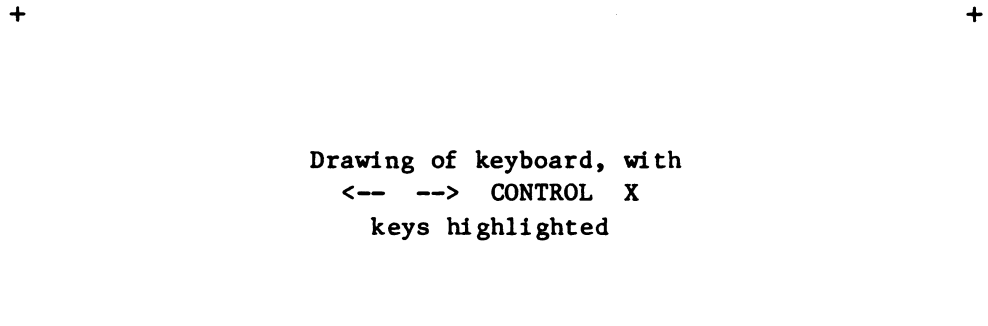
[I sigh the lack of many a thing I sought[]

Oops . . . this is the third line of the sonnet, not the second. To tell the Apple to forget this line so you can start again, hold down CONTROL and type an X. The Apple responds by typing a backslash, skipping a line, and waiting for you to retype the line.

[I sigh the lack of many a thing I sought\

The process of holding down the CONTROL key while typing some other character is called generating a control character. The CONTROL key is a special kind of SHIFT key: it, too, can change the meaning of other keys on the keyboard.

Control characters do what their name implies: they are used to control the operation of a program or application. Depending upon the application you're using, you may be asked to type many different control characters at various times. This and other manuals will use the phrase "type CONTROL-L", for example, to mean "hold down CONTROL while typing the letter L".



You'll use backspacing and cancelling like this when you're using programs written in languages like BASIC. But some systems, such as Pascal, use a slightly different destructive backspace. A destructive backspace works just like the nondestructive backspace you've just seen, except that the characters you backspace over are removed from the screen. A language or application usually uses only one type of backspace, destructive or nondestructive. You can't normally change which type of backspace you're using, but this demonstration has a special command which allows you to do just that. To see how a destructive backspace works, hold down the Open Apple key and press the spacebar.

Type the actual second line to the sonnet:

[I summon up remembrance of things past[]

Now use the backspace key to go back and change "of" to "about". See the characters disappear? That's destructive backspacing. Each character is erased as you back over it. To fix an error in a line when you're using destructive backspace, you must back up

to the error, correct it, and type the rest of the line again. The retype key is disabled when you're using destructive backspacing.

[I summon up remembrance about[]

When backspacing is destructive, so is cancelling lines. Type the fourth line of the sonnet:

[And with old woes new wail my dear time's waste.[]

But these memories are unsettling: let's cancel this line. Type CONTROL-X (remember how? Hold down CONTROL and type an X). Instead of cancelling the line as before, CONTROL-X now erases the entire line you typed, and leaves the cursor at the beginning of the same line.

WRAPPING AND SCROLLING@

Type the preamble to the U. S. Constitution, or any other lengthy sentence more than eighty characters long. When you get to the right edge of the screen, don't press RETURN; just keep typing and see what happens. Since the screen is only eighty characters wide, the whole sentence won't fit. If you were typing on a typewriter and you reached the right side of the page, the typewriter would probably stop at the right margin and not let you type any more on that line; you'd have to press the carriage return to proceed. But on the Apple, whenever the cursor hits the right side of the screen, it automatically jumps to the beginning of the next line. Sometimes it splits a word in two, leaving the beginning on one line and the end on the next. This phenomenon is called wraparound: the cursor, when it hits the right side of the screen, "wraps" itself around and appears on the other side again.

(Photo 11)

Wraparound

If you don't like wraparound, then you can do just as you would on a typewriter: when you approach the right side of the screen, press the RETURN key. Pressing RETURN sends the cursor to the beginning of the next line on the screen. In many applications, RETURN also signals the Apple that you've finished typing something, and you want it to process what you've typed.

Drawing of keyboard, with
RETURN
keys highlighted

If you type enough text, or press RETURN often enough, you'll quickly fill up the screen. When the cursor reaches the bottom line of the screen, and reaches the right edge of that line (or you press RETURN), it has nowhere to go: there is no "next line". So the Apple scrolls the screen, rolling it up one line, and gives you a fresh, blank line at the bottom. Try it: press RETURN enough times to get down to the bottom of the screen, type something, and press RETURN again. All the text will roll upwards, and a new blank line will appear at the bottom.

(Photo 12a&b)

Scrolling: Before and After

Try holding a key (like the exclamation point, SHIFT-1) down for a few seconds. The moment you press it, you get one exclamation point (as you expected). But after half a second, you start getting more and more exclamation points! It's as if you were pressing that key repeatedly, ten times per second. Every standard key on the keyboard will automatically repeat if you hold it down for more than half a second.

Now without letting go, press the Solid Apple key. Not only do you get more exclamation points, but they come faster, too. When you press and hold the Solid Apple key while holding down any other key, you will get that key repeated at a rate of about 33 keystrokes per second. The four arrow keys also repeat automatically at this faster speed if you press down hard on them.

Drawing of keyboard, with
Solid Apple
keys highlighted

LEAVING THE DEMONSTRATION@@

These are the most common uses of the console: entering information and correcting minor errors. There are some other features of the console you may wish to use. The operation of the console is described in full in the Apple III Standard Device Drivers manual, which accompanies this manual.

There's another demonstration on the Demonstration diskette that introduces you to typeahead, which allows you to enter information faster and more efficiently. You may want to experiment with that demonstration. But to do anything now you must first leave the console demonstration you're now using.

To leave the console demonstration and return to the demonstration menu, hold down the Open Apple key and press ESCAPE. Now you can try the typeahead demonstration, or continue reading this manual and learn about the Apple III Utilities diskette.

USING THE UTILITIES DISKETTE@@

Now find the diskette labeled "APPLE III UTILITIES DISKETTE", insert it in the built-in disk drive, and boot it (using the usual procedure for booting diskettes, given at the beginning of this chapter).

The Utilities diskette has three functions: it allows you to format new diskettes, so that you can store information on them; it allows you to copy the contents of one diskette onto another; and it allows you to use the System Configuration Program to change the configuration of your boot diskettes.

When you boot the Utilities diskette, the first thing you see on your screen is the Utilities menu:

(Photo 13)

Utilities Menu

This menu is similar to the menu on the Demonstration diskette: to perform one of the functions listed on the menu, you simply type the number associated with that function. There's one difference, though: on the Utilities menu (as well as throughout the Utilities diskette programs and many other applications on the Apple), you must press the RETURN key after you type the number of the function you want. Pressing RETURN is a confirmation that you really want the Apple to do what you told it to do. If you type the wrong number by mistake, you can use the backspace key to erase the wrong number and type the number you really want, before you press RETURN.

FORMATTING DISKETTES@@

Your Apple comes equipped with a box of blank diskettes. You'll use these blank diskettes to store information and programs you generate while using other Apple languages or applications. But right now, the diskettes are useless to you: the Apple cannot store any information on them. Before you can use a blank diskette, you must format it.

When diskettes are manufactured, they have no information on them at all. They're like blank recording tape. When you format a diskette, you set it up to be receptive to new information, and you give it a name by which you can refer to it later.

&HAND
You should format all of your blank diskettes now. It's good to have a supply of formatted diskettes on hand. If you were using

some language or application on the Apple and had entered a lot of information into the computer, and you discovered that all your diskettes were full and could hold no more new information, you'd be stuck. You would have no place to store the information, and no way to format a blank diskette without losing the information in memory. So every time you get some new, blank diskettes, format them immediately so that you can use them.

To format a diskette, choose the FORMAT DISKETTE option from the Utilities menu by typing the number 1 and pressing RETURN. The screen will show this:

(Photo 14)

Diskette Formatting Program

The computer needs to know which disk drive you're going to use to format the blank diskette. If you don't have any additional drives, you'll have to use the Apple's built-in drive. Its name is .D1 (for Disk 1). Open the door to the disk drive, remove the Utilities Diskette from the drive, type .D1, and press RETURN.

If you have additional disk drives attached to your Apple, you might want to use one of them, to avoid having to remove the Utilities Diskette. The names of the additional drives are .D2 , .D3 , and .D4 , for the first, second, and third additional drives, respectively. Type the name of the drive you wish to use and press RETURN.

Regardless of which drive you choose, the Apple will respond

[Insert diskette to format and press 'RETURN'

Insert a blank diskette into the drive you chose, close the drive door, and press RETURN. The Apple will whirr and grind

while it erases the diskette, creates "blocks" on the surface of the diskette where information can be stored later, and gives the it the name BLANK . When it's finished, it will display

[Format operation complete.

Now remove the blank diskette, write on the label that it is formatted and its name is BLANK, place it back in its protective paper envelope, and store it in a safe place.

&EYE
If you try to format a diskette that has information on it already, the Apple will ask you to verify that you do indeed want to clear off that diskette. If you format a diskette on which you've already stored information, all the information that was on that diskette will be lost.

The Apple will also ask you

[Do you wish to format another diskette (Y/N)? []

If you have more blank diskettes to format, type the letter Y (for "Yes") and press RETURN. The Apple will ask you to insert another blank diskette into the same disk drive and press RETURN. Continue until you've formatted all your blank diskettes.

When you have no more blank diskettes to format, answer N (for "NO") to the Apple's question and press RETURN. You will see the Utilities menu again.

&EYE
If something goes wrong during the formatting process, the Apple will display an error message informing you of what went wrong. If you get one of these messages, see Appendix A.

COPYING DISKETTES@@

The COPY DISKETTE selection on the Utilities Menu allows you to make duplicate copies of any Apple III diskette. The most important use for copying diskettes is in making backup copies of important programs or information.

