ROYAL
Alphatronic PC
System Handbook

ROYAL
Productivity Computers

ROYAL BUSINESS MACHINES, INC.

Important Notices from the FCC

Warning

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

Your ROYAL PC and all ROYAL peripherals must be used with *SHIELDED CABLES.* These cables are included with your ROYAL PC, disk drives, monitors, and printers.

Information to the User

This equipment generates and uses radio frequency energy. If not installed properly (that is, in strict accordance with the manufacturer's instructions), it may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception (which can be determined by turning the equipment on and off), the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient the receiving antenna.
- *Relocate the computer with respect to the receiver.
- *Move the computer away from the receiver.
- *Plug the computer into a different outlet so that the computer and receiver are on different branch circuits.

If necessary, consult the dealer or an experienced radio/television technician for additional suggestions. The following booklet (prepared by the FCC) may be helpful:

"How to Identify and Resolve Radio-TV Interference Problems."

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4.

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INTRODUCTION

. . . to your ROYAL PC

May we present your *ROYAL PRODUCTIVITY COMPUTER*, with advanced computing capabilities, a software emphasis on your business needs, plus a full set of interfaces to expand your system today - and in the future.

With a powerful Z80 microprocessor, and 64K of usable memory.

With a choice of programs ready to run on your ROYAL PC: disks, cassettes, or ROM-Packs for education, entertainment, or business use.

With the optional ROYAL Disk Drive (or two), equipped with Microsoft[1] BASIC 80, and the CP/M[2] Operating System and MENU![3] Utility Program on your SYSTEM DISK.

With the optional ROYAL CO-POWER 88 Module to expand your ROYAL PC with MS[4]-DOS capabilities.

With a built-in ROM BASIC Interpreter, allowing you to program in Microsoft[1] ROM BASIC as soon as you turn on your system.

With a *BASIC 80 MANUAL* to support the ROYAL PC implementation of Microsoft[1] BASIC.

Because you have purchased a ROYAL PC, you have joined the ROYAL family. We look forward to serving you.

[1]Microsoft is a registered trademark of Microsoft Corporation.
[2]CP/M is a registered trademark of Digital Research, Inc.
[3]MENU! is a trademark of San Francisco Computing!, Inc.
[4]MS is a trademark of Microsoft Corporation.

INTRODUCTION

. . . to the ROYAL PC Manual

IF YOU ARE NEW TO MICROCOMPUTERS, a careful reading of this manual is essential to gain the maximum benefits from your ROYAL PC. The manual lets you use your system as you learn about it.

IF YOU ARE AN EXPERIENCED COMPUTER OPERATOR, read through the Table of Contents to decide which sections will be of most use to you now. Review in your manual all procedures before trying them on your ROYAL PC. You will probably find the appendices to be of most use to you.

CHAPTER 1 (SETTING UP) explains how to assemble your system.

CHAPTER 2 (GETTING STARTED) explains how to start up your system, and use your keyboard and display screen. There are also instructions for using cassette recorders and ROM-Packs.

CHAPTER 3 (HOW IT WORKS) briefly explains microcomputers and CP/M. If you are a computer novice, be sure to read this chapter carefully!

CHAPTER 4 (DISK DRIVE AND CP/M) tells you how to use disks to run applications programs. (Note: This manual uses the term DISK. "Disk," "floppy disk," and "diskette" all mean the same thing.)

CHAPTER 5 (MENU!) explains how your MENU! program simplifies the use of your ROYAL Disk Drive.

CHAPTER 6 (PROGRAMMING) presents an overview of programming and Microsoft BASIC. (Henceforth, ROM BASIC refers to the language built into the ROM BASIC Interpreter. BASIC 80 refers to the Microsoft BASIC available on disk.)

CHAPTER 7 (ADDING ON) introduces you to options you may wish to consider for your ROYAL system.

THE APPENDICES AND GLOSSARY provide easy reference to information you will need in your work.

In addition, the *BASIC 80 MANUAL* is a guide to programming in Microsoft BASIC with your ROYAL PC.

CHAPTER 1

SETTING UP

CHAPTER 1 - SETTING UP

1.1 OVERVIEW

This first chapter introduces you to your equipment, setting up the various pieces, and attaching them properly to each other. These instructions include some important precautions. Therefore, even if you are quite sure you know how to set up a computer system, and even if you have set up several systems in the past, take a moment to read through this chapter as you unpack and get started.

Specifically, this chapter includes

A. what you need to set up properly
B. the various components of your system, and how to install them
C. precautions for maintaining your ROM-Packs, disks or cassettes (including write-protect procedures for disks)

1.2 FINDING WHAT YOU NEED

Space

Before you begin to unpack your ROYAL PC, be sure you have enough room to set up your system comfortably and safely. Not only should your desk or table top be large enough to hold the components of your system; your software collection (which you will build up over time) should be safely stored nearby. (Software maintenance is discussed below in Section 1.4.) Your system also requires

1. unblocked ventilation on all sides (e.g., do not block vents by setting up on a rug or sofa)
2. protection from
   a. moisture (e.g., rain, coffee)
   b. excessive dust and crumbs (e.g., erasures, cigarette ash)
   c. prolonged exposure to extreme temperatures

In general, the longevity of your computer is best served in temperatures which are comfortable for you.

Equipment

To complement your ROYAL PC, you need at least a display screen and a storage device. Be sure you have the following, including the cabling:

DISPLAY SCREEN

RGB (color) monitor* + cable *OR*
Monochrome monitor* + cable *OR*
TV set + adaptor with switchbox + cable

*Specifications for monitors are included in Appendix E. For best results, use ROYAL monitors.

STORAGE DEVICE

ROYAL Disk Drive (F1) + cable OR
Cassette recorder + ROYAL cable

Data Storage

Be sure to keep a supply of blank disks (or cassettes) and labels. The conventional wisdom among computer users is that a backup disk (or cassette) is ALWAYS made for every program, and for all important data. Although rare, accidents do happen. And the loss of a disk or cassette can be very costly to you.

Power

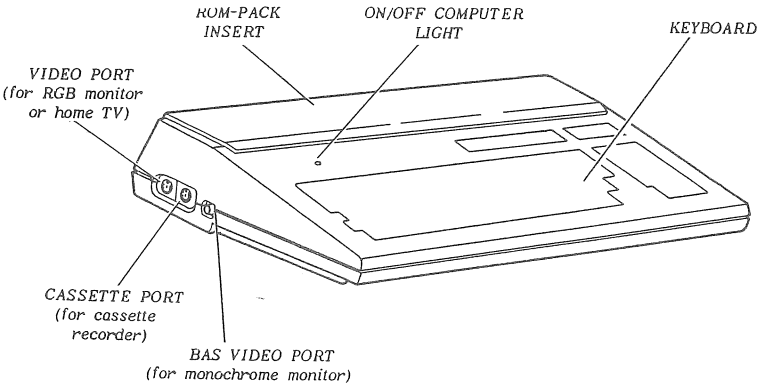
Be sure to set up your system near adequate electrical outlets. Do not try to use a circuit already handling large applicances (even an iron). Your system will use a minimum of three power cords for your components: 1) your ROYAL PC, 2) your monitor or television set, and 3) your disk drive or cassette recorder. In addition, your computer and disk drive power cords require polarized, grounded three-hole outlets.

1.3 Hooking Up Your System

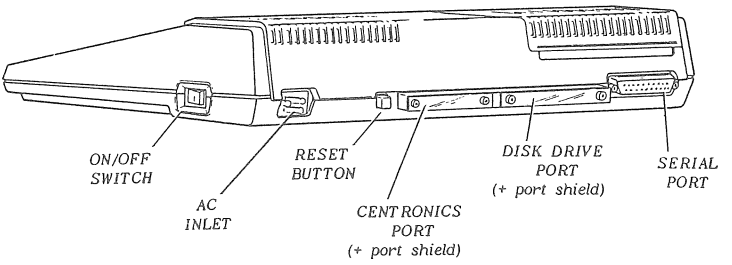
As you assemble your system, familiarize yourself with the components, using the following diagrams.

ROYAL PC

(front and left-hand side)



(rear and right-hand side)



PERMANENT ROYAL PC INSTALLATIONS

MEMORY

64K Bytes of Dynamic RAM (Random Access Memory)
4K Bytes of Video RAM
24K Bytes of ROM (Read Only Memory) for BASIC Interpreter
8K Bytes of ROM for Monitor

I/O (Input/Output) Interfaces

Centronics/Parallel (for parallel printer)
RS232/Serial (for serial printer or telecommunications)
RGB (Red Green Blue) CRT (monitor)
Composite Monochrome CRT (monitor)
CPU Expansion Bus (includes disk drive)
ROM-Pack
Audio Cassette (Kansas City Standard)

Installation of ROYAL PC System

1. Place ROYAL PC so that you have easy access to side and rear ports.

2. REAR PORT SHIELDS. With a small Phillips head screw driver, remove the screws and port shield attached to any of the rear ports to which you are attaching peripheral cables. SAVE THE SHIELDS AND SCREWS. REPLACE THE SHIELDS WHENEVER THE PORTS ARE NOT IN USE (to reduce the possibility of radiated interference).

3. CABLES. Connect cables to designated peripherals (e.g., disk drive, monitor), and to PC ports. Be sure to follow SPECIFIC INSTRUCTIONS FOR EACH PERIPHERAL, and to attach cables SECURELY.

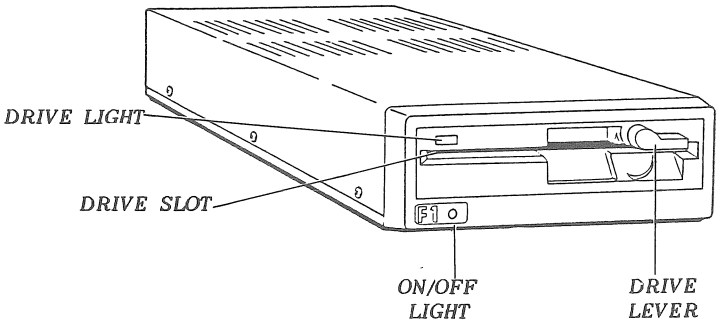
   IMPORTANT: Disk drive and ROM-Pack installation instructions are included in this chapter.

4. POWER CORDS. Plug in power cords to correct wall outlets AFTER attaching cables to components.

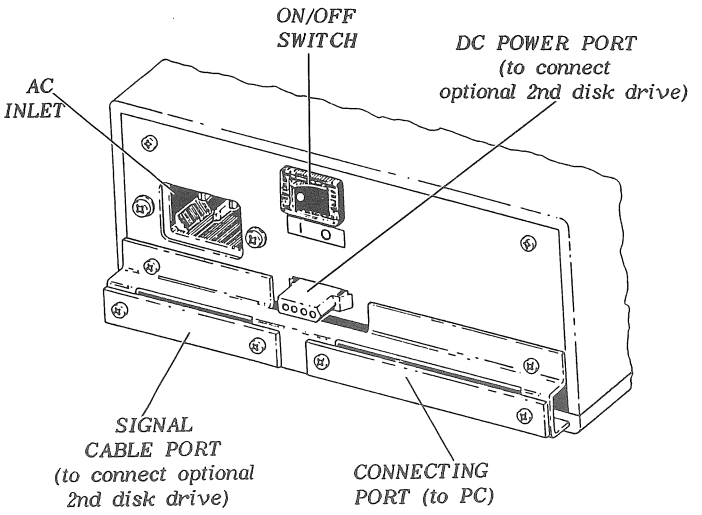
5. Follow START-UP instructions in Chapter 2.