THE IMPORTANCE OF BACKUPS@

If something were to happen right now that rendered all of your boot diskettes unusable, your Apple would be completely useless. Honestly. You must have a set of good boot diskettes in order for your computer to have any usefulness whatsoever. There are many ways to destroy a diskette: leaving it out in the sun or in a hot car trunk, bending it, leaving it in the vicinity of a powerful magnetic field, and so on. As your boot diskettes are very valuable, and it's not difficult to accidentally destroy one, you should make backup copies of every important diskette you have.

When you make a backup copy of a diskette, label it with the name of the diskette it was copied from, and the date the copy was made. Then store it in a safe place. If your original diskette becomes unusable for some reason, you can then use the backup copy. Make sure that when you switch to the backup copy, you make a new backup and store it away so that you'll still be protected against future accidents.

Some boot diskettes supplied for your Apple may be write-protected. This means that you won't be able to store information on them; you can only read the prerecorded information. This is done to protect the information on the diskette from possible erasure. Before you use one of these diskettes, you must first make a copy of it. Put away the original, Apple-supplied diskette as the backup, and when you wish to use the program, boot the Apple using the copy.

You can write-protect your own diskettes, too. Just stick one of the small silver tabs (included with each box of diskettes) over the notch on the right side of the diskette. When this notch is covered, the Apple can't store information onto the diskette or change what's already on it. If you want to store information on the diskette, you must first peel off the tab.

Some diskettes have no write-protect notch. Such diskettes are permanantly protected--you can never change the information on these diskettes.

(Photo 20)

A Write-Protected Diskette

USING THE DUPLICATION PROGRAM@

To make a copy of a diskette, choose option 2 from the Utilities menu by typing the number 2 and pressing RETURN. The Diskette Duplication program will introduce itself:

(Photo 21)

Diskette Duplication Program

The Duplication program will use two diskettes: a source diskette, which is the diskette containing the original material, and a destination diskette, which is the diskette onto which the original material will be duplicated. You can use almost any diskette for the destination diskette: the Duplication program can copy onto either preformatted blank diskettes, unformatted diskettes, or diskettes that already have information on them.

&EYE
The Duplication program will destroy whatever information was on the destination diskette. It makes an exact copy of the source diskette on the destination; all information previously on the destination diskette will be lost. If you attempt to copy information onto a diskette that has information on it already, the Apple will ask you to verify that you do indeed want to destroy the information on that diskette.

For now, let's make a backup copy of the Utilities diskette itself. You'll need two diskettes: the Utilities diskette (which is already in the built-in disk drive), and one blank diskette (use one of the ones you formatted in the last section). As the Duplication program works with two diskettes, it's helpful to have two disk drives. If you have only the built-in disk drive, you can still make copies, but you have to swap the diskettes in and out of the one drive. See the section "Copying with One Drive", below.

COPYING WITH TWO DRIVES@
The Apple should still be waiting patiently, asking for the name of the drive in which you want to place the source diskette. The source diskette in this case, the Utilities diskette itself, is in the built-in disk drive, whose name is .Dl . You could type .Dl and press RETURN, but see the parenthetical remark on the right side of the screen, which says DEFAULT .Dl ? This means that if you don't type a drive name in response to this question, but simply press RETURN, the Apple will assume "by default" that you meant .Dl, the built-in disk drive. Pressing RETURN alone is the same as typing .Dl and pressing RETURN. Do this now. (If, of course, your source diskette were in some other drive, you would type the name of that drive and press RETURN.)

The Apple will respond with:

[Destination Drive: (Default .D2)

It now wants to know the name of the drive the destination diskette will be in. Using drive 2 (the first additional disk drive) is the most convenient, and besides, it's the default. Choose drive 2 by just pressing RETURN.

The Apple will now ask you to insert both diskettes. Insert the source diskette into the built-in disk drive (since you're copying the Utilities diskette, it's already in there), insert a blank diskette into drive 2, and close the door. To begin the copying operation, press RETURN.

When the copy is done, the Apple will display

[Copy complete. Do you wish to copy another diskette (Y/N) ?

If you type Y (for "Yes") and press RETURN, you'll be asked about the source and destination drives again, and will be able to make either another copy of the same diskette or a copy of another diskette. Try making backup copies of all the boot diskettes supplied with your Apple. When you've copied all the diskettes, answer N (for "NO") to this question and you'll be returned to the Utilities Menu.

COPYING WITH ONE DRIVE@

The procedure for copying diskettes with only the built-in disk drive is much the same as the procedure for copying with two drives (see above), except that you must periodically remove one diskette from the drive and insert the other. The number of times you will have to make such swaps will vary with the amount of memory your Apple has and the amount of information on the diskette.

When the Apple asks you which drive the source diskette is in, type .D1 and press RETURN. When it asks you the same question about the destination diskette, again answer .D1 and press RETURN. The Apple will respond with

[Insert source diskette and press 'RETURN'

Place the source diskette into the disk drive (if you're making a copy of the Utilities diskette, it's already in the drive), and press RETURN. The Apple will load as much information as it can from the disk into its memory. It will then ask you to

[Insert destination diskette and press 'RETURN'

Open the disk drive door, remove the source diskette, and insert the destination diskette. Close the door again and press RETURN. The Apple will save all of the information it stored in

its memory onto the destination diskette. It will then ask you to insert the source diskette again. Open the door, remove the destination diskette, and insert the source diskette again. Close the door and press RETURN. Repeat this procedure until the Apple displays

[Copy complete. Do you wish to copy another diskette (Y/N) ?

If you type Y (for "Yes") and press RETURN, you'll be asked about the source and destination drives again, and will be able to make either another copy of the same diskette or a copy of another diskette. Try making backup copies of all of the boot diskettes supplied with your Apple. When you've copied all of the diskettes, answer N (for "NO") to this question, and you'll be returned to the Utilities Menu.

THE SYSTEM CONFIGURATION PROGRAM@@

The third program on the Utilities diskette, the System Configuration program, allows you to specify the number and types of peripheral devices you have attached to your Apple. The program tailors your boot diskettes to match the devices you have installed in your Apple.

You'll use the System Configuration program only if you have attached additional devices to or removed standard devices from your Apple. Your boot diskettes come configured in this manner:

* One built-in disk drive, one additional disk drive

* Standard console: built-in screen and keyboard

* Graphics capability installed

* Printer capability installed; configured for QUME

If you have attached additional disk drives, you should read the remainder of this chapter. If you have attached any other peripheral devices (except joysticks) to your Apple, you should read the manuals that came with those devices and also Part 1 of the Apple III Standard Device Drivers manual, which accompanies this manual.

If you have attached a printer other than the Qume Sprint 5 to Port C on the back of your Apple, see Part 4 of the Device Drivers manual.

If you wish to write your own programs to use the full text and graphics capabilities of the Apple, please see Parts 2 and 3 of the Device Drivers manual.

USING THE SYSTEM CONFIGURATION PROGRAM@

Each boot diskette must be configured to match the devices you've attached to your Apple. Part of this involves knowing how many disk drives you have. If you don't have one and only one additional disk drive, you should use the System Configuration program to tell your boot diskettes they can use a different number of drives.

To use the System Configuration program, boot the Utilities diskette (if you haven't done so already) and choose selection 3 from the Utilities menu by typing the number 3 and pressing RETURN. You will be shown the Configuration menu:

+ +

(Photo 22)

+ +

Configuration Menu

There are seven choices from this menu, numbered 1 through 7. You'll use option 4, CHANGE SYSTEM PARAMETERS, to change the number of disk drives you've attached to your Apple. The other six options are used for adding and removing other devices; see the Standard Device Driver manual for a description of these options.

&HAND

You should configure all of your Apple III boot diskettes each time you add or remove a disk drive or other peripheral device. A peripheral device can only be used when you boot your Apple using a diskette that has been configured to recognize that device. You cannot configure diskettes that are write-protected. To configure a write-protected diskette, you must make a copy of the diskette and configure the copy. See the section "Copying Diskettes", above.

CHANGING THE SYSTEM PARAMETERS@

From the Configuration menu, choose option 4, CHANGE SYSTEM PARAMETERS, by typing the number 4 and pressing RETURN. This part of the Sytstem Configuration program allows you to change the number of disk drives and three other things that affect the operation of your Apple: the character set, the keyboard layout, and the peripheral slot assignments.

(Photo ??)

Changing System Parameters

The number of disk drives parameter lets you configure your diskettes with the proper number of disk drives on your Apple. If a boot diskette doesn't know the number of drives available to it, it cannot use any of the additional drives.

If the number of drives shown on the screen (to the right of the words "# of Disk Drives") is different from the number of drives attached to your Apple (counting the built-in drive, too), you should change this parameter. Type 3 and press RETURN. The Apple will ask:

[Number of Disk Drives.....

Type the number of disk drives (from 1 to 4) you have and press RETURN. The number of disk drives shown on the screen will immediately change to the number you typed.

To tell the Apple that you're finished with the system parameters, press the ESCAPE key. You will be returned to the Configuration menu.

GENERATING A NEW SYSTEM@
To save the results of your work, chose option 5, Generate New System, from the Configuration menu and press RETURN. The Apple will ask you:

[Perform system validity check (Y/N) ?

Answer Y (for Yes), and the System Configuration program will check all the work you've done to make sure the configuration you've created is valid, and that your Apple will be able to operate in that configuration. Now you will be asked:

+ +

(Photo 26)

+ +

Generate New System

You should now place the boot diskette that you wish to configure into the Apple's built-in disk drive. Configure the Utilities diskette itself first, then configure all your other boot diskettes (remember that you can't configure write-protected diskettes; you should configure the copies you made above).

The Apple is now waiting for you to enter the name of the file in which it should save the configuration information. The default name is SOS.DRIVER. To use this name, all you need to do is press RETURN. The System Configuration program will quickly update the diskette and return you to the Configuration menu.