DISK DRIVE

(front and left-hand side)

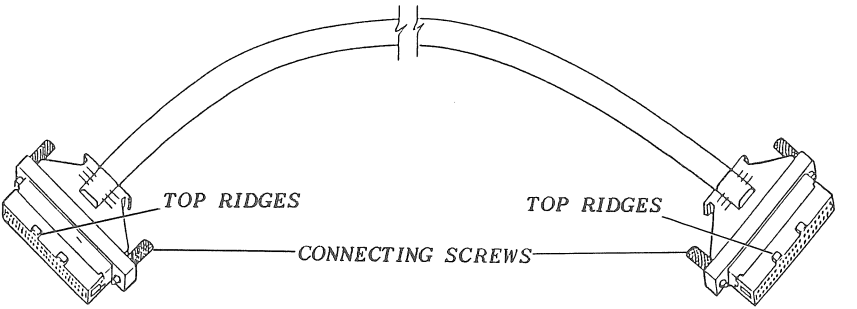


(rear view)

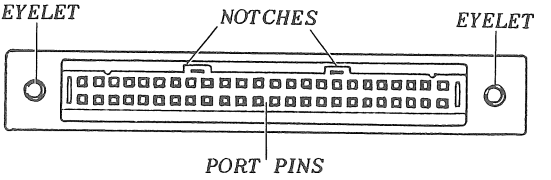


CONNECTING CABLE

(between Disk Drive and ROYAL PC)



DISK DRIVE AND CONNECTING PORTS



Installation of Disk Drive

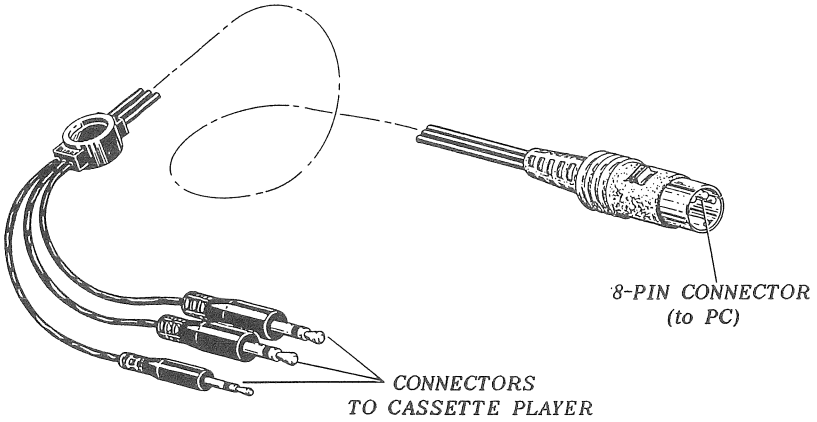
1. PORTS. The ports for the connecting cable are keyed (notched) to fit the top ridges on the cable. To insert the connecting cable, hold it STRAIGHT in front of the port, ridged side up. DO NOT INSERT THE CABLE AT AN ANGLE! (An angled approach will bend the pins inside the port.) This insertion may take some patience. DO NOT FORCE THE CABLE INTO THE PORT.

2. EYELETS. Tighten the connecting screws into the eyelets.

3. CARDBOARD INSERT. Be sure you have removed the cardboard insert from the disk drive (lift the drive lever). SAVE THE CARDBOARD INSERT AND REINSERT IT INTO THE DISK DRIVE WHENEVER YOU MUST TRANSPORT IT.

4. To remove the connecting cable, pull it STRAIGHT out of the port (avoid bent pins!).

CASSETTE RECORDER
Enlargement of 8 Pin Cable Connector (optional)



Installation of Cassette Recorder

IMPORTANT: Be sure to read about cassette recorder specifications in Appendix E before purchasing a recorder to use with your ROYAL PC.

1. Until you become experienced with your cassette recorder as an I/O storage device, be sure your ROYAL PC power switch is OFF when you connect it to your cassette recorder.

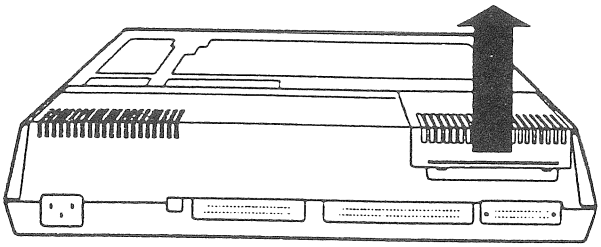
2. Connect cassette recorder cable to cassette recorder, following the instructions of your cassette recorder.

3. Connect the 8 pin connector to the center port on the left hand side of the ROYAL PC (between RGB and BAS).

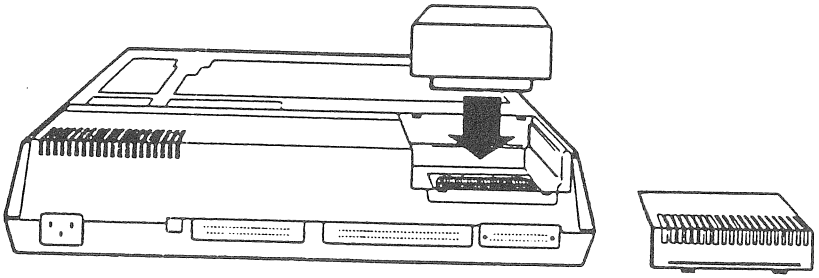
ROM-PACK

IMPORTANT: TO AVOID POSSIBLE DAMAGE TO YOUR ROM-PACKS OR ROYAL PC, BE SURE TO TURN OFF YOUR ROYAL PC BEFORE INSERTING OR REMOVING ROM-PACKS

(OPENING THE ROYAL PC)



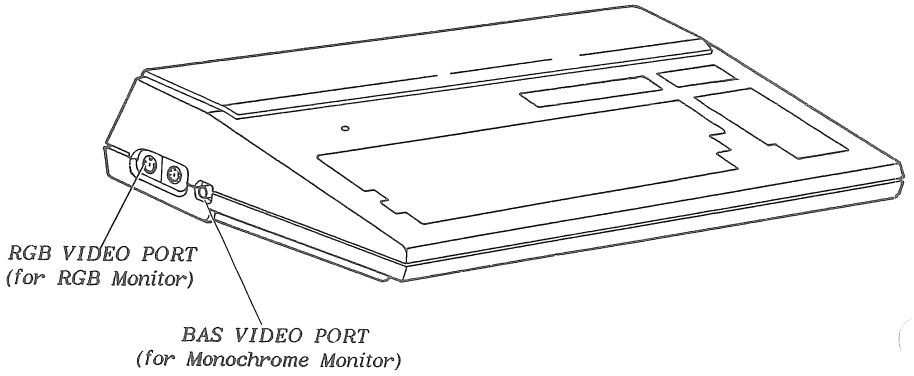
Lifting from the back,
pull up on the ROM-Pack cover of the ROYAL PC.



Insert ROM-Pack (label toward you) until it fits SECURELY. Replace ROM-Pack cover, beginning with the front edge.

RGB or MONOCHROME MONITOR

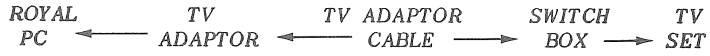
Monitor Cable Ports on ROYAL PC



Installation of Monitor

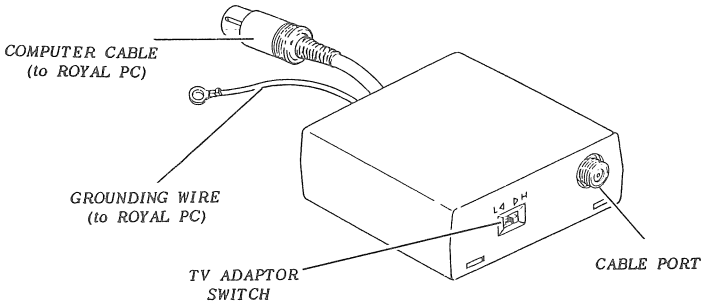
Follow the assembly instructions in the User's Manual for your monitor. Be sure to insert the monitor cable into the correct port on your ROYAL PC (see illustration above).

TELEVISION SET + TV ADAPTOR



TV Adaptor

To use your television set as a display monitor, see your ROYAL dealer for a TV Adaptor (with Switchbox and TV Adaptor Cable).



TV Adaptor Port:

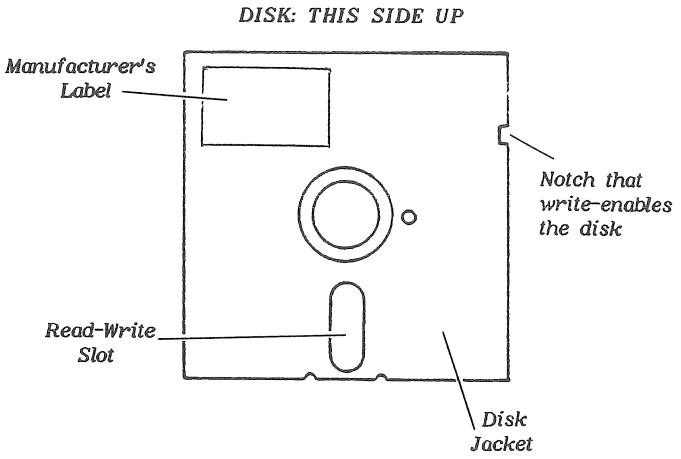
Look on the back of your TV to find this TV Adaptor Port. (If your TV set does not include this port, a local video store carries an inexpensive converter for your TV set.

Installation of Adaptor + Switchbox

Installation instructions are packaged with your ROYAL TV Adaptor plus Switchbox.

NOTE: Your TV will display only 40 column (not 80 column) applications programs.

1.4 CARING FOR YOUR DISKS



To avoid possible damage to your disks, be sure to following these procedures:

1. Handle disks by their jackets - never touch the disk itself. Return disks promptly to their envelopes after use.

2. Always make a back-up copy of a disk IMMEDIATELY. Store the original in a safe place, and use your back-up copy.

3. Keep disks away from
   a. prolonged hot or cold environments (50° to 125° F. or 10° to 51.6° C. is recommended.) Note: A helpful rule of thumb is that your disk is not going to be comfortable if you aren't.
   b. prolonged sunlight (especially through windows)
   c. moisture
   d. dust and crumbs (and erasure dust)
   e. magnets or strong electrical currents (e.g., telephones and answering machines, electronic office machines, televisions, large electrical motors)
   f. small children, pets, food, overnight storage in cars

4. Write on disk labels BEFORE applying them to disks. If you must write on the disk jacket, write SOFTLY and only use a felt-tip pen. NEVER use an eraser on a disk jacket.

5. Store disks upright or place disks flat in a box for longterm storage. Never lay objects on top of your disks, or leave them where they are likely to be damaged.