Repeat this procedure for each boot diskette you have. You don't need to perform the validity check again; you've done it once already. On the label of each boot diskette you configure, write the date that you configured it and what you've done to it (for example, "2 drives, Graphics and Printer installed").

When you've finished configuring all your boot diskettes, choose option 7 to return to the Utilities menu.

SUMMING UP@@

The System Configuration program has many more capabilities than have been discussed here. The Standard Device Drivers manual and manuals for Apple products that use the System Configuration program contain more complete instructions on the other features of this program.

We hope that the experience of using both the console demonstration and the Utilities diskette have made you familiar with the Apple and the way it works. Now you can go on to the other programs and applications which were included with your Apple. There is a multitude of things your Apple can do for you, and the only way to find them is to try.

CHAPTER 3@@

THE SYSTEM@@@

STANDARD SOFTWARE@@

Three major pieces of software are supplied with every Apple III: the startup routines, the Apple III operating system (SOS), and the utility programs. This common software works closely with the hardware of your Apple III to create a powerful operating base for all other software. The startup routines are stored inside your Apple, etched permanently into its memory. SOS is included on every boot diskette supplied for your Apple, and the utility programs are included on the Utilities diskette.

STARTUP ROUTINES@@

Each time you turn on the power to your Apple, the computer performs an extensive initialization and diagnostic check of its most vital parts. The programs to do this are stored permanently in memory. These programs are always present inside your Apple, and you can run them at any time.

The first thing the Apple does when its power is turned on is to initialize the entire system. This includes resetting all input and output devices, setting up and clearing the screen, and setting the screen's character set.

In the next phase of initialization, the Apple searches through its entire memory space to see how much working memory it actually has. Computer memory is measured in units of 1,048 memory locations; this unit is called "one K". The size of the Apple's memory can range from 96K (98,304 locations, the minimum memory size) to 128K (131,072 locations, the maximum memory size for a fully-loaded Apple III). The Apple also tests small portions of its memory to ensure that it is usable.

The initialization is followed by a quick diagnostic check of the Apple's permanent memory, internal registers, serial interface, joystick interfaces, and keyboard. If any of these proves faulty, the Apple will display the word "DIAGNOSTIC" in the upper left corner of the screen, followed by one or more diagnostic codes. If you see one of these codes, refer to Appendix A.

If the Apple passes all the tests it gives itself, it will load an operating system from the diskette in the built-in disk drive. Normally, this operating system will be the Apple III

Sophisticated Operating System (SOS); you can, however, load other systems (including the Apple II Emulator) in exactly the same manner.

You can repeat the initialization and testing cycle at any time by turning off the Apple and turning it back on again. This will, however, destroy any program or information you have stored in the Apple's memory.

ALL ABOUT SOS@@

The most important piece of software that will ever run on your Apple III is called SOS, the Sophisticated Operating System. The purpose of SOS is to provide an efficient, consistent means for programs to use the hardware of the Apple. All programs communicate with the computer's hardware through SOS and only through SOS.

SOS is usually hidden from you; only advanced programmers who work in machine language will actually need to know about the inner workings of SOS. But as all systems and languages you will be using on the Apple themselves use SOS, it will help you to have some knowledge of SOS.

A DISK-BASED SYSTEM@@

SOS is included on every boot diskette you use to start up your Apple III. Because of the size, complexity, and power of SOS, it is likely that newer, improved versions will be released as time goes on. Unlike other computers, which have their operating systems burned permanently into memory, the Apple III allows you move up to a newer version of SOS easily, quickly, and at comparatively little expense, simply by updating your SOS diskettes.

If you have returned your Apple III Warranty Registration card, you will be informed of changes and improvements in SOS as they occur. If you subscribe to the Apple Extended Warranty Program, you will be eligible to receive each new version of SOS as it is released; see the Extended Warranty brochure included with your Apple. No matter how you obtain a new version of SOS, updating

your current SOS diskette is simple; instructions will be included with your new SOS diskette.

THE STRUCTURE OF SOS@@

The core of SOS is the Kernel, a set of programs and subroutines that control the flow of information around and through SOS. The Kernel is divided into five main areas: the File Manager, the Device Manager, the Memory Manager, the Utility Manager, and the Interrupt Manager.

The File Manager controls the logical storage, transfer, and routing of information within the Apple. All information is stored in units called files. The File Manager can create and destroy files, read their contents, write new information into them, change their names, or move them from place to place.

The Device Manager controls the physical storage and flow of information into and out of the Apple. Together with its associated device drivers, it controls the operation of the console (the screen and keyboard), the serial port, the printer port, and all other peripheral devices connected to the Apple.

The Memory Manager in SOS allows programs and languages to use all the memory you have in your Apple quickly and efficiently. In its native state, the microprocessor (the "brain") on which the Apple is based can address only 64K (65,536) memory locations, each of which contains one byte of information. But the Apple III has advanced circuitry that greatly increases that memory space. The Memory Manager keeps track of "banks" and "pages" of memory, and allocates their use to different programs and languages. The operation of the Memory Manager is usually invisible to you.

The Utility Manager allows programs access to built-in devices such as the joysticks and the clock/calendar. Most languages and applications that use the clock and joysticks will have more convenient, higher-level commands to read the status of those devices; these high-level commands simply request the information from the Utility Manager through SOS.

The Interrupt Manager works with the Device Manager to allow devices such as the keyboard or the serial port to interrupt the Apple in the middle of an operation. The Apple can then attend

to the interrupting device and then resume its previous operation as if nothing had happened. The operation of the Interrupt Manager, like that of the Memory Manager, is normally invisible to you.

FILES@@

The fundamental unit of storage in SOS is the file. Files are used to "file away" information for later use. Files can hold numbers, programs, business letters, phone lists, or any other information you can put into your Apple.

All files have names. When you want to get at the information stored in a particular file, you refer to that file by its local name.

WHAT'S IN A NAME?@

Local names can be composed of up to 15 letters, numbers, and periods. A local name cannot begin with a number. The Apple automatically converts all lowercase letters in a local name to uppercase.

Here are a few legal local file names:

```
MIKE.2.JULY.8Ø
SORTPROGRAM
LETTER.TO.SUE
.PRINTER
```

Here are some names that will not work, and reasons why:

BAD NAME	(contains a space)
1.TO.1Ø	(begins with a number)
STEVE'S.PROGRAM	(contains an apostrophe)
ANTHROPOMORPHOUS	(more than 15 characters)

WHERE TO FIND FILES@

Files may be stored in many different places in and around your Apple. One common place for a file to reside is inside the memory of your Apple. When a file is stored in memory, the file

is said to be loaded, and can be changed, examined, and modified more easily there than anywhere else. Remember, however, that files in memory disappear whenever you turn the computer off.

The second common place for a file to reside is on the surface of a diskette. When a file has been stored on a diskette, the information in that file is safe and is not lost when the power is turned off, nor when you remove the diskette from the Apple. But to change the information in a file stored on a diskette, you must first copy the file into memory, change it there, and then store it back onto the diskette.

The last common place for a file to reside is on a peripheral device. SOS treats devices such as the console (the screen and keyboard), the printer, and the serial port as special kinds of files. To print information on a printer, for example, you simply store it in the special device file named .PRINTER . Device files differ from standard files in two ways: all device file names must begin with a period, and there are some restrictions on how you can read from and write into device files (for example, you can't read from a printer).

DIRECTORIES@@

During the course of normal use your Apple can have dozens, perhaps hundreds, of files present in the system at once. To help you organize your files, so that you can easily locate a particular file when you need it, SOS allows you to group files together into directories. A directory is just another file; it has a local name like any other file. But the contents of a directory file are the names and locations of other files in the system. For example, when SOS looks at a diskette, all it sees is one file, the directory file for that diskette. But that file contains the names and locations of other files on that diskette. So to find out the names of all of the files on a diskette, you don't have to search the diskette to see what's there: you simply look at the contents of the directory file. The list of the contents of a directory file is usually called a catalog.

At the very top level, SOS thinks that you've only got a few files: some device files and some diskette directories (called volumes). That's all it sees. But each diskette directory points to some files on that diskette, and any of those files

might be a subdirectory that points to some more, and so on. By using directories and subdirectories properly, you can build a hierarchical storage system whose structure reflects the relationships among the pieces of information you're storing.

AN EXAMPLE: WIDGETS INCORPORATED@
Widgets Incorporated, a wholly owned subsidiary of Donothing Gadgets Ltd., has offices in a building on Fourth Street. When you walk into their offices, you see three large filing cabinets against the wall:

(Photo 7)

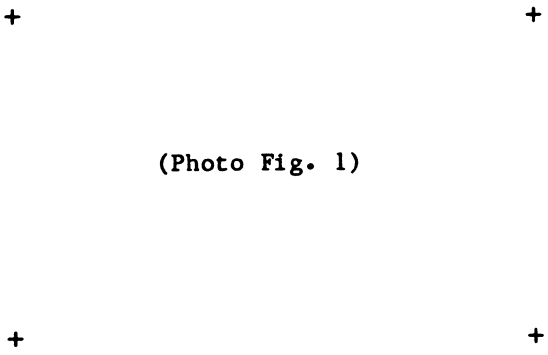
Widgets' Filing System

The left cabinet is labeled ACCOUNTING, the right cabinet is labeled PERSONNEL, and the center cabinet is labeled INVENTORY.

The ACCOUNTING file cabinet has one drawer marked PAYABLE and one drawer marked RECEIVABLE. In each drawer are a lot of file folders, one folder for each company that has an open account with Widgets Inc.

The PERSONNEL file has drawers marked CURRENT EMPLOYEES, FORMER EMPLOYEES, and COMMUNICATIONS. The first two contain individual file folders for each current or former employee. The last drawer has a divider down the middle, separating INTERNAL from EXTERNAL communications. The INTERNAL side contains file folders for each person who's ever sent a memo, and each folder contains every memo that person has sent. The EXTERNAL side contains all the documentation of Widgets' products, in no particular order.