6. NEVER leave a disk in the disk drive when the drive power is OFF.

7. NEVER remove a disk from the disk drive while the rectangular drive light is on.

1.5 WRITE PROTECT DISKS

Notch = Write

As you pull a disk from its envelope, you may see a small notch on the upper right-hand side, near the disk label. This is a WRITE-ENABLE NOTCH: your disk drive can record your input on this disk.

To protect this disk from accidental erasure, cover the notch with a small label or piece of opaque tape. (Such labels usually come with blank disks you buy.) This label will prevent a user from writing or erasing information on the disk. (You can remove this label at any time.)

No Notch = No Write

If there is no notch - or if the notch is covered - the disk is WRITE-PROTECTED. Your disk drive cannot record your input on this disk.

1. *Tab-Covered Notches.* If a disk has been commercially write-protected with a tab or tape, remove the write-protect tab to *write-enable* the disk.

2. *No Notch at All.* An un-notched disk is permanently write-protected and is meant to stay that way.

1.6 CARING FOR YOUR CASSETTES

To avoid possible damage to your cassettes, be sure to follow these procedures:

1. ALWAYS make a back-up copy of a cassette IMMEDIATELY. Store the original in a safe place and use your copy for daily use.

2. Store cassettes in their cassette boxes when not in use.

3. Keep cassettes away from
   a. prolonged hot or cold temperatures (see the precautions for Disks, page 1-13)
   b. prolonged sunlight (especially through windows)
   c. moisture
   d. dust and crumbs
   e. magnets or strong electrical currents (see precautions for Disks, page 1-13)

4. Never handle cassettes by the tape.

5. Do not remove a cassette from your recorder while the tape is revolving.

6. If a cassette becomes loosely wound, insert a pencil into the cassette reel and twist to tighten the tape.

CHAPTER 2

GETTING STARTED

CHAPTER 2 - GETTING STARTED

2.1 OVERVIEW

In Chapter 2 you will learn to perform many basic (and vital) functions for your ROYAL PC system.

Specifically, Chapter 2 concerns

A. starting up the system (and stopping it, too)
B. using ROM-Packs
C. using your keyboard
D. some important features of your screen display
E. using a cassette recorder with your ROYAL PC.

2.2 STARTING UP YOUR SYSTEM

The following is the start-up procedure for your ROYAL PC when you are not using a disk drive or a cassette recorder. It is included here to introduce you to your ROYAL PC. (Instructions for adding a disk drive are included in Chapter 4; instructions for adding a cassette recorder begin in Section 2.6.)

IMPORTANT: Be sure that your disk drive or cassette recorder is turned off.

Display Screen

MONITOR. Turn on power to your monitor.
OR
TELEVISION. Slide your Switchbox switch to "Computer," and turn on your TV set. (Review Chapter 1.3 for use of your TV Adaptor.)

Computer

Turn on your ROYAL PC, using the On/Off switch (right side of the computer). A red light will appear at the top left of the keyboard. You will hear a beep and see this display:

MICROSOFT BASIC VERSION x.xx
COPYRIGHT (c) 198x BY MICROSOFT
xxxxx BYTES FREE
OK

(The fine tuning on your set may need adjustment.) This display gives you important information:

1. You have accessed the computer's ROM BASIC Interpreter, and may program your computer in ROM BASIC. This ALWAYS occurs if you start up your system without a disk, cassette, or ROM-Pack.

2. You have xxxxx bytes (or characters) of memory available in the computer's RAM.

3. The "OK" prompt ALWAYS means that your ROYAL PC is ready for your input in ROM BASIC (or BASIC 80 with disk drive).

4. At this time, your ROYAL PC is ready. Your input will begin EXACTLY where you see the blinking *CURSOR* (place marker on the screen).

*If your ROYAL PC does not respònd as described, turn off the system and wait a few seconds.

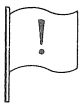
*Check all connections (ROYAL PC, monitor, wall sockets).

*Using a television set for a monitor? Be sure that you have given your set enough time to warm up. Did you double-check the steps in Chapter 1.3 for hooking up your TV set with an Adaptor? Try turning Off (or On) the AFT switch (Automatic Fine Tuning).

*Disk drive connected to your system? Be sure it is OFF (rear switch). Remember: Disk drive operating instructions begin in Chapter 4.

*After you have completed these checks, start up the system again, beginning with section 2.2 above. If the problem persists, consult the HELP SECTION at the back of this manual (Appendix F).

IMPORTANT:



If you wish to leave your ROYAL PC for a brief while, whatever is stored in RAM will wait until you return (unless there is a power failure). However, you will empty the RAM as soon as you turn OFF your ROYAL PC. Therefore, be sure to save important information on disk (Chapter 4) or cassette (Chapter 2.6) before turning off your system.

2.3 ADDING ROM-PACKS

Insert

Insert your ROM-Pack, as described in Chapter 1.3. (Remember to TURN OFF YOUR ROYAL PC BEFORE INSERTING YOUR ROM-PACK.) Turn on your ROYAL PC and monitor (or TV). This will bring up the ROM-Pack to your screen.

Using the ROM-Pack Program

Your ROM-Pack programs will operate like any other programs in your ROYAL PC. You will encounter specific directions within each program or ROM-Pack manual.

Saving Your Data

If you have a cassette recorder, you can save the data you generate with your ROM-Pack program. (See Section 2.6 to save data with your cassette recorder.)

When You Are Finished

TURN OFF YOUR ROYAL PC BEFORE REMOVING YOUR ROM-PACK. Once you have removed your ROM-Pack, replace the ROM-Pack cover before re-starting your system.

2.4 USING THE KEYBOARD

Now that you have learned how easy it is to start up (and stop) your ROYAL PC, you are ready to learn to operate the keyboard.

While these directions specifically pertain to using the keyboard with the ROM BASIC Interpreter (i.e., without a ROM-Pack or disk drive), most of these instructions apply to your ROYAL PC system in general, regardless of peripherals.

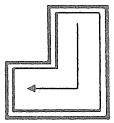
⟨INPUT⟩ + ⟨CR⟩: Two Simple Rules

To instruct you to type input at your keyboard, this manual will use this format:

Type <input> <CR>

1. The <> always enclose the letters or key that you should type (do NOT type the <> marks).

2. <CR> means "hit the carriage return": either of the two large keys shaped like this:



   As a rule, <CR> or "hit the carriage return," enters your input into the ROYAL PC's RAM, and drops your cursor to the beginning of the next line. In most cases, you will see your input appear right away on your screen. And you can change it easily, as you will soon discover.

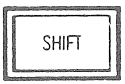
IMPORTANT: If you hold down any character key for longer than one second, your computer will respond with a repeated character display. Try this now.

NOTE: Your ROM BASIC Interpreter assumes you want to program in ROM BASIC, so it will give you ERROR MESSAGES for typing letters and digits at random. Just ignore it for now: Go ahead and type.

Confusing Keys: O/0 and 1/1

If you are new to computing, you may be used to typing 1 (numeral) and l (letter) interchangeably. Your ROYAL PC is fussy about such mix-ups. The same is true of O (letter) and 0 (numeral). If your ROYAL PC responds to your input with confusion, check to see if you have mixed up any of these keys. Try typing these now to notice the differences.

The Shift Key



SHIFT. Locate the two SHIFT Keys on your keyboard. These keys, along with the alphabet and numeric keys on the ROYAL PC, look and respond like the keys on a standard typewriter. Practice using the SHIFT Keys with various letters, numerals, and other symbols.

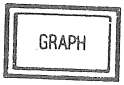
NOTE: The asterisk (*) above the colon (:) is also a MULTIPLICATION SIGN on the ROYAL PC and prints a * on the screen.

SHIFT LOCK. Locate the LOCK Key above the left SHIFT Key. Notice that an amber LOCK light comes on when this key is depressed. To release the LOCK Key, depress it again (and the light goes off).

The Alphabet Keys. LOCK allows you to type in uppercase letters without holding down the SHIFT key. Try these now.

The Non-Alphabet Keys. Unlike the corresponding key on some keyboards, the ROYAL PC LOCK does not affect the non-alphabet (i.e., numeral and punctuation) keys. To use the upper symbol on the non-alphabet keys, use the SHIFT key. Experiment with these keys, using both SHIFT and LOCK.

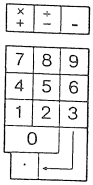
The Graphics Mode



Toward the top right of your keyboard is a GRAPH Key. As you press that key, you enter the GRAPHICS MODE (as signalled by the amber GRAPHICS LIGHT). To return to standard LETTER MODE, simply press the GRAPH Key again (and the light goes out). Use GRAPHICS MODE to explore the graphics symbols on your ROYAL PC.

NOTE: To print these graphic symbols in BASIC 80 (i.e., with a disk drive), you will use the ASCII codes instead of the specific graph keys. When you are ready to try this, consult Appendix D in this manual and the CHR$ function in the *BASIC 80 MANUAL.*

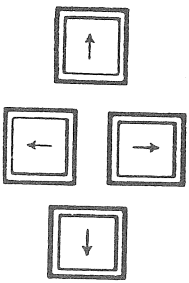
The 10-Key Pad



If you often use a calculator, the 10-Key Pad to the right of your keyboard will be useful to you in entering numeric data for applications programs. (These keys behave EXACTLY like the numeric and operations keys found elsewhere on your ROYAL PC.)

NOTE: The ROM BASIC Interpreter is not a calculator. To perform mathematical calculations, consult your *BASIC 80 MANUAL.*

The Cursor Keys and Space Bar



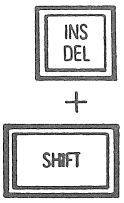
Along the bottom of your keyboard are four keys marked with arrows. These CURSOR Keys move the cursor one or more spaces in the indicated directions. (If a CURSOR Key is held down longer than one second, the cursor will move more than one space.) Using the CURSOR Keys, you can locate an error and "strike over" (erase and correct) in one keystroke.

The long bar - the SPACE BAR - moves the cursor forward one space. Unlike the → CURSOR KEY, however, the SPACE BAR will erase characters as it moves.

Delete and Insert

Located to the right of your cursor keys is a key for inserting and deleting characters. This key is important because it allows you to edit characters on your screen either before or after you have actually entered them into RAM (that is, either before or after you have typed the <CR>. To use this key, position the cursor under the character (or space) where an insertion or deletion is needed. <CR> enters the edited line (or lines) into RAM.

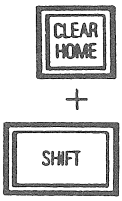
DELETE. With the cursor in position, press the DELETE Key. The character will disappear and characters will close in from the right (and perhaps up from the previous line, if needed). To delete more than one letter, place the cursor under the left-most character to be deleted. Repeatedly press the DELETE Key.



INSERT. With the cursor in position, press the SHIFT Key with the INSERT Key. Then press a character key: text will shift to the right and the character will be inserted. You may continue to insert characters until you press a cursor key or another key that does not display a character.

Home/Clear Key

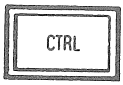
HOME KEY. The HOME Key is located toward the right side of the keyboard, near the GRAPH key. The HOME Key moves the cursor to the upper left-hand corner of your display screen - the "home position."



CLEAR KEY. This key must be used with the SHIFT Key. SHIFT + CLEAR sends the cursor home and clears the display screen as well. THIS KEY DOES NOT DESTROY ANY INFORMATION IN RAM. It simply clears your screen.