In block diagram form, this is how the files are organized:



(Photo Fig. 1)

The Widgets Inc. Hierarchy

You are in charge of maintaining these file cabinets, getting things from them, and filing things away in them. If somebody wanted to write a letter of recommendation for Sam Johnson and asked you for Sam's personnel file, you would go to the PERSONNEL filing cabinet, look in the FORMER EMPLOYEES drawer, and find the file for Sam Johnson. If you wanted to find out how much was owed to the Quigley Supply Company, you would go to the ACCOUNTING cabinet and look in the PAYABLE drawer for the Quigley file folder. If Steve Atkins gave you a copy of a memo he wrote, you would go back to the PERSONNEL cabinet, open the COMMUNICATIONS drawer, look in the INTERNAL side for Steve's file, and drop the memo in with all of the other internal memos Steve has sent.

(For the sake of brevity in the example, the contents of the INVENTORY cabinet and the other drawers in the other cabinets will not be discussed here.)

If you wanted to store all of Widgets' records on the Apple, you could set up the filing system in exactly the same way. The filing cabinets correspond to diskettes:

(Photo Fig. 2)

Diskette = Filing Cabinet

Each diskette takes the same name as the file cabinet it's replacing; this name is called the volume name of the diskette. The diskette's main, or root, directory is also identified by this same volume name. So the ACCOUNTING diskette's root directory would contain (in addition to some standard program files) the files named PAYABLE and RECEIVABLE, which would correspond to the drawers in the filing cabinet. These files themselves would be directories. The PAYABLE subdirectory would contain files named QUIGLEY, ACME, and so forth, which would contain the same information that was previously in the individual file folders.

The structure is the same throughout the rest of the filing system. The PERSONNEL diskette contains three subdirectory files: CURRENT, FORMER, and COMMUNICATIONS. The COMMUNICATIONS subdirectory contains subdirectory files called INTERNAL and EXTERNAL; INTERNAL contains subdirectories for ADAMS, SMITH, JOHNSON, ATKINS, and all the rest of the memo-senders, and finally the subdirectory ATKINS contains a file for each memo Steve Atkins has sent.

PATHNAMES@

If you now wanted to get that employee file for Sam Johnson, you would tell SOS how to get at that file by supplying a pathname. A pathname is a set of local names, each beginning with a slash and all joined together, that specify the "path" you take from directory to directory to get to a certain file. A pathname always begins with a volume name and ends with a local file name. The pathname of Sam Johnson's employee file, which has the local name JOHNSON, is

/PERSONNEL/FORMER/JOHNSON

(just like PERSONNEL cabinet, FORMER drawer, JOHNSON file). The pathname for the Quigley accounts payable file is

/ACCOUNTING/PAYABLE/QUIGLEY

and the name of the individual memo that Steve Atkins sent on March 15 might be

/PERSONNEL/COMMUNICATIONS/INTERNAL/ATKINS/MARCH.15

(Photo 9)

Each file has one pathname, and each pathname specifies only one file. Even if you have two files with the same local name, such as accounts payable to and receivable from Quigley, you can still tell them apart by their pathnames. One would be named

/ACCOUNTS/PAYABLE/QUIGLEY

and the other would be

/ACCOUNTS/RECEIVABLE/QUIGLEY

Even though the two files have the same local name, they are separate because they have different pathnames.

THE PREFIX@

As you might guess, it would be inconvenient to have to specify a complete pathname whenever you wish to get at any file. For

example, if you wanted to look at all the memos Steve Atkins has sent, you wouldn't want to have to type the entire forty- or fifty-character pathname of each memo. SOS lets you avoid this by setting the prefix. The prefix is a pathname that specifies a directory. When you set the prefix, you can refer to any file in that directory by its local name alone. So if you were reading Steve Atkins' memos, you would set the prefix to

/PERSONNEL/COMMUNICATIONS/INTERNAL/ATKINS

and refer to the individual memos by their local names: MARCH.15, PURCHASEPLAN, RELEASESCHED, and so forth. Setting the prefix is like bringing just one drawer from the filing cabinet over to your desk: you know you won't need the contents of all three cabinets at your fingertips, only the files in the drawer you have.

You can set the prefix to the name of any directory. If that directory has subdirectories, you can get at the files in the subdirectories by using partial pathnames. A partial pathname is the pathname to a given file from the prefix directory. If you were going to be looking at all the employee files, both current and former, you might set the prefix to /PERSONNEL; you could then refer to current employee George Simpson's file by the partial pathname

CURRENT/SIMPSON

and former employee Sam Johnson's file by the partial pathname

FORMER/JOHNSON

Even when you set the prefix, you can still get to any other file in the system by supplying its full pathname. The prefix is only used when you supply a file name or a pathname that does not begin with a slash. If you set the prefix to /ACCOUNTING, you can still get at a memo you sent about the Quigley account by the full pathname

/PERSONNEL/COMMUNICATIONS/INTERNAL/YOURNAME/QUIGLEYMEMO

without changing the prefix. You can also get at the Quigley receivable file by the partial pathname

RECEIVABLE/QUIGLEY

and use the account auditing and balancing program (stored in the directory /ACCOUNTING) with the local name

AUDIT.BALANCE

all without changing the prefix.

When you boot SOS, the prefix is automatically set to the volume name of the boot diskette. Also, device files (those that begin with a period, like .PRINTER) are not affected by the prefix. You can always refer to a device file by its local name, regardless of the prefix.

USING FILES@

Among the standard operations you can perform on diskette files are reading information from them into memory, storing information from memory into them, creating new files and destroying old ones, changing their names, and setting some other miscellaneous information about them. You can also set the prefix, and find out what the current prefix is.

Language and applications on the Apple will have slightly different names for each of these procedures, and slightly different ways of using them; the manuals for the language or application you're using will describe how to actually perform the file manipulations. But a file is a file is a file, and directory files are directory files wherever you go.

You'll also see other types of files, besides directory files and "normal" files. There are program files, data files, random-access files, sequential-access files, files ad infinitum, but they're still all files and they're all manipulated in the same ways.

Also, don't be thrown by the complexity of the Widget company's files in the examples given above. You'll rarely build hierarchies of such complexity on the Apple. You might have different diskettes for different purposes, and maybe a few subdirectories on each diskette, but you'll find that most times you won't need more than one or two levels of subdirectories on any one diskette. But the important thing is that the capability is there. If you later acquire a disk drive with more capacity,

you will be able to store the contents of many, many floppy diskettes on that device, and you'll want to exploit the tremendous power of pathnames and prefixes.

DEVICES@@

There are two types of devices that can be connected to an Apple: block devices and character devices. All devices behave like files, so each device has its own local name. All device names must begin with a period.

BLOCK DEVICES@

Any device that can store information in chunks of 512 characters, and can obtain access to any given chunk on demand, is a block device. All disk drives and other external memories are block devices. Files (except other device files) can be stored only on block devices.

Block devices have two local names: a volume name and a device name. The volume name of a block device is the name of the volume currently contained in the device; the volume name of a disk drive will change as you insert and remove diskettes. A block device containing no volume (such as a disk drive without a diskette, or with its door open) has no volume name and, to SOS, does not exist. Such devices are said to be off-line.

The other local name associated with each device is its device name. Device names let you refer to a particular device without knowing the name of the volume it contains. When SOS sees a device name at the beginning of a pathname, it automatically substitutes the name of the volume contained in the specified device for the device name in the pathname. The Apple's built-in disk drive has the device name .D1 ; the additional disk drives are named .D2 , .D3 , and .D4 , respectively. So a file named ALPHASORT in the root directory of a diskette named PROGRAMS that is in the Apple's built-in disk drive can be referred to as either

/PROGRAMS/ALPHASORT

or, by using the device name, as

.D1/ALPHASORT

Notice that there is no initial slash before the device name. When a pathname begins with a device name, SOS does not apply the prefix to the pathname and so an initial slash is not necessary.

CHARACTER DEVICES@

Character devices send or receive streams of characters, one at a time. The console (screen and keyboard), serial interface, and printer are all character devices.

Character devices behave like independent standard files, and thus have their own local names. For example, the printer device is accessed through the file .PRINTER . Like all device names, the names of character devices always begin with a period.

Unlike block devices, which can take a block of bytes, store it, and retrieve it later from its storage place, a character device can only receive a stream of individual characters and process them, or generate a stream of characters for the Apple to interpret. Character devices themselves are usually built into the hardware of the Apple, and have no intelligence of their own. Special programs called device drivers take the streams of characters coming from SOS and convert them to machine actions, or convert physical actions of the machine into streams of characters for SOS to process. Device drivers for the standard Apple peripherals are included in SOS; you can change or delete these, or add new ones, by using the System Configuration Program. For more information on the System Configuration Program and device drivers, see the Apple III Standard Device Drivers manual.

Since character devices look like standard files to SOS, you send information to a device the same way you would write it a standard file. You also read information from a device the same way that you read it from a standard file. The exact procedures for reading and writing files differ from language to language and device to device; please see the Standard Device Drivers manual and the manual for the specific language or application you are using for details on how to use devices.

Trying to refer to a device for which SOS has no device driver is like trying to use a file that doesn't exist: you'll probably

get some kind of error message. Similarly, if you have a device driver but you don't have the hardware for that device installed in your Apple, SOS considers this device to be off-line and won't let you use it until you connect it and turn it on.