Tab and Control Keys

TAB. The TAB Key is located toward the lower right of your keyboard. The TAB Key moves the cursor to specified columns (in multiples of 8) from left to right. Under ROM BASIC, this cursor movement also erases the characters over which it moves. (In many of the applications programs that you use, the TAB Key does not erase characters on the screen. You may also be able to change the length of TAB.)



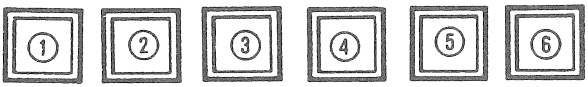
CONTROL KEYS. On the left of your keyboard is a key labeled CTRL. This CONTROL Key is ALWAYS used in conjunction with another key (just as you use the SHIFT key) to perform a special function on your ROYAL PC. There are a number of CONTROL Key functions built into your ROM BASIC system. The most commonly used are listed below. A full listing of the ROYAL PC CONTROL KEY functions is included in Appendix C of this manual.

Commonly Used ROYAL PC Control Keys

<CTRL B>	Cursor moves BACK one word, numeral, or variable
<CTRL C>	Break in programming or program execution
<CTRL E>	Deletion of line from cursor to END of line
<CTRL F>	Cursor moves FORWARD to next word, numeral, or variable
<CTRL G>	Bell rings (GONG?)
<CTRL H>	Cursor backspaces and deletes last letter typed
<CTRL K>	Cursor moves to home position
<CTRL L>	Cursor moves home and clears screen
<CTRL N>	Cursor moves to last character of line
<CTRL U>	Cursor deletes current line

Programmable Function Keys

At the top of your keyboard are six FUNCTION KEYS. For ROM BASIC and BASIC 80, these keys, plus the additional six keys gained with the SHIFT Key, have been programmed to input twelve useful programming commands and statements. If you already program in BASIC, you may wish to reprogram the ROM BASIC functions of these keys. This procedure is explained below.



In addition, you will use these keys with various software commercial software (as explained in the software manuals).

Programmable Function Keys and Their Functions

<1>	GOTO	<SHIFT>+<1>	GOSUB
<2>	COLOR	<SHIFT>+<2>	LOCATE
<3>	PRINT	<SHIFT>+<3>	INPUT
<5>	EDIT	<SHIFT>+<5>	AUTO
<6>	RUN (CR)	<SHIFT>+<6>	CONT (CR)

Reprogramming Function Keys

To reprogram the Function Keys in ROM BASIC or BASIC 80, use the following syntax:

<key #,"function"><CR>

Example: <key 3,"lprint"><CR>

Display of Function Keys

Using the ROM BASIC Interpreter or BASIC 80, the lower edge of your screen displays the first six FUNCTION KEYS. By pressing the SHIFT Key, you may display the additional six FUNCTION KEYS. These displays serve as a time-saving reminder when you are programming in ROM BASIC. Look at these displays now.

Break, Escape and Reset: The Interrupt Keys

BREAK. The BREAK Key interrupts the execution, listing, or inputting of a program, which can be resumed under the ROM BASIC Interpreter. With applications programs (see Chapter 4), BREAK often exits the program and returns you to the operating system.

ESCAPE. The ESCAPE Key functions only under CP/M. Consult your software manuals.

RESET. The RESET BUTTON (rear of computer) empties RAM of all data. Under the CP/M operating system, the RESET BUTTON will exit your program and reenter CP/M.

The Reserve Function Key

In the lower left-hand corner of your keyboard is a key with a circle enclosing a "C." This key is reserved for future expansion of your system under CP/M.

2.5 FEATURES OF YOUR SCREEN DISPLAY

Using some simple commands, you can alter the way information is displayed on your screen.

Screen Width

If you are using a monitor for a display screen, your screen width can be easily adjusted for 40 or 80 columns. After the A> prompt, type

<width 80><CR>
<narrow><CR>

You will see that the command WIDTH 80 causes your ROYAL PC to print the word "NARROW" or any characters you choose) very narrow indeed. Your screen now includes 80 columns instead of 40. But if you type

<width 40><CR>

your second width command returns your display screen to 40 columns. Much of the applications software will automatically set your screen width at 80. Cassette and ROM-Pack programs will set your screen width at 40. However, if you write your own programs, you will find various uses for WIDTH.

NOTE: A TV set attached to a computer has a 40 column display. Therefore, if you are using your TV set as a monitor, leave your display at WIDTH 40.

SCROLLING

Usually, <CR> at the bottom of a computer screen causes the top line of data to disappear, as additional input is displayed at the bottom of the screen. This process of data rolling up the screen is called SCROLLING. You can easily control two aspects of this process:

1. how much of the screen scrolls (the size and location of the scroll window), and

2. whether the screen scrolls at all (see SCROLL OR PAGE MODE below).

SCROLLING values are changed with the CONSOLE command. For example:

<console 0,14> <CR>

The first number specifies on what line the scrolling will begin: in this case, the first line of the screen.
The second number defines how many lines of the screen to scroll: in this case, 14.
If you do not enter a SCROLLING specification, the default (or standard) scroll is 24 lines (full screen).

SAMPLE USE OF CONSOLE
Push the RESET button (rear of computer) to clear RAM and reload ROM BASIC. The ROM BASIC logo will reappear (see page 2-3).

If you have a color display, type in this ROM BASIC program to demonstrate SCROLLING. (Monochrome displays: omit *<20 color n><CR>*)

```
<console 4,20><CR>
<10 for n=1 to 7><CR>
<20 color n><CR>
<30 print n><CR>
<40 next n><CR>
<50 goto 10><CR>
<run><CR>
```

The screen will begin to scroll at line 4.

Press <BREAK> to stop the program.
Type <run> to restart the program.

DISPLAY OF FUNCTION KEYS

In ROM BASIC and BASIC 80 you have the option to eliminate the display of FUNCTION KEYS from the bottom of your screen. This is controlled through a third numerical value in the CONSOLE command. For example:

```
<console 0,14,0> <CR>
```

The third CONSOLE value (in this case, 0) tells your ROYAL PC whether or not to print the FUNCTION KEYS at the bottom of the screen:

```
0 means "NO DISPLAY"
1 means "DISPLAY" (default)
```

SCROLL OR PAGE MODE

While SCROLL MODE is the default mode, you may prefer to use PAGE MODE: When the screen is full, the computer begins a new "page" of text at the top of the screen, rather than scrolling up from the bottom. Look at this console command:

```
<console 0,14,0,0>
```

The fourth CONSOLE value (in this case, 0) tells your ROYAL PC whether to use SCROLL or PAGE MODE:

```
0 means "PAGE MODE"
1 means "SCROLL MODE" (default)
```

NOTE: Should you wish to change some (but not all) of the CONSOLE values, use this format:

```
<console 10,10>
   (changes only SCROLL display)

<console ,,0>
   (changes only FUNCTION display)
```

Color

If you have an RGB monitor or color television for your ROYAL PC display screen, you can choose among eight colors for characters and background display. These colors, and their values, are as follows:

0	black	4	green
1	dark blue	5	light blue
2	red	6	yellow
3	purple	7	white

COLOR COMMAND

Look at the following example:

<color 0,6> <CR>

First color value --- character color
Second color value --- background color

NOTE: The same color value chosen for both background and characters results in an "Illegal function call" error.

ATTRIBUTES COMMAND

At the same time that you specify COLOR, you can modify certain character attributes:

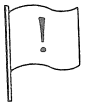
Value	Color Inversion	Flashing Letters
0	no	no
1	no	yes
2	yes	no
3	yes	yes

EXAMPLE: <color 2,7,1> yields flashing red characters on white background.

<color ,,3> inverts the previous background and character colors, and leaves them flashing.

<color 7,0> yields white characters on a black background but does not change the preceding attributes.

IMPORTANT: If you wish to experiment with the COLOR values, first read CLS (below) and keep this reference page handy. (The flashing colors can be intense!) Remember: you can also push RESET, thereby emptying RAM and returning your ROYAL PC to all of its default values.



CLS

Type <cls><CR> to achieve three results:

1. cursor moves home
2. display screen is cleared
3. the color values return to their default settings.

<CLS><CR> does *not* empty RAM.

2.6 STORING INFORMATION ON A CASSETTE RECORDER

If you do not have a disk drive with your system, you will need a cassette recorder and Royal Cassette Cable to save data generated from ROM-Pack programs, or to run and store programs that you write or purchase for cassette. (See Chapter 1.3 to hook up a cassette recorder to your system.) The following instructions will allow you to load and save information using cassette tapes and the ROM BASIC Interpreter.

Loading Programs from Cassette to RAM: LOAD + PLAY

1. *ROYAL PC.* Turn on your computer and display screen.

2. *ADVANCE LEADER.* Set the cassette recorder counter at 000 and advance the tape just past the end of the clear "leader" (that portion of the tape that does not record). You will have to remove the cassette to check your tape; often the leader has cleared the recording heads when the counter is somewhere between 2 and 5. Make a note of the counter on the cassette label.

3. *VOLUME CONTROL.* Set the volume control on your recorder at a mid-range level. You may find that you need to adjust this setting up or down to operate your recorder with your ROYAL PC.

4. *<CLOAD>.* Double-check the spelling of the name of the program on your cassette (and substitute that name for "Sample" below). After the OK prompt type

   <cload "sample> <CR>

   and depress the PLAY button on your recorder.

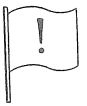
NOTE: Did you notice that SAMPLE needed only one QUOTATION MARK (")? This is a feature of BASIC programming: A SECOND QUOTATION MARK IS OPTIONAL IF THE NEXT CHARACTER is <CR>.

5. *THE SEARCH.* Depending upon the location of "Sample" on your cassette, your screen will look something like this:

```
OK                          OK
cload "sample               cload "sample
FOUND SAMPLE      OR        SKIP FIRST
OK                          SKIP SECOND
                            FOUND SAMPLE
                            OK
```

At this point, your ROYAL PC has searched the tape until it found "SAMPLE," loaded "SAMPLE" into RAM, and told you it was ready for you.

IMPORTANT: A file may be stored under a file name of 6 or fewer characters on a cassette. If you attempt to use a longer name, the final characters will be eliminated.



6. *STOP BUTTON.* If your cassette player has not stopped (some will; some won't), press the STOP BUTTON on the recorder.

7. *COUNTER.* If you are using a new cassette, record the counter number at the end of CLOAD.

8. *<LIST>.* To look at "Sample," type <list> <CR>. (Your screen will then display the program, followed by "OK.")

9. *<RUN>.* To run the program, type <run><CR>. (Your screen will display the execution of the program. If keyboard input is required, your screen will display "?")

HINTS: *For each of your programs, keep a list of beginning and ending counter numbers.

*Remember to rewind your tape only to the end of the leader after each use.

Saving a Program onto Cassette: CSAVE + RECORD

1. *ROYAL PC.* Enter a program into RAM, as explained earlier in section 2.4.

2. *ADVANCE RECORDER.* Using the counter to guide you, advance your cassette recorder just past the end of your previous program. RECORD THE NEW COUNTER SETTING. (You may record over old programs that you do not wish to save. However, use CLOAD to double check the contents of your cassette first. See CLOAD TO VERIFY, to follow.)

3. *VOLUME CONTROL.* Set the volume control at midrange.

4. *CSAVE.* With your recorder on STOP (or PAUSE), type in

   <csave "sample> <CR>

   and press the RECORD KEY.

5. *OK.* Your ROYAL PC will soon respond with the OK prompt, signifying that your program has been saved on the cassette. Your screen will look like this:

   ```
   OK
   CSAVE "SAMPLE
   OK
   ```

6. *STOP BUTTON.* If your recorder has not stopped (some will; some won't), press the STOP key. COUNTER. Record the counter number at the end of CSAVE.

7. *REWIND.* To double check that your recorder has worked properly, rewind your cassette and use the CLOAD ? procedure in CLOAD TO VERIFY, to follow.

If your recorder has not CSAVEd your program, adjust the volume control. Experiment with this control to find the best level for CSAVEing programs. Do not empty RAM (e.g., with the RESET button or by typing <new>) unless you are sure your program has been CSAVEd.

Using CLOAD to Verify Cassette Files

1. *<CLOAD ?>*
   CLOAD ? lists all completed files on a cassette. Use CLOAD ? to verify a new file or to develop a directory of files on a cassette. Be sure to press the PLAY key after typing <cload ?><CR>. You will see something like this on your screen:

```
CLOAD ?                          CLOAD?
FOUND: SAMPLE                    FOUND: SAMPLE
FOUND: SECOND        OR          FOUND: SECOND
FOUND: MORE                      BAD FILE
OK
```

IMPORTANT: <CLOAD ?> ceases to list files when it encounters a problem ("Bad File"). This could be a partially erased or incomplete program. At that point, press the BREAK key, then repeat <CLOAD ?> <CR> to continue.

If a newly created file on cassette does not match the program in RAM, the error message will let you know to re-record before emptying RAM.

2. *<CLOAD "xxx>* (where "xxx" is a non-existent file)
   This command lists the files on a cassette, *regardless of their status.* <CLOAD "xxx><CR> tells your ROYAL PC to search the cassette for a non-existent file. While its search is futile, your ROYAL PC lists all files on the cassette:

```
CLOAD "xxx
SKIP: SAMPLE
SKIP: SECOND
SKIP: MORE
(<break>)
OK
```

IMPORTANT: As you develop cassette file directories, keep one copy of each directory with the tape, and another copy filed in a master directory of cassette files.

CHAPTER 3

HOW IT WORKS

CHAPTER 3 - HOW IT WORKS

3.1 OVERVIEW

As you operate your ROYAL PC system, you will begin to understand how the system (or any computer system) works. This chapter assumes that you have begun that process, and attempts to put together some of your understandings, and to fill in some of the gaps. Admittedly, this chapter presents a very simplified explanation of how a computer works. It is intended for those who are relatively new to computers.

This chapter will briefly cover the following aspects of your ROYAL PC system:

A. The fundamental components
B. Definitions of some important terms
C. The CP/M Disk Operating System
D. Programming with the ROYAL PC

While you may want to skip ahead to more "hands on" instruction, it is strongly suggested that you take the time now to read through these pages.

3.2 THE MICROCOMPUTER SYSTEM

Every microcomputer on the market today includes five components:

1. *THE MICROPROCESSOR* (the actual "brain" of the operation, where all the computing occurs - a microchip about the size of a fingernail)
2. *THE MEMORY* (a set of integrated circuit chips that store all the information fed into or generated by the microprocessor)
3. PROGRAMS (sets of instructions designed for a particular computer to tell it what to do)
4. *INPUT/OUTPUT (I/O) DEVICES* (equipment that links the computer to the operator - monitors, keyboards, disk drives, etc.)
5. *INPUT/OUTPUT INTERFACES* (those microchips that carry - and sometimes interpret - microprocessor messages to and from the I/O devices)

With your ROYAL PC system, for example, these five components may look like this:

Computer

MICROPROCESSOR
MEMORY CHIPS
INPUT/OUTPUT INTERFACES
KEYBOARD (I/O DEVICE)

Peripheral I/O Devices

DISK DRIVE
PRINTER

Programs

WORD PROCESSING
ELECTRONIC SPREADSHEET
DATA BASE MANAGEMENT
TELECOMMUNICATONS

Hardware, Software, and Firmware

Another way to look at your ROYAL PC system is to use the terms HARDWARE, SOFTWARE, and FIRMWARE.

Hardware

COMPUTER
Microprocessor
Random Access Memory
Interfaces (built in)

I/O DEVICES
Keyboard
Monitor
Disk drive (or cassette recorder)
Printer (optional)

Software

(to store data and program files)

Disk (or)
Cassettes

FIRMWARE

ROM-Packs (optional)
ROM BASIC Interpreter
Initial Program Loader

3.3 DEFINING SOME TERMS

The Z80 Microprocessor

The microprocessor is the primary component in any computer, the organizer of all activity in the system. It relies upon the computer's memory for all of its instructions. The Z80 is a particularly powerful microprocessor. When you start up your system, the microprocessor begins a methodical procedure: it looks in the first memory location and carries out the instruction it finds there, then moves on to the next location, and then the next. In this process, the microprocessor locates, moves and combines pieces of data, all according to the instructions it encounters in the memory. And all of this happens with lightning speed (say, a half million moves per second).

The Memory

Memory in a microcomputer has two purposes: to store program files (instructions to the microprocessor) and data (all the important information that brought the operator to the computer in the first place). In addition, there is more than one kind of memory, as you learned earlier. These are summarized on the next page.

RANDOM ACCESS MEMORY (RAM) is the main storage area for your microprocessor. RAM is a series of integrated circuit chips containing over 64,000 (64K) memory locations, each with a specific address. Using these addresses, the microprocessor can access any of these locations quickly, without having to go through the entire memory system. This main memory is emptied completely whenever power is removed (e.g., when you turn off the system). In general, programs are stored separately from data, and the operator decides what is written into RAM. RAM also contains memory locations which are accessible to input/output devices. It is through these input/output locations that the microprocessor communicates with the outside world (usually you, or perhaps another computer).

READ ONLY MEMORY (ROM) is a separate series of integrated circuit chips onto which programs have been permanently written. No additional information can be added to ROM (hence, "read only"). In your ROYAL PC, over 24,000 (or 24K) memory locations have been assigned to your BASIC Interpreter, the resident language program to which you have access every time you power up your system. In addition, fundamental start-up instructions (called the IPL: Initial Program Loader) are stored in ROM.

ROM-PACKS - like the resident ROM - include permanently programmed integrated circuitry. However, ROM-Packs are an optional feature of your ROYAL PC System. When you plug a ROM-Pack into the top of your ROYAL PC, you load that ROM program into RAM. At that point, you can input data to RAM as your computer runs that program - to do word-processing, to practice skills, to play a game.

Binary Logic: Bits and Bytes

Microprocessors use binary logic, which relies upon the ability of electronic circuits to be turned either ON or OFF. For each circuit there is a BInary digiT (BIT). This bit of information signals whether the circuit is ON (1) or Off (0). These two digits comprise the binary number system (as compared with the 10 digits in the decimal number system with which you are probably more familiar).

From combining eight bits, 256 unique binary notations are possible. Each 8-bit combination is called a BYTE, and each of these bytes has been assigned to represent a letter (either upper or lower case), a mark of punctuation, a digit (0-9), or a specific function (delete, backspace, carriage return, etc.). You may hear people use the terms BYTE and CHARACTER interchangeably.

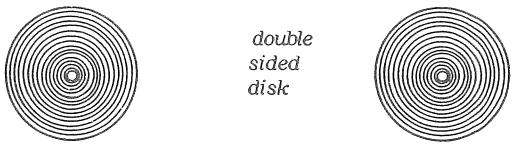
In addition, each of these 256 BYTES has been assigned a numeric value from 0 to 255, and these assignments have been accepted virtually world-wide as the ASCII code (American Standard Code for Information Interchange). Therefore, regardless of where you are, using whatever language, a computer with an ASCII keyboard will understand that the ASCII value of "A" (for example) is 65 and the ASCII value of "a" is 97.

The Disk

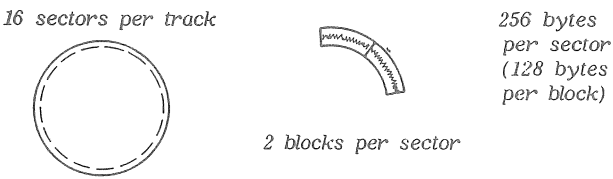
The 5 1/4-inch disk is the most commonly used information storage device for microcomputers. This magnetic disk is made of a flexible mylar material protected by a cardboard jacket with a strategically placed hole through which the disk drive can read or write information. Your ROYAL PC uses "double-sided, double-density" disks. This means that both sides of the disks have been prepared to store information, totalling 320K bytes. This is roughly enough room to record 70 pages of text, each page 50 lines in length.

To help keep track of all these bytes or characters, the disk is organized into a series of units and sub-units (called tracks and sectors). Most computers have their own arrangement (called a format) for these units. The CP/M operating system formats your blank disks quickly for your ROYAL PC (see section 3.4 to follow).

Circling the disk on each side are 40 concentric circles called TRACKS.



Each track is divided into 16 SECTORS, and each SECTOR contains 256 BYTES. Furthermore, CP/M divides each sector into 2 FILE BLOCKS, each of 128 Bytes. When CP/M loads and stores your files onto disks, it uses these file block divisions. (The disk drive reads both sides of the disk; you do not have to worry about what is on which side.)



3.4 THE CP/M OPERATING SYSTEM

Purpose

CP/M stands for Control Program for Microcomputers, and it allows you to do what its name implies: control the basic functions of your disk-driven microcomputer. Three primary areas of control are included: input/output consistency; management of data files recorded on your disks; and use of applications programs (e.g., PeachText Word Processing) to get your work done.

Popularity

While CP/M is not the only operating system for microcomputers, it is by far the most popular. CP/M is run in more computers than any other operating system. It is not uncommon to find operators adding CP/M to computers not originally equipped to run it. In addition, more software has been developed for CP/M than for any other system.

Implementations

The implementation of CP/M for your Z80 microprocessor is called CP/M-80. This is also the implementation for other 8-bit microprocessors (8080 and 8085).

CP/M-86 is a CP/M implementation for 16-bit microprocessors (8086 and 8088), while CP/M-68 supports the 68000 (a 32-bit microprocessor). In addition, there is MP/M for multi-user systems, and CP/Net and MP/Net for computer networking systems.

Functions

A full understanding of your operating system is not necessary for you to use it effectively. At this point, it is sufficient to note many of the basic functions CP/M allows you to perform when you load it into your ROYAL PC:

1. load files from a disk into RAM
2. write information on a disk
3. catalog data into retrievable files
4. prepare (format) disks for use with your ROYAL PC
5. copy files or entire disks
6. rename files
7. delete files
8. add to or change files
9. run applications programs
10. output data to your printer

CP/M Utilities

CP/M allows you to run a number of UTILITIES PROGRAMS, which are included on your SYSTEM DISK. Unlike applications programs (which perform specific tasks with your data), these utilties programs provide system maintenance for your ROYAL PC. As you become more adept with your computer, you will need to learn about these utilities programs. They are explained for you in the CP/M PRIMER, which is included with the ROYAL Disk Drive (F1).