CHAPTER 4@@

THE MACHINE@@@

SPECIFICATIONS AND CAPABILITIES@@

SIZE:	17.5 inches wide (44.45 cm) 18.2 inches deep (46.22 cm) 4.8 inches tall (12.2 cm) Cast aluminum base with molded plastic cover
WEIGHT:	26 pounds (11.8 kilos)
PROCESSOR:	Apple designed processor utilizes 6502A as one of its major components. Other circuitry provides extended addressing capability, relocatable stack and zero page, and memory mapping.
EMULATION MODE:	Provides hardware emulation of 48k byte Apple II or Apple II plus. Allows most Apple II programs to run without modification
CLOCK SPEED:	1.8 MHz with video off, 1.4MHz average 1.0 MHz in emulation mode
MAIN MEMORY:	96K (98,304) eight-bit bytes minimum 128K (131,072) bytes maximum Dynamic RAM memory
ROM MEMORY:	4K (4,096) bytes used for self-test diagnostics
POWER SUPPLY:	High-voltage switching type +5, -5, +12, -12 volts
MASS STORAGE:	One 5.25 inch floppy disk drive built-in 140K (143,360) bytes per diskette Up to 3 additional drives can be connected by daisy-chain cable (560K bytes on-line storage)
KEYBOARD:	74 keys (61 on main keyboard, 13 on numeric pad) Full 128 character ASCII encoded All keys have automatic repeat Three special keys: SHIFT, CONTROL, ALPHA LOCK Two user-definable "Apple" keys Four directional arrow keys with two-speed repeat Four other special keys: TAB, ESCAPE, RETURN, ENTER
SCREEN:	Three upper/lower case text modes: 80 column, 24 line black-and-white 40 column, 24 line 16 color foreground and background 40 column, 24 line black-and-white All text modes have a software-definable 128-character set (Includes upper and lower case) with normal or inverse display

Three graphics modes:
280x192, 16 colors (with some limitations)
140x192, 16 colors
560x192, black-and-white
plus Apple II Modes

VIDEO OUTPUT:	RCA phono connector for NTSC black-and-white composite video DB-15 type connector for: NTSC black-and-white composite video 4 TTL outputs for generating RGB color Composite sync signal NTSC color composite video +5, -5, +12, -12 volt power supplies Color signals appear as 16-level grey scale on black-and-white video outputs
AUDIO OUTPUT:	Built-in 2-inch speaker Miniature phone-tip jack on back of Apple Driven by six-bit digital/analog converter or fixed-frequency "beep" generator
SERIAL I/O:	RS-232C compatible, DB-25 female connector Software selectable baud rate and duplex mode
JOYSTICKS:	Two DB-9 connectors for two joysticks with pushbuttons
PRINTER:	One DB-9 connector (shared with second joystick) For Apple Silentype printer
CLOCK:	Can be set and read from programs Powered by long-life replaceable watch batteries Keeps track of month, date, day of week, and exact time to 1/1,000th of a second
EXPANSION:	Four 50-pin expansion slots inside the cabinet
SOS:	Sophisticated Operating System handles all system I/O SOS can be configured to handle standard or custom I/O devices and peripherals by adding or deleting "device drivers" All Languages and Application programs access data through the SOS file system
LANGUAGES:	Apple Business BASIC, Pascal, FORTRAN (4th quarter)

THE FRONT@@

Two things are prominent on the front of your Apple III: the typewriter-like keyboard and the slot for the disk drive.

THE KEYBOARD@

The Apple keyboard has two sections: the 61-key alpha keyboard and the 13-key numeric keypad.

The alpha keyboard has letters, numbers, and special symbols in traditional typewriter layout. All ASCII characters are included. The CONTROL, SHIFT, and ALPHA LOCK keys are used to modify the character codes produced by the other keys. The two Apple keys (Open Apple and Solid Apple, to the left of the spacebar) also can be used to modify the meaning of other characters.

The RETURN, ESCAPE, TAB, ENTER, and four directional arrow keys produce control characters. The control characters associated with these and all other keys are given in Appendix C.

If you hold down any key (except CONTROL, SHIFT, ALPHA LOCK, or the Apple keys) for more than one half second, it will repeat automatically at a rate of 10 characters per second. If you press and hold down the Solid Apple key while pressing another key, that key will repeat at a rate of 33 characters per second. Also, any one of the four directional arrow keys will repeat at a rate of 33 characters per second if you press harder on it and hold it down.

The thirteen keys on the numeric keypad generate the same characters as their main keyboard counterparts. They are grouped here to make entry of numbers easier, as on an adding machine. Even though the keys on the numeric keypad generate the same ASCII codes as their counterparts on the main keyboard, a program can detect whether a numeric key was pressed on the keypad or on the main keyboard.

The ENTER key on the numeric keypad is the same as the RETURN key on the main keyboard.

THE DISK DRIVE@

The other prominent feature on the face of the Apple III is the access slot for the built-in disk drive. To insert or remove a diskette, you must first open the disk drive door by pulling up on its bottom edge.

You should insert a diskette into the drive with its label upwards and its oval slot pointing into the drive. The built-in disk drive is tilted upwards at a 5-degree angle; you should insert diskettes pointing slightly downwards, into the Apple. Make sure when you are inserting a diskette that you push it in all the way: if the diskette is not completely inserted, you cannot close the door.

The Apple can read from or write to a diskette only when the diskette is fully in the drive and the door is closed. When the Apple is using the disk drive, the red light under the drive door will come on. This is an indication that the diskette is spinning and that the disk head, the part that actually reads and writes the information, is touching the surface of the diskette. When this happens, the head is said to be loaded. When the light is off (or the door is open), the head is away from the diskette, or unloaded.

&STOP

When the head is loaded and the IN USE light is on, you should not open the drive door or turn the Apple off. Either of these actions could cause the head to scramble the information on the diskette.

THE BACK@@

The back and most of the case of the Apple is made of cast aluminum, with vertical fins along the back and part of the sides. These fins dissipate heat generated by the circuitry of the computer, much in the same way as the fins on a radiator or engine cylinder. Thus the Apple III does not need a fan to cool down its insides. The fins and the aluminum part of the case may get slightly warm while the Apple is operating; this is a normal condition.

(Photo 27)

The Back of the Apple III

Most devices you use with your Apple III plug directly into one of the connectors on the back panel of the computer. The back of the Apple also has four large, vertical access slots that hold connectors for any peripheral interface cards you may install (these are discussed in the next section, "Inside the Apple").

&HAND

*** WARNING! ***

Before connecting or disconnecting
ANYTHING
on your Apple III,
TURN OFF THE POWER SWITCH.
This is a must.

THE POWER SWITCH AND CONNECTOR@

On the right side of the back of your Apple (looking from the rear) are the power connector and power switch. The Apple accepts line input in the range of 107 to 132 volts, 60 Hertz alternating current. The connector has three prongs: two for line voltage, and one for earth ground.

The power switch is located to the right of the power connector. The switch has two positions: ON (labeled "ON" or "1") and OFF (labeled "OFF" or "0"). When the power to the Apple is on, the power-on indicator on the keyboard (to the left of the spacebar) lights up the word ON.

THE DISK DRIVE CONNECTOR@

The leftmost connector (looking from the rear) on the back of the Apple, marked FLOPPY DISKS, allows you to connect up to three additional Apple floppy disk drives to your Apple III. The first additional drive plugs into the Apple. The second additional drive plugs into the first, and the third plugs into the second. This connection scheme is called a "daisy chain".

&EYE

You should never connect more than three external disk drives to the FLOPPY DISKS connector of the Apple III. Also, the disk drive connector is meant to connect only to Apple Computer Inc. Disk III (or Disk II for the Apple III) disk drives. DO NOT CONNECT ANY OTHER PRODUCTS OR PERIPHERALS TO THIS CONNECTOR: you may damage both the peripheral and your Apple.

THE JOYSTICK PORTS@

Next to the disk drive connector are two nine-pin D-type connectors that allow you to connect miscellaneous input and output devices to your Apple. The most common use for these ports is to connect to Apple-supplied joysticks.

(For the uninitiated, a joystick is an input device that resembles the control stick of an airplane. The stick moves in two dimensions: forward and backward, left and right. The joystick can send the Apple information regarding the position of the stick, and programs can use a joystick input, for example, to move items around the screen.)

Besides the joystick connections, each port has additional circuitry for one pushbutton and one switch. The Apple's +5 volt power supply is also available on port A. Port B carries the +5, +12, and -12 volt supplies. Electrical specifications of these connectors are given in Appendix C.

THE SILENTYPE" PRINTER PORT@

In addition to its function as a joystick port, the port B connector on the back of your Apple can also be connected to an Apple Silentype" printer. Details of the connection, setup, and operation of the Silentype" are given in the manual accompanying that product.

THE COLOR VIDEO CONNECTOR@

If you wish to connect your Apple to some display device other than the standard black and white monitor, you may need to use the COLOR VIDEO connector located to the right of ports A and B. This 15-pin D-type connector carries National Television Standards Committee (NTSC)-compatible, positive composite synchronization, color and black and white video signals. The connector also carries composite synchronization signals and other signals that can create Red, Green, and Blue (RGB) color video output, as well as all four power supply voltages.

The signals available on this connector allow you to connect your Apple to any color or black-and-white video monitor, an RGB studio quality monitor, a video tape recorder, or any other video device. For full details of the signals available on this connector, please see Appendix C.

THE B/W VIDEO CONNECTOR@

The round connector immediately to the right of the color video connector, marked B/W VIDEO, carries only the black and white, positive composite synchronization video signal. This connector is an RCA-type female phono jack and will connect to any male RCA-type phono plug. A cable with such a plug is included with your Apple.

Physical and electrical specifications of this jack can be found in Appendix C.

THE AUDIO CONNECTOR@

Any sound generated by the Apple's speaker can be captured and sent to an external speaker, tape recorder, amplifier, or other device by connecting that device to the AUDIO jack on the back of the Apple. When you insert a miniature phone-tip plug into this jack, the Apple's internal speaker is silenced; if there is an amplifier or other device properly connected to the plug, then that device will receive all audio signals generated by the Apple.

Physical and electrical specifications of this jack can be found in Appendix C.

THE SERIAL INTERFACE@

Port C is the most versatile port on your Apple. It allows you to connect the Apple to letter-quality printers, high-speed data collection devices, other computers, modems, and any number of other devices that communicate using the Electrical Industries Association (EIA) RS-232-C communications protocol.