3.5 PROGRAMMING

Because your ROYAL PC comes equipped with the ROM BASIC Interpreter, your system has the capacity to allow you to program in ROM BASIC immediately. If you have also purchased a Disk Drive, you have BASIC 80 included on your SYSTEM DISK.

This manual includes some introductory comments about programming (Chapter 6), and a listing of the programming commands and functions for your ROYAL PC (Appendices A and B). In addition, a separate Microsoft BASIC Manual (called *BASIC 80 MANUAL*) is included.

Every programming language consists of a specific vocabulary and syntax which must be used PRECISELY and is "read" by a language translator in your system. This translator interprets the programming language (Microsoft BASIC or otherwise) into the machine language that your ROYAL PC understands. (This goes back to the binary notation discussed earlier. All your computer understands are arrangements of 0s and 1s.)

If you are interested in learning more about programming, helpful texts are listed in the HELP SECTION (Appendix F). You may also be interested in purchasing additional software that allows you to program your ROYAL PC in other languages.

CHAPTER 4

DISK DRIVE AND CP/M

CHAPTER 4 - DISK DRIVE AND CP/M

4.1 OVERVIEW

In Chapter 2 you learned to use your keyboard and many of the features of your ROYAL PC. In this chapter you will add your ROYAL Disk Drive F1. If you are new to computers, take a moment to review the following rules for disk handling. (Section 1.4 discusses these precautions more fully.)

* Touch only the disk jacket - never the disk.
* Do not remove a disk from the drive while the rectangular drive light is lit.
* Never leave a disk in the drive when the drive is off.
* Avoid writing on disk jackets, except softly with a felt tip pen.
* Store disks upright or flat in boxes.
* Protect your disks from extreme temperatures, moisture, prolonged sunlight, food, electrical currents or magnets, and dust from erasers or other fine particles.

This chapter will teach you to use your disk drive for the following purposes:

A. To load and run applications programs
B. To create and handle files on disks
C. To prepare (format) blank disks for use
D. To make copies of disks
E. To add the operating system to a disk
F. To copy files from one disk to another

Read through these instructions now, trying out those that are relevant to you. You will probably need to refer back to this chapter as you learn to use your ROYAL PC in your work.

NOTE: This chapter pertains to the use of one disk drive. Chapter 10 includes instructions for using a second drive.

4.2 CP/M

CP/M is a program that runs in your ROYAL PC at the same time as the progrms on your applications disks (see Chapter 3). Among other things, CP/M handles the communication between your programs and the various parts of your computer (the keyboard, the display, etc.). As you learned earlier, this kind of program is called an *OPERATING SYSTEM.* Before you can use any applications program or data from your disk drive, *THE OPERATING SYSTEM MUST BE LOADED.* Loading the operating system is often referred to as "booting the disk" (from the notion that the operating system pulls itself up - or into RAM - by its own bootstraps).

An operating system is required to run any disk in a microcomputer. While many program disks include the operating system, CP/M is included on the SYSTEM DISK you received with your disk drive.

4.3 DISKS AND DISK DRIVE

* *ALWAYS* insert disks with the label up and toward you (label under your thumb).

* The disk drive functions *ONLY* when a disk is inserted in the drive slot and the drive lever is lowered. Lowering the lever brings the drive heads into contact with the disk. (You'll see the rectangular drive light glow.)

* When your disk drive "reads" a disk, it puts a *COPY* of a file into RAM. When you store or *SAVE* a file onto a disk, your disk drive *REPLACES ANY EARLIER FILE OF THE SAME NAME.* Thus, after you work on a file, *YOU UPDATE YOUR DISK WHEN YOU STORE (SAVE) THAT REVISED FILE.*

* The disk drive can be operated by your SYSTEM DISK (to load CP/M) followed by an applications disk. *OR*

* The drive can be operated by an applications disk that includes CP/M (like the PeachTree disk with PeachText and PeachCalc).

4.4 STARTING UP

Use this START-UP with your SYSTEM DISK, your PeachTree disk, or any applications disk with CP/M.

Display Screen

MONITOR. Turn on your monitor.

OR

TELEVISION. Turn on your television. (Be sure that the TV Adaptor, Switchbox, and TV set are all correctly installed or prepared. See Chapter 1.3).

Disk Drive

ON. Be sure drive is empty. (To check, raise the black lever until it is parallel to the drive slot.) Reach behind the disk drive and switch it ON. The round red light on the front of your drive tells you when your drive is ON. (This is a READY state.)

DISK INSERT. With the disk label facing up and toward you, insert the disk into the drive slot, and lower the drive lever.

Computer

Switch on your ROYAL PC (right side, rear). The computer will beep, the disk drive will whir for a few seconds, and the rectangular drive light will glow, because the disk drive is loading CP/M into RAM. While this rectangular light glows, you cannot type input to your computer: your disk drive is either reading or writing to your disk.

IMPORTANT: DO NOT REMOVE A DISK FROM THE DRIVE WHILE THE RECTANGULAR DRIVE LIGHT IS ON. YOU WILL LOSE INFORMATION OR DAMAGE YOUR DISK.

If you have booted your SYSTEM DISK or your PEACHTREE DISK, you will see:

A>__ *(blinking cursor)*

IMPORTANT: This A> prompt means your ROYAL PC is ready for your input under CP/M. Input typed before the A> is displayed will not be received.

At this point, type <dir><CR> and skip to section 4.6 (DIRECTORY).

4.5 START-UP VARIATIONS

No CP/M on Applications Disk

If an applications disk will not boot, it probably lacks CP/M. Follow this procedure:

BOOT CP/M
Use the SYSTEM DISK to boot CP/M (previous page). When the A> prompt appears (and the drive light goes out), remove the SYSTEM DISK from the drive.

DISK INSERT
Insert the applications disk into your drive (label under thumb). Lower the drive lever.

DIRECTORY
Type <dir><CR>. CP/M will display the directory of the inserted disk (see section 4.6, DIRECTORY).

Changing Disks to Change Jobs

Before changing to a different applications program, be sure to SAVE your data first! (See the User's Manual for the applications program.)

DISK REMOVAL
When the rectangular drive light is not glowing, remove your disk from the drive, and *return the disk to its envelope.* Your screen does not change because the removal of a disk does not empty RAM.

DISK INSERT
Be sure you are using a disk that has been *formatted* for your ROYAL PC (see section 4.12 PCFORM). Insert the disk into the drive (label under your thumb), and lower the lever across the drive slot.

COMPUTER RESET
Press the RESET button (rear of computer). The computer will beep and the disk drive will whir and groan a bit. The rectangular drive light will glow (the drive heads are reading), and the screen will go blank. Then the screen will present a display. The A> prompt tells you when your ROYAL PC is ready for your input, or you may see a *program menu* from which to choose.

NOTE: When you load a program after RESET, you must use a disk that includes CP/M. RESET clears *everything* out of RAM!

4.6 DIRECTORY

The SYSTEM DISK and all of the applications disks you use include a DIRECTORY. A DIRECTORY is a listing of all the disk's FILES (as the contents of a disk are called). To access the directory on a disk, type <dir><CR> after the A> prompt. Use a disk and try this now:

```
A>  <dir><CR>      (what you typed)

A:FILENAME EXT    :FILENAME EXT    :FILENAME EXT
A:FILENAME EXT    :FILENAME EXT    :FILENAME EXT

A> __  (blinking cursor)
```

* The "A:" symbols indicate that the disk is in the A: drive (as opposed to the B: drive).

* Every file has a FILENAME (see section 4.7).

* *Almost* every file has a file type EXTension (see section 4.7). .COM files can be run by using this syntax:

```
A> <filename><CR>
```

You will learn more about the .COM files on your SYSTEM DISK later in this chapter.

4.7 FILENAMES AND EXTENSIONS

Under CP/M any collection of data, text, or program instructions stored on a disk is a FILE, and has a FILENAME plus a FILE TYPE EXTENSION. Note the format of the following examples:

BROCHURE.#03	*[third draft of brochure]*
INV3-83.DAT	*[data file March 1983 inventory]*
LETTERS.TXT	*[text file of form letters]*
FILECOPY.COM	*[a CP/M program to copy files]*
MAZEGAME.BAS	*[a maze game created in BASIC]*

File Name Specifications

Every CP/M *FILENAME* must meet these specifications:

1. 8 or fewer characters (no spaces), beginning with a letter
2. characters selected among
   a. letters of the alphabet
   b. numerals 0-9
   c. punctuation marks *EXCEPT* _ ? * . , = :

File Type Extension Specifications

CP/M *FILE TYPE EXTENSIONS* are preceded by "."

1. 3 or fewer characters (no spaces)
2. characters selected among
   a. letters of the alphabet
   b. numerals 0-9
   c. punctuation marks *EXCEPT* _ ? * . , = :

Sometimes the .EXT is assigned by CP/M or an applications program. Common CP/M file type extensions include:

.BAK	a CP/M-generated backup copy of file
.BAS	a file written in BASIC
.COB	a file written in COBOL
.COM	a Command Program: machine readable, but not user readable (you can run the program but not "read" it)
.DAT	a data file
.DOC	a text file created with PeachText
.FOR	a file written in FORTRAN
.PAS	a file written in PASCAL
.$$$	a CP/M-generated temporary file
.TXT	a text file

WILDCARDS to Search for Files

WILDCARDS (the characters ? and *) are used to refer to more than one filename at a time.

?

The "?" means "match any character in the filename." Therefore

```
A> <dir INV???83.DAT><CR>
```

might call forth all of these files:

INVJAN83.DAT, INVFEB83.DAT, INVMAR83.DAT

NOTE: "INVAP83.DAT" would be left out because this filename lacks the correct number of letters to match the 3 "?"s.

*

The "*" wildcard replaces the ENTIRE filename.

```
A> <dir *.TXT><CR>
```

calls forth all .TXT files on a disk.

4.8 BASIC FILENAMES

While programming in BASIC 80, use the following conventions for filenames:

* BASIC files are stored under filenames that may include uppercase or lowercase letters, and must be referenced exactly as stored. (The specific formats for SAVEing and LOADing BASIC 80 files are explained in the *BASIC 80 MANUAL*).

* BASIC 80 filenames (and ROM BASIC) may be 6 or fewer characters (see *BASIC 80 MANUAL*).

* .EXTs in BASIC 80 are optional. If you attempt to use a filename of more than 6 characters, BASIC 80 will assign characters 7, 8, and 9 as the .EXT, and eliminate any additional characters (see *BASIC 80 MANUAL*).

4.9 .COM FILES AND UTILITY FILES

CP/M .COM (Command) files are EXECUTED when called up by filename (e.g., <syscopy><CR>), *with no extension.* Unlike other files, .COM files cannot be printed out by your computer because they are written in machine language: 0s and 1s. Included among the .COM files are these CP/M UTILITY PROGRAMS on your SYSTEM DISK:

FILECOPY, PCFORM, DISKCOPY, SYSCOPY: explained in sections 4.12 to 4.15 to follow.
MOVCPMPC, SUBMIT, XSUB, LOAD, ASM, SYSGEN, STAT, DDT, ED, PIP: see CP/M PRIMER.
PCTRANS: file transporter between microcomputers
WIDTH: see Chapter 2.5, Screen Width
DUMP: displays the hexidecimal and ASCII codes (Chapter 3-7) for a file (use *<dump filename.ext><CR>*)

Your SYSTEM DISK also includes three *.ASM* files: *CBIOS, BIOS, and DEBLOCK.* These files are sub-routines of the CP/M operating system.

If these UTILITY PROGRAMS are strange to you now, you will learn to use many of them as you need to manipulate various applications programs. There is also a set of CP/M commands (called RESIDENT COMMANDS) to manipulate your files.

4.10 THE CP/M RESIDENT COMMANDS

Six commands are built into CP/M:

DIR, ERA, REN, TYPE, SAVE, USER.

These resident commands are explained in the CP/M PRIMER. Four are defined here.

1. *<DIR>* Displays the disk directory

2. *<ERA>* Erases file(s) from disk

```
<ERA FILENAME><CR>
<ERA *.TXT><CR>
```

NOTE: <ERA *.*><CR> will *ERASE YOUR DISK!*

3. *<REN>* Renames a file

```
<REN NEWNAME.BAS=OLDNAME.BAS><CR>
<REN FILE.TXT=FILE.BAK><CR>
```

4.11 USING APPLICATIONS SOFTWARE

Defining Applications Programs

Applications programs help you to do specific tasks or accomplish specific purposes. These programs are distinct from the utilities programs under CP/M that help you manage the computer and the files you create (computer housekeeping). Applications programs are, in fact, only one of three categories of SOFTWARE under CP/M.

SOFTWARE AVAILABLE UNDER CP/M

DISK SOFTWARE	*EXAMPLES*
APPLICATIONS PROGRAMS	
***BUSINESS/HOME MGT	Word Processing Financial Accounting Mailing list Systems Electronic Spreadsheets Business Graphics Telecommunications
***EDUCATIONAL & ENTERTAINMENT	Puzzles and Games Computer Aided Instruction
UTILITY PROGRAMS	DISKCOPY PCFORM
LANGUAGE PROGRAMS	Microsoft BASIC (BASIC 80) Pascal FORTRAN

Not all CP/M programs are currently configured for any brand of computer. However, packaged with your disk drive are PEACHCALC ELECTRONIC SPREADSHEET and PEACHTEXT WORD PROCESSOR.

Also included with your drive are catalogs from which you can order computer programs covering the broadest range of business and home applications. As you become familiar with your ROYAL PC and your own computer needs, your ROYAL dealer can help you select the software that is right for you.

NOTE: Software is also available on ROM-Packs for your ROYAL PC. Consult your ROYAL dealer.

PeachCalc Electronic Spreadsheet

One of the most widely-used applications programs in small businesses is the electronic spreadsheet for data analysis. PeachCalc Electronic Spreadsheet is included with your disk drive because it is highly versatile (for a range of business needs) and easy to learn (even for a novice computer operator.)

PeachCalc installs a grid into RAM, onto which you may enter numeric data, labels, and formulas - to compare, experiment with, and forecast statistical changes in your business. Every grid block can be accessed easily, and any single change is reflected throughout the grid sheet (a maximum of 254 rows by 63 columns - or 16,002 grid blocks).

Perhaps most important, PeachCalc's instructions - both on-screen and in the PeachCalc's User's Manual - are written clearly and simply. This includes "user-friendly" error messages, understandable help messages, and step-by-step instructions. For a fuller understanding of how PeachCalc can help you, turn to the PeachCalc's User Manual and read "Overview of PeachCalc" and "PeachCalc Concepts."

PeachText Word Processor

Probably the most popular application for microcomputers today is word processing. PeachText Word Processsor has also been included with your disk drive to enable you to create and edit a broad array of documents. If you have a printer in your ROYAL PC system, you will be able to produce "hard copy" in unlimited formats.

PeachText includes a broad range of editing and formatting options that allow you to create and change text simply and immediately. PeachText also allows you to set up data files from which to insert information into form letters or documents.

Like PeachCalc, PeachText includes understandable instructions, both on-screen and in the PeachText User's Manual. Follow the self-paced tutorials, and you will be creating and editing text almost immediately.

Loading PeachCalc or PeachText

Your PeachTree disk includes both PeachCalc and PeachTree. To load either applications program, boot CP/M from your SYSTEM DISK, then insert your PeachTree disk into the disk drive and type <dir><CR> after the A> prompt. As you examine the PeachTree directory, you will find both PeachCalc (PC) and PeachText (PT) listed

Type <pc><CR> to load PeachCalc.
Type <pt><CR> to load PeachTree.

The other programs on the PeachTree disk are auxiliary programs for either PeachCalc or PeachText. You will use them automatically as you learn to use these applications programs. Henceforth, it is not necessary to examine the directory before loading either PeachCalc or PeachText.

NOTE: You may install CP/M onto your PeachTree disk with the SYSCOPY utility program (see page 4-15). With CP/M installed on the PeachTree disk, you eliminate the need to use your SYSTEM DISK first.

If you should need assistance with a PeachTree program during the first 90 days after purchasing your ROYAL PC, you may consult with PeachTree via the telephone number listed in your PeachTree manuals.

4.12 PREPARING BLANK DISKS: PCFORM

EVERY blank disk you use must first be *FORMATTED.* (Some people say "initialized.") There is a UTILITY PROGRAM on your SYSTEM DISK called PCFORM, which you will use to format your disks. To format a blank disk, first load CP/M. When the A> prompt appears, type <pcform> <CR>. Then follow the procedures on your screen (and explained under PCFORM below). The SOURCE DISK is your SYSTEM DISK; the DESTINATION DISK is the blank disk.

*****PCFORM*****

SCREEN	A>	
TYPE	<pcform><CR>	
SCREEN	PCFORM PROGRAM Version x.x COPYRIGHT by TA (date)	
	Which Drive (A..D)?___	*("A..D" means "A through D")*
TYPE	<a>	*(format in drive A; no <CR>)*
SCREEN	Remove System Disk! Insert new diskette in A! Choose function: (S)tart (A)bort (E)nd	
TYPE	<s>	*(insert blank disk, then <s>)*
SCREEN	Track 0 (to 39)	*(formatting)*
	Choose function: (N)ew Start (E)nd	
TYPE	<E>	*(format ended)*
SCREEN	Insert System Disk in A and Press Any Key to Reboot!	
TYPE	<*>	*(insert SYSTEM DISK, then type any key)*
SCREEN	A>	*(your system is ready to continue)*

****

4.13 BACKING UP YOUR DISKS: DISKCOPY

As you have learned, it is very important to make copies of your disks. (Your SYSTEM DISK is especially important, and you should make a copy of it as soon as possible. If you have a blank FORMATTED disk on hand, use the following instructions to copy it now. The SYSTEM DISK is the SOURCE DISK since you are copying it, and the blank disk is the DESTINATION DISK.) Always begin DISKCOPY by booting your SYSTEM DISK. If you are using only *one* drive, type <diskcopy a: a:><CR> after the A> prompt. Then follow the instructions on your screen (and explained below under DISKCOPY).

IMPORTANT: FORMAT BLANK DISKS FIRST!

*****DISKCOPY*****

SCREEN A>

TYPE <diskcopy a: a:><CR> *(copy FROM Drive A: TO Drive A: Careful!)*

SCREEN DISKCOPY Version x.x
Copyright by TA (date)

Insert Source Diskette in Drive A:,
then type <CR>

TYPE <CR> *(if copying SYSTEM DISK, do not switch disks)*

SCREEN Reading Track 0 (to 5)
Function Complete
Insert Destination Diskette in Drive A:,
then type <CR>

TYPE <CR> *(insert blank disk, then <CR>)*

SCREEN Writing Track 0 (to 5) *(do not remove disk now!)*

Insert Source Diskette
in Drive A, then type <CR>

TYPE <CR> *(switch again, then <CR>)*

[NOTE: READING/WRITING CONTINUES UNTIL SCREEN DISPLAYS A>. WITH 1 DRIVE, BE SURE TO KEEP SWITCHING DISKS!]

****

4.14 ADDING CP/M TO A DISK: SYSCOPY

SYSCOPY will allow you to add CP/M to blank formatted disks and to applications disks which lack the operating system. From your SYSTEM DISK, type <syscopy><CR> in response to the A> prompt. Then follow the procedures on your screen (and outlined below under SYSCOPY).

*****SYSCOPY*****

SCREEN	A>	
TYPE	<syscopy><CR>	
SCREEN	Syscopy Version x.x Copyright by TA (date)	
	Source Drive Name (or <CR> to skip)	
TYPE	<a>	*(you are using A: drive)*
SCREEN	Source on A, then type <CR>	
TYPE	<CR>	*(CP/M Source already in A:)*
SCREEN	RRRRRRRRRRRRRRRRRRRR Function Complete Destination Drive Name (or <CR> to reboot)	*(reading CP/M for new disk)*
TYPE	<a>	*(using A: drive)*
SCREEN	Destination on A, then type <CR>	
TYPE	<CR>	*(insert new disk, then <CR>)*
SCREEN	WWWWWWWWWWWWWWWWWWWW Function Complete Destination Drive Name (or <CR> to reboot)	*(writing CP/M on new disk)*
TYPE	<CR>	*(returns to CP/M; CP/M on new disk)*
SCREEN	A>	

****

NOTE: After you SYSCOPY, you will not find CP/M listed in your DIRectory, as CP/M is not a file, but an operating system.

4.15 COPYING FILES: FILECOPY

FILECOPY allows you to copy a file (or files) from one disk to another, *using one disk drive*. (To copy files using two drives, consult your CP/M PRIMER for PIP: Peripheral Interchange Program.) FILECOPY requires three disks: a SYSTEM DISK, a SOURCE DISK (with the file to be copied), and a DESTINATION DISK. To begin, boot FILECOPY from your SYSTEM DISK.

IMPORTANT: Type FILENAME.EXT in CAPITAL LETTERS.

Otherwise, you will see, "File does not exist."

*****FILECOPY*****

TYPE <filecopy> <CR>

SCREEN
```
TA filecopy        Version x.x
Copyright by TA    (date)
This program is designed to copy a single
file - using drive A: only.
Name of source file?
Enter filename without drive code!
Wildcards not permitted!
```

TYPE <FILENAME.EXT> <CR> *(use CAPITAL LETTERS here!)*

SCREEN Name of destination file? FILENAME.EXT

TYPE <NEWNAME.EXT> <CR> *(if you want to change filename)*
or <CR> *(if not changing filename)*

SCREEN
```
Insert source diskette
       (E)nd  (A)bort  (C)ontinue
```

TYPE <C> *(insert disk with filename.ext, then type <C>)*

SCREEN
```
Reading . . .
Insert destination diskette    (C)ontinue
```

TYPE <C> *(insert new disk, then type <C>)*

SCREEN
```
Writing . . .
Copy operation completed
(N)ew start  (E)nd
```

TYPE <E>

SCREEN Insert system diskette. (C)ontinue

TYPE <C> *(Insert system disk, then type <C>)*

SCREEN A>

****

4.16 AUTO LOADING .COM FILES

On your SYSTEM DISK is a utility program called AUTO (AUTO.COM). It is used to load a program (.COM file) automatically from a disk, as soon as you turn on your system or hit the reset button. You do not need to call up the AUTO-booted program by name when you see the A> prompt.