The electrical specifications for this port are given in Appendix C.

INSIDE THE APPLE@@

The inside of your Apple III contains the most important parts of the computer. You need to see the inside of your Apple only when you are installing or removing interface cards for peripheral devices, or using the security mount to attach the Apple to a table or shelf to prevent theft. No other occasion merits opening up your Apple.

&STOP

Before removing the cover on your Apple, or connecting or disconnecting anything on the inside or outside, TURN OFF THE POWER SWITCH.

REMOVING THE COVER@

To get at the inside of your Apple, you must first remove the top cover. The cover is attached to the case of the Apple by two quarter-turn screws located on the underside of the left and right corners of the face of the Apple:

(Photo 28)

Cover Attachment Screw Locations

Use a short, flat-blade screwdriver to turn both of these screws one-quarter turn in either direction. If you don't have a screwdriver short enough, remove all the connections from the back of the Apple and tilt it up onto its backside to loosen the screws. They should become loose and fall down (they're captive screws and won't fall out of the case). Remove the cover by lifting it straight up.

&STOP

Because of electromagnetic interference regulations, the United States Federal Communications Commission prohibits the operation of an Apple III with its cover removed. To remind you of this, when you open the cover of your Apple, there is a small red light on the left side of the main board, near the back. If you see that this light is on, TURN YOUR APPLE OFF! (Don't forget to save any programs or data you might be working on.) This light is your protection: you should not remove the cover of the Apple or connect or disconnect anything while the power is on.

(Photo 29)

The Inside of the Apple III

PERIPHERAL DEVICE CARDS@
On the inside of the Apple, between the disk drive and the power supply, is a rectangular well. At the bottom of this well are four long gold-toothed peripheral connectors, mounted on the main board. These peripheral connectors, often called "slots", are meant to hold Apple peripheral interface cards. With these interface cards, you can connect your Apple to many devices that cannot be plugged into an Apple port or connector.

The four peripheral connectors are numbered, from 1 to 4, counting from left to right. Peripheral interface cards can usually be placed in any of the four slots; to find out the particular slot into which a given interface card should be installed, consult the manual accompanying that card.

When your Apple is shipped to you, the four peripheral connectors contain dummy cards. The sole purpose of these cards is to hold the metal shields which cover the four vertical access slots in the back of the Apple's case. These shields prevent excessive radio-frequency interference (RFI) from leaking from the Apple. Apple interface cards have similar shields, some of which may have plugs, connectors, or switches mounted on them. To install an interface card, you must first remove one of the dummy cards.

&HAND
Do not remove any dummy card without replacing it with an Apple peripheral interface card that has the proper metal shield.

(Photo 30)

Peripheral Connectors
with Dummy Cards

REMOVING PERIPHERAL CARDS@

Peripheral interface cards are supported on the bottom by the peripheral connectors, on the back by their metal shields, and on the front by notches in the front of the well. These notches are called "card guides".

To remove a peripheral interface card (or a dummy card), you should pull straight up on it. To assist you, there is a hole drilled in the top of each card, near the back of the card. You can use a hook in this hole to pull the card straight up, or you can pry the card up with a screwdriver, using the side of the well for leverage.

Pull the card straight up and out of the well. The shield, which fits into one of the tall vertical access slots in the back of the Apple, may be tight: you may have to push it up with your forefinger to remove the card.

(Photo 31)

Removing a Peripheral Card

&HAND
Handle any peripheral interface card as you would handle a high-quality, expensive phonograph record. Grasp it only by the corners or edges, and try not to touch the delicate components or pins. Don't grasp the card by the gold or silver "fingers"--they are the medium through which the Apple communicates to the card and their efficiency is decreased if they are dirty or scratched. Interface cards are precision instruments and should be handled with care. Store unused interface cards in the boxes in which they were shipped.

Save any dummy cards you remove from your Apple. You may need to reinstall them if you remove one of your peripheral interface cards. Remember, there must be either a peripheral interface card or a dummy card in each slot at all times.

INSTALLING PERIPHERAL CARDS@
To install a peripheral interface card in your Apple, first see the manual accompanying the card to determine which slot the card belongs in. Then remove the dummy card from that slot (see above).

With the Apple facing you and the cover (and the power) off, hold the interface card with the silver or gold "fingers" pointing down into the Apple. The components should be on the right side of the board. Slide the near edge of the card into the card guide, and the metal shield into the access slot:

(Photo 32)

Installing an Interface Card

Slide the card evenly down until the "fingers" enter the peripheral connector itself. At this point, the metal shield should be tightening up in the access slot. Now you're going to have to use just a little force (not too much) to fit the card completely into its slot. You can tell that the card is fully inserted when the top of the metal shield is flush with the top edge of the access slot.

(Photo 33)

A Fully Inserted Interface Card

If the peripheral card doesn't seem to fit, remove it completely and try again, making sure that the card enters the card guide straight up and down.

THE SPEAKER@

The Apple's internal speaker is mounted on the front of the face of the Apple, right inside the top cover. The speaker is mounted facing the front of the computer, and is connected to

the main board by a long twisted pair of wires. The sounds generated by the speaker can be controlled by your programs, but the volume of the speaker cannot be adjusted. The speaker can be silenced by inserting a miniature phono plug in the AUDIO jack in the back of the Apple (see the previous section).

THE SECURITY MOUNT@

On the inside of the Apple, just to the left of the internal speaker, is a hole in the baseplate of the Apple through which you can install a strong bolt. With this bolt, you can secure the Apple to a table, shelf, chain, or other secure stronghold to prevent theft.

(Photo 34)

Security Mount and Bolt

The hole is unthreaded, .25 inch in diameter, and .15 inch deep. The well around the top of the hole is .5 inch wide and 1.25 inches long.

REPLACING THE COVER@

To replace the cover on your Apple, fit it onto the top of the Apple so that the back of the cover is flush with the back of the computer and the holes on the underside of the front of the cover fit over the two quarter-turn screws. Retighten the two screws by pushing up on them and turning them each one-quarter turn in either direction with a flat-bladed screwdriver (you might tilt the Apple up again, if necessary).

THE BOTTOM@@

The bottom of the Apple contains access panels for the power supply and main board electronics. You should never open the power supply access panel; this is for authorized service personnel only and opening it may invalidate your warranty.

The main board access panel must be opened about once every three years, to change the batteries for the Apple's built-in clock and calendar. When the batteries run out, you should take the Apple to an authorized Apple dealer or Level One service center for installation of fresh batteries.

APPENDIX A@@

ERROR MESSAGES@@@

DURING STARTUP@@

These are the error message you could receive during power-up or a disk boot:

Message	Meaning
RAM	The test of the Apple's random-access memory failed. The pattern on the screen is an indication of exactly which component failed. See your dealer.
ROM	The test of the Apple's read-only memory failed. See your dealer.
ACIA	The test of the Asynchronous Communications Interface Adapter (ACIA), which controls the serial port, failed. See your dealer.
VIA	The test of the Versatile Interface Adapters (VIAs), which control various internal functions in the Apple, failed. See your dealer.
A/D	The test of the Analog-to-Digital converter, which controls the joysticks, failed. See your dealer.
ZP	The Zero Page test, which determines whether the Apple's memory management circuitry is operational, failed. See your dealer.
Blank screen	The diskette in the built-in disk drive is not a boot diskette. Insert a proper boot diskette into the built-in disk drive, hold down the CONTROL key and press RESET to attempt to reboot.
RETRY	The disk boot failed. Either there is no diskette in the built-in disk drive, or the diskette is unformatted or the data on the diskette has been destroyed. Place a good boot diskette in the built-in drive, close the door, and attempt to reboot.
I/O ERROR	The disk boot was partially successful, but an Input/Output error was encountered. Remove the

diskette, reinsert it, and try to boot again. If you again receive this error, some vital information on the diskette has been destroyed or your disk drive is malfunctioning. If you can't boot any diskettes, see your dealer.

FILE SOS.KERNEL NOT FOUND
FILE SOS.DRIVER NOT FOUND
FILE SOS.INTERP NOT FOUND

These three messages indicate that although your diskette is almost bootable, it lacks one of the three vital files needed to complete the bootstrap operation. Boot your system on another diskette. If the SOS.DRIVER file is missing, use the System Configuration Program on the Utilities diskette to create a device driver file on the diskette that wouldn't boot.

COPY AND FORMAT ERRORS@@

These errors are reported during the operation of the diskette duplication and diskette formatting programs:

Diskette is Write-protected

The diskette you are trying to format or copy onto is write-protected. If you do wish to destroy the information on the diskette, remove the diskette from the drive, peel of the small tab that covers the write-protect notch, and reinsert the diskette.

Bad disk media/drive

The diskette has been physically damaged and is unusable, or your disk drive is malfunctioning.

Disk drive not present/not configured

You specified a disk drive that you either have not physically installed in your system or have not configured your Utilities diskette to recognize. Make sure that your daisy chain cables are connected securely, and use the System Configuration program (see Chapter 2) to configure your boot diskettes for the proper number of disk drives.

Cannot read source diskette

The diskette that you are trying to make a copy of is unreadable. Make sure you have specified the proper source and destination drives, and that the diskette is correctly inserted in the source drive.

GENERAL ERRORS@@

SYSTEM FAILURE Indicates a catastrophic failure of SOS from which the only recovery is to reboot your system. System failures are rare and usually can be attributed to sudden hardware failure or an unknown error in the operating system or language interpreter. If you receive the same system failure at the same place in the same program more than once, your program has probably discovered an error in the language or operating system.

APPENDIX B@@

CARE AND HANDLING@@@

CARE OF THE APPLE@@

Treat your Apple as carefully as you would treat a good quality electric typewriter: don't bump or jar it too much, try to keep it level on the surface of a desk or table, and don't spill any liquids on it. Even though the Apple is mostly electronic, its mechanical parts (such as the disk drive) are delicate, and will become misaligned if subjected to physical abuse.

The Apple has no ventilating fan, and the only way it can dissipate heat is through the cooling fins on the back and sides of the case. Always be sure your Apple has adequate ventilation, and that the ambient air temperature doesn't get too high. Constant operation at high temperature will drastically shorten the lives of the components in the Apple.

Keep the disk drive door closed. An open door is an invitation to dust and other foreign particles which could degrade the performance of the disk drive.

Above all, use common sense. Don't drop anything heavy on the Apple's keyboard, and don't drop the Apple itself onto anything. If you have obtained the vinyl carrying case for the Apple, use it; it was specifically designed to transport the Apple safely and comfortably. If you're going to be shipping the Apple by freight, pack it in its original packing material, and make sure it's packed tightly enough so that its components cannot vibrate loose.

CARE OF DISKETTES@@

Never let anything touch the brown or grey surface of the plastic disk inside the diskette package. Handle the diskette only by its black plastic cover. When a diskette is not in use, keep it in the paper envelope it came in. These envelopes are treated to minimize static build-up which attracts dust. It is best to store diskettes vertically when they are not in use. Vinyl notebooks made especially for this purpose are convenient.

Diskettes hold a tremendous amount of information: a single diskette can hold over a million bits of information. An individual bit, therefore, occupies a very small portion of the diskette. An invisible scratch on the surface of the diskette, or even a fingerprint, can cause errors. Do not place diskettes

on dirty or greasy surfaces; do not let them collect dust.

To write on a diskette label, use a FELT TIP pen or marker, never a pencil or ball point pen. Do not press hard. It is best not to write on a label attached to a diskette: it is better to write on the separate label, then attach it to the diskette.

Keep diskettes away from magnetic fields. This means keep them away from electric motors and magnets; they should also not be placed on top of televisions or other electronic devices. Don't leave them on top of the Apple; the magnetic field generated by the transformer in the Apple's power supply could erase information on the diskette.

(Figure: Diskette No-No's)

Don't Do This

Diskettes are sensitive to extremes of temperature. Keep diskettes out of the sun, and away from other sources of heat which could cause them to warp. On hot days, car trunks (or dashboards, glove compartments, or anything else) can be diskette killers. Diskettes operate satisfactorily up to a temperature of 125 degrees Farenheit (51.7 Celsius), which is not very hot. The first evidence of heat damage is a warped or bent plastic cover.

If you want to protect the information on your diskette from accidental erasure (by the Apple), just stick one of the small silver tape tabs supplied with your diskettes over the rectangular notch in the right side of the diskette. When this notch is covered, the computer is prevented from writing any information onto the diskette, or changing the information which is already there. To store information on the diskette, you must first remove the tab. The write-protect tab will not, of course, prevent loss of data due to the accidents mentioned above.

With reasonable care, a diskette will give you an average life of about 40 hours--which is a lot, when you consider the few seconds it takes to load a file from a diskette. But with just a little bit of carelessness, a diskette may give you no service at all.

APPENDIX C@@

ELECTRICAL SPECIFICATIONS@@@

PORT A: JOYSTICK INPUT@@

This port contains circuitry for two analog devices (usually potentiometers) and two digital devices (usually switches). The analog inputs accept input voltage in the range of Ø to +2.2 volts and sink 3ua input current. The digital inputs are standard TTL series inputs.

<<9-pin connector drawing>>

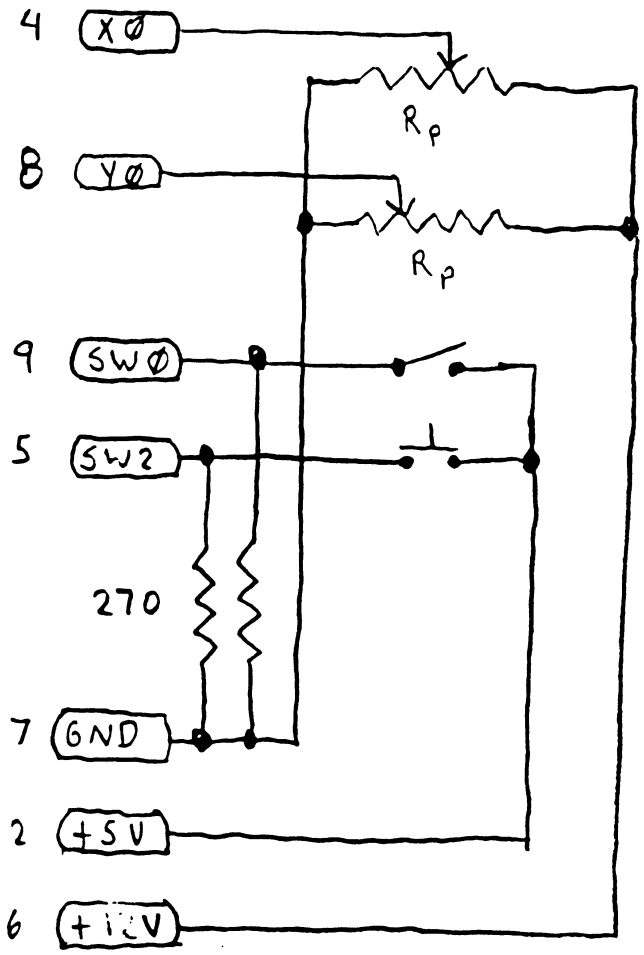
Pin	Name	Description
1	GND	Shield ground.
2	+5	+5 volt power supply.
3	GND	Power and Signal ground.
4	XØ	Horizontal analog input; in Emulation mode, equivalent to Apple II GC3 input.
5	SW2	Joystick pushbutton input; in Emulation mode, equivalent to Apple II PB2 input.
6	+12	+12 volt power supply.
7	GND	Power and signal ground.
8	YØ	Vertical analog input; in Emulation mode, equivalent to Apple II GCl input.
9	SWØ	Joystick switch input; inaccessable from Emulation mode.

PORT B@@

<<9-pin connector drawing>>

Pin	Name	Description
1	GND	Shield ground.
2	+5	+5 volt power supply.
3	GND	Power and Signal ground.
4	X1	Horizontal analog input; in Emulation mode, equivalent to Apple II GC2 input.
5	SW1	Joystick pushbutton input; in Emulation mode, equivalent to Apple II PB1 input.
6	+12	+12 volt power supply.
7	GND	Power and signal ground.
8	Y1	Vertical analog input; in Emulation mode, equivalent to Apple II GCØ input.
9	SWØ	Joystick switch input; in Emulation mode, equivalent to Apple II PB3 input.

Here is a sample circuit for a joystick with two potentiometers, one pushbutton, and one switch. The value of the potentiometers can range from 1K ohm to 700K ohm, with only 20% of the range used.



PORT C: RS-232-C SERIAL INTERFACE@@

The Apple III is classified as Data Terminal Equipment (DTE) under the EIA RS-232-C communications protocol. It can be directly connected to a piece of Data Communications Equipment (DTE), such as a modem. To connect the Apple to another piece of Data Terminal Equipment (such as a printer), you must use a modem eliminator.

All output levels are minimum +6 volts when active and maximum -6 volts when inactive measured into a 3K ohm load.

All inputs have a turn-on threshold of +1.25 volts and a turn-off threshold of +.8 volts typical. All inputs sink 10ma current.

<<25-pin connector drawing>>

Pin	Name	Description
1	SGND	Shield ground.
2	TXD	Transmitted data; serial data output from the Apple.
3	RCD	Received data; serial data input to the Apple.
4	RTS	Request to Send output; this indicates that the Apple is ready to transmit data.
5	CTS	Clear To Send input; this acknowledges that the Apple may begin transmission.
6	DSR	Data Set Ready input; this acknowledges that the remote device is on and operational.

Pin	Name	Description
7	GND	Signal ground.
8	DCD	Data Carrier Detect input; this acknowledges that the remote device is ready to transmit data.
9-19		No connect.
20	DTR	Data Terminal Ready output; this indicates that the Apple is on and operational.

THE COLOR VIDEO CONNECTOR@@

This connector supplies seven different video signals and four power supplu voltages. Through this connector you can hook up the Apple to any NTSC color or black and white video monitor. With an additional circuit you can hook up the Apple to a studio-quality RGB color monitor.

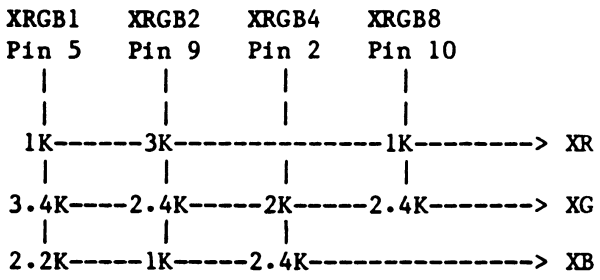
<<15-pin connector drawing>>

Pin	Name	Description
1	SG	Shield ground.
2	XRGB4	One of four RGB outputs. This (and pins 5, 9, and 10) is a TTL output with instantaneous color information. A linear-weighted sum of these four signals will form a true 16-color RGB video signal (see the circuit below).
3	SYNCH	Composite synchronization signal with negative-going synch tips.
4	PDI	Not used.
5	XRGB1	See pin 2.
6	GND	Power and signal ground.
7	-5V	-5 volt power supply. A device may draw up to 200 ma through this pin.
8	+12V	+12 volt power supply. A device may draw up to 500 ma through this pin.

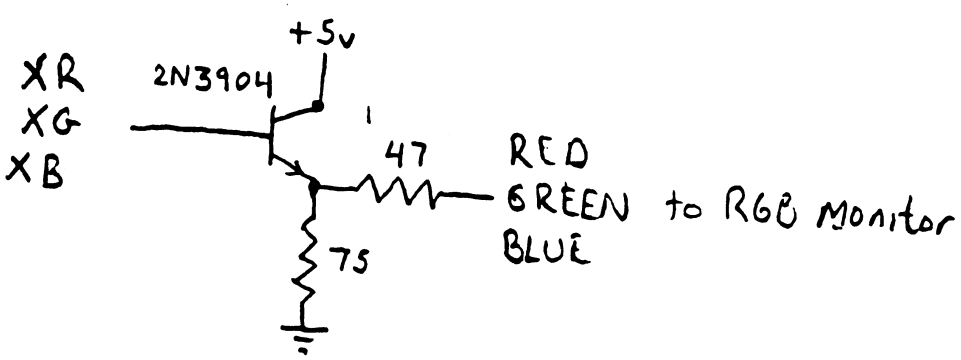
Pin	Name	Description
9	XRGB2	See pin 2.
10	XRGB8	See pin 2.
11	BWVID	Black and white composite video. This is an NTSC compatible video signal with negative-going synch tips, 1 volt peak-to-peak into a 75 ohm load. Color information is encoded as a liner grey scale.
12	NTSC	Color composite video. This is an NTSC-compatible video signal with negative-going synch tips, 1 volt peak-to-peak into a 75 ohm load.
13	GND	Power and signal ground.
14	-12V	-12 volt power supply. A device may draw up to 200 ma through this pin.
15	+5V	+5 volt power supply. A device may draw up to 1 amp through this pin.

All power supply current ratings assume that no peripheral cards are installed in the system. If there are cards in the system, be sure to account for the current drawn by those cards.

The four XRGB signals should be fed to a weighted resistor network to form the three RGB color signals. The network below shows the proper resistance values to generate the standard color set. The resulting RGB signals can then be connected to an RGB monitor through an emitter-follower transistor circuit (shown below). The SYNCH signal (pin 3) may also need to be connected to the RGB monitor.



Values for Weighted Resistor Network



Emitter-follower circuit (one of three)

THE B/W VIDEO CONNECTOR@@

This RCA connector carries the BWVID black and white NTSC video signal (same as pin 11 on the color video connector) on its tip and signal ground on its ring.

THE AUDIO CONNECTOR@@

This miniature phono jack carries a .5 volt peak-to-peak audio signal on its tip and signal ground on its ring. When a miniature phone plug is inserted in this connector, the Apple's internal speaker is disabled.

APPENDIX D@@

THE APPLE II EMULATOR@@@

A diskette included with your Apple III allows you to run programs written for the Apple II on your Apple III computer. This diskette is called the Apple II Emulator. While you are using the Emulator, none of the advanced features of the Apple III are available to you: you can use only Apple II functions.

The Emulator makes your Apple III act like an Apple II with either Apple Integer BASIC or Applesoft II BASIC, a 16-sector Disk II controller card in slot 6, and a communications card in slot 7. The Emulator assigns the Apple III's built-in disk drive to be the equivalent of slot 6, drive 1 on an Apple II; the first additional disk drive on an Apple III is assigned slot 6, drive 2. The Emulator's communications card simulator uses the Apple III's built-in RS-232-C serial port to look like an Apple II communications card plugged into slot 7.

BOOTING THE EMULATOR@@

You boot the Emulator diskette as you would boot a normal Apple III diskette. But there is no SOS kernel file, no device drivers, no Apple III software at all on this diskette. When you boot it, it asks you the question:

(Photo 35)

The Apple II Emulator

You have two choices: you can choose to have an Apple II running Integer BASIC, with the Programmer's Aid #1 installed; or you can choose to use Applesoft II BASIC. Once you choose a language, you cannot change without rebooting the Emulator.

Press the digit of your choice. The Emulator will instantly load the language you chose into the Apple III's memory. Now you can

insert any Apple II DOS 3.3 boot diskette (one is included with your Apple III), and press RETURN to boot DOS.

If you do not wish to boot DOS, you can press the RESET button instead of pressing RETURN. You will be placed into the language of your choice, without any disk operating system whatsoever.

To leave the Apple II Emulator, simply use the usual procedure to boot a SOS diskette.

LIMITATIONS@@

The Apple II Emulator cannot exactly duplicate the behavior of an Apple II. These are the known limitations:

You cannot use an Apple II Language System, an Applesoft II or Integer BASIC Firmware card, or most other Apple II peripherals with your Apple III. You cannot have both BASIC languages resident in memory simultaneously.

The Apple III does not have a cassette interface, so the BASIC LOAD and SAVE commands, as well as all other commands which use the cassette interface, will not work. The Apple III also does not have an Apple II Game I/O connector, but the Emulator recognizes the Apple III joysticks as game paddles:

```
Port A Vertical    is  Apple II Paddle 1
Port A Horizontal  is  Apple II Paddle 3

Port B Vertical    is  Apple II Paddle 0
Port B Horizontal  is  Apple II Paddle 2

Port A Pushbutton  is  Apple II Paddle 2 button
Port A Switch      is  Apple II Paddle 0 button

Port B Pushbutton  is  Apple II Paddle 1 button
Port B Switch      is  Apple II Paddle 3 button
```

(Note that on an Apple II, Paddle 3 cannot have a pushbutton. In emulation mode, this capability is added.)

The Apple III's RGB color video outputs do not generate a color signal for High-Resolution Graphics in the Emulator. Apple II

High-Resolution images are available only on the NTSC black and white and color video outputs.

Dots on the left border of the high-resolution graphics screen flicker uncontrollably.

The symbols @ ^ & (*) : + = - " ' have been relocated on the Apple III keyboard. Although these symbols can still be generated by the keyboard, different keystrokes are required to generate them.

The subroutines in the Apple II's monitor ROM that handle Non-Maskable Interrupts (NMIs), annunciators, cassette input and output, and paddle input have been altered. The NMI vector in the Emulator is the same as the Reset vector. Cassette input and output have been removed and are inoperable. Paddle input has been modified to work with the Apple III's joystick circuitry.

The RESET button on an Apple III in Emulation mode does not operate the same as the Apple II RESET button in that it generates a Non-Maskable Interrupt, not a true reset. Holding down CONTROL while pressing RESET causes the Apple III to attempt to boot a diskette.

The Emulator uses only Apple II DOS 3.3 . In order to use DOS 3.2 diskettes in the Emulator, you must first update them using the FID and MUFFIN programs on your DOS 3.3 boot diskette. See your DOS 3.3 manual (or your dealer) for more information.

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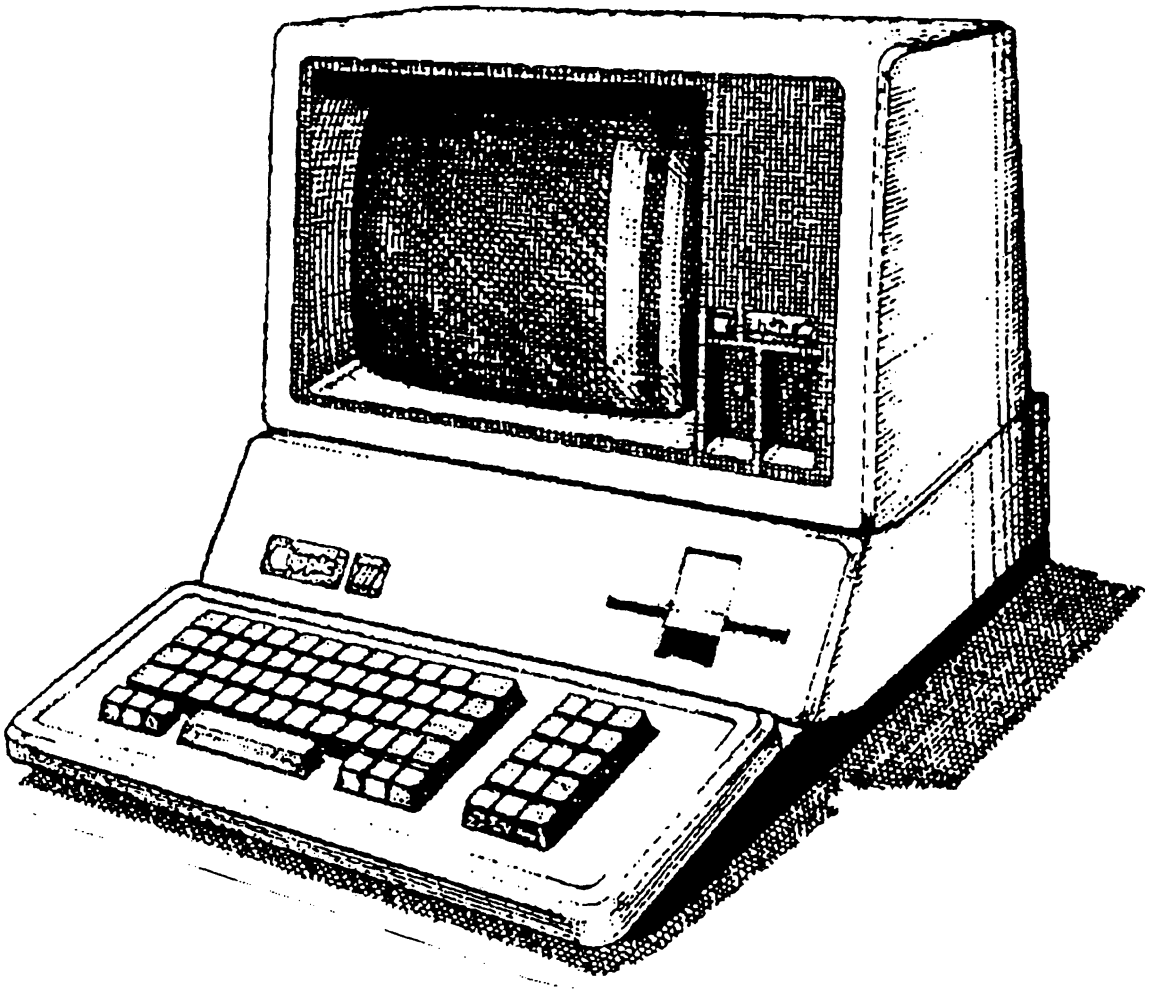
Apple III Computer Information



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