You may AUTO-boot any of your .COM files; however, you may use AUTO-boot for only one program on a disk at a time (if you have more than one .COM file on a disk). Directions for removing or switching the AUTO utility program are explained later in this section.

To Use AUTO with <FILENAME.COM>

Boot your back-up SYSTEM DISK. At the A>, enter <auto><CR>.

When you see the prompt:	You should enter:
SELECT DRIVE	<A> (for Drive A: on a single drive system)
INSERT DESTINATION DISK IN DRIVE A THEN ENTER <CR>	(unless you are using AUTO with a program on your SYSTEM DISK, change disks now) <CR>
PRESENT AUTO FILE: CHANGE (Y/N):	<y>
ENTER NEW AUTO FILE:	<filename><CR>

At this point, AUTO.COM will end, and FILENAME is ready to AUTO boot.

The HELP Screen <?>

After the SELECT DRIVE prompt, you may enter <?> to bring up the HELP screen. This explanation includes the purposes and procedures for AUTO.

To Remove AUTO from <FILENAME.COM>

To remove AUTO from FILENAME (or to add AUTO to a different program on the disk), load <auto><CR>.

When you see the prompt:	You should enter:
SELECT DRIVE	<A>
PRESENT AUTO FILE: FILENAME CHANGE (Y/N)	<y>
ENTER NEW AUTO FILE:	<CR>
(or)	<newfile><CR>

At this point, AUTO is removed from FILENAME, or a new .COM file (NEWFILE) will AUTO-boot, if specified.

AUTO-Booting MENU!

Once you have learned to use MENU! (see Chapter 5), you may wish to use AUTO with that .COM file. To prepare MENU! to AUTO-boot, you do not need to switch disks in drive A: as both AUTO and MENU! are included on your SYSTEM DISK.

CHAPTER 5

USING MENU!

CHAPTER 5 - MENU!

5.1 OVERVIEW

As you become more comfortable with CP/M and various applications programs, you will begin to build up a "library" of files which you will use quite frequently. At that point, you will probably find the use of MENU! a great convenience and time-saver. MENU! is a "front end utility program," which means that MENU! works between you and your operating system to simplify and speed up the manipulation of your files.

Specifically, this chapter covers the following topics:

How to Begin with MENU!
The MENU! Conventions
- Changing Default Drives
- The MENU! Sequence: COMMAND-SELECT-VERIFY
- Global Search Options
- Wild Card Search Options
- Control Keys
- Moving In and Out of MENU!

The MENU! Commands
- ?
- Compare
- Copy
- CPM
- Dir
- Erase
- Protect/Unprotect
- Rename
- Restore
- Run
- Size
- Space
- Test
- Type

The Menu! Program User Registration Form

Before you continue with this chapter, it is recommended that you turn to page 5-26 to complete the Program User Registration Form.

5.2 HOW TO BEGIN WITH MENU!

If you load the directory for your SYSTEM DISK you will see MENU listed. To load MENU! into your ROYAL PC, follow this syntax:

A> <menu><CR>

NOTE: Some people prefer to have CP/M and MENU! on each applications disk. Many people with two disk drives load their SYSTEM DISK (with CP/M and MENU!) onto their DEFAULT drive (A: drive), and load their programs onto B: drive. You will soon decide which approach makes the most sense to your working habits. (To copy MENU! onto a disk, use FILECOPY on your SYSTEM DISK - see Chapter 4.15)

A0=

A0= tells you that MENU! is loaded into RAM, and is waiting for your COMMAND.

The A: drive is currently the DEFAULT drive (or the only drive if you have only one). You are currently in USER AREA 0. It is likely that you will always work in USER AREA 0, unless you decide to share this disk space with a colleague. (It is probably easier to buy a second disk.) You can define up to 15 USER AREAs on a disk - but you probably won't want to. It is recommended that you stay with USER AREA 0 in the interest of simplicity.

Begin by typing this command:

<dir><CR>

MENU! will respond with a DIRECTORY of numbered, alphabetical filenames. Notice that this is the same listing - reorganized - that you encountered in Chapter 4.

A0=? The MENU! Commands

The MENU! COMMANDS are easy to understand and use. To list the COMMANDS, use this format:

A0=<?><CR>

5.3 THE MENU! CONVENTIONS

Changing the Default Drive and User Area

Unless you designate differently, MENU! assumes that the Default Drive and User Area is A0. To change the DEFAULT DRIVE, use this syntax:

A0=<b:><CR>

Or you can change the default drive by preceding a COMMAND with a new drive designation. For example:

A0=<b:dir><CR>

In this case, MENU! will respond with the B: drive directory, and maintain B: as the default.

MENU! allows you to define up to 15 User Areas per disk. To change the DEFAULT USER AREA, use this syntax:

A0=<5:><CR>

MENU! will respond with

A5=

Finally, you can change both the DEFAULT DRIVE and USER AREA at once:

A0=<b10:><CR>

MENU! will respond with

B10=

The following also works fine:

A0=<b10: RENAME><CR>

While this syntax works for all COMMANDS in MENU!, you will probably do most of your work in USER AREA 0. (If you try to work in a USER AREA where you have nothing stored, MENU! will simply tell you "No files," and return you to the DEFAULT.)

Command-Select-Verify

In general, using MENU! follows this sequence:

A0=Command

After the A0= prompt (or some variation thereof), enter the COMMAND you wish to execute. Often MENU! responds with a directory listing pertinent to your COMMAND, then asks you to . . .

Select?

From your numbered menu, SELECT the file(s) upon which you wish to execute whatever COMMAND you just SELECTed. Before doing anything rash, MENU! will verify each decision with . . .

(Y/N) (Verify)

This frequent verification can help you avoid costly errors. A Y/N verification also includes the FULL FILENAME of the file whose number you SELECTed. Look at this example:

****

A0=<copy><CR>

A0: 1= ARCHIVE.DOC - 2= CHECK .DOC - 3= DOCMT .DOC
A0: 4= DRAFT1 .DOC - 5= PT .COM - 6= PRDCT .DOC

Select? <1-4 6><CR>

Destination drive? <b>

B: =A:ARCHIVE.DOC (y/n) <y>
B: =A:CHECK .DOC (y/n) <y>
B: =A:DOCMT .DOC (y/n) <y>
B: =A:DRAFT1 .DOC (y/n) <y>
B: =A:PRDCT .DOC (y/n) <y>

A0=

****

Command Plus Filename

If using only one filename, you may combine the first two steps into one (COMMAND + SELECT):

A0=<copy archive.doc><CR>

Notice that you save a step, but must type out the filename.ext *EXACTLY.*

Global Search Options

There are two GLOBAL SEARCH OPTIONS to use with the various MENU! COMMANDS. The syntax for each of these options is as follows:

A0=<COMMAND [OPTION]><CR> *OR*
A0=<COMMAND FILENAME.EXT [OPTION]><CR>

In other words, the option letter is bracketed ([]) and comes LAST in the COMMAND syntax.

[U] All User Areas on a Disk

If you are using more than one USER AREA, you will use this option to search all user areas on one disk in one command. In response, MENU! will display file names with correct user area labels.

A0=<dir [U]><CR>

produces a list of all directories on the disk.

A0=<rename filename.ext [U]><CR>

searches all user areas for FILENAME.EXT.

[X] All Accessed Disk Drives

If you have previously accessed disks in more than one drive, this option will search the default user area of each of those disks in one command. In response, MENU! will display file names with correct disk drive designations.

A0=<compare [X]><CR>

lists all the files on all accessed drives, then prompts you to SELECT those you wish to COMPARE.

A0=<run filename.ext [X]><CR>

searches all accessed drives for the program you wish to RUN.

[UX]

The two GLOBAL SEARCH OPTIONS can be used together:

A0=<dir [UX]><CR>

**Wild Card Search Options

** is MENU!'s WILD CARD SEARCH OPTION. (MENU! also recognizes the CP/M wild card formats.) With this option, you can quickly prepare a tailored directory of filenames - to locate one particular file, or to perform a single command upon a series of files. For example

A0=<compare **txt><CR>

provides a directory of .TXT FILES, from which you can SELECT those you wish to COMPARE.

A0=<type INV**><CR>

creates a directory of all filenames beginning INV, from which you can SELECT those you wish to see TYPEd.

Renaming Files with a WildCard

It is possible to RENAME a series of files with the WILD CARD OPTION. For example, you can insert **TXT into the RENAME COMMAND, thus changing the .EXTs on a series of files to .TXT. See RENAME for a fuller explanation.

Control Keys

<CTRL C> or <ESCAPE>

<CTRL C> or <ESCAPE> interrupts a MENU! COMMAND process. <CTRL C> exits MENU! completely, and returns you to CP/M (A>). <ESCAPE> returns you to the MENU DEFAULT PROMPT (usually A0=).

<CTRL P> PRINTER CONTROL KEY

<CTRL P> tells your ROYAL PC to output data to PRINTER as well as to the display screen. A second <CTRL P> resumes output to the screen only.

A0=<dir CTRL P>

Scrolling Control Keys

The SCROLL CONTROL KEYS allow you to examine data at your own pace, either at the screen or printer.

SPACE BAR
Immediate STOP! (<CTRL S> also works here.) After this halt, SPACE BAR proceeds through the data line by line.

<CR>
PAGE BY PAGE. Once output is halted, <CR> proceeds through the data page by page.

ANY KEY
Pressing ANY KEY cancels STOP and PAGE BY PAGE, and your data begins to SCROLL.

<CTRL P>
The printer signal (see above). You can enter <CTRL P> after hitting the SPACE BAR to stop output. Then hit ANY KEY to initiate a continuous scrolling of data to the printer. (SPACE BAR + <CTRL P> + <CR> stops printing, and resumes paging information to the screen only.

<0> THROUGH <9>
SCROLL PACING. To cancel paging and resume scrolling, hit one of the number keys 0-9. <0> sets up the FASTEST speed; <9> sets up the SLOWEST speed.

5.4 THE MENU COMMANDS

In using the MENU! commands, and their various options, be sure to adhere to their exact syntax. The following principles apply to all MENU! commands:

Always enter the DRIVE first, then USER AREA, then COLON (:), with NO SPACES separating them.

A0: <b:> *B0: <b10:>*

Enter these before or after the command, as needed:

To CHANGE the DEFAULT, list the drive and user area BEFORE the command *(A0: <b0: rename>)*

To RETURN to the DEFAULT, list the drive and user area AFTER the command *(A0: <rename b0:>)*

Enter any bracketed [] options as the LAST item in the command syntax *(A0: <dir b: [U]>)*

If you are using a specific FILENAME.EXT with a COMMAND, enter that filename AFTER the command (or command/disk drive designation).

NOTE: SYNTAX VARIATIONS for the following commands are discussed earlier in section 5.3, MENU! CONVENTIONS.

A0=? (Help List of MENU! Commands)

<?> calls for a list of MENU! commands. (In addition, MENU! prints this list automatically when you make a mistake on command syntax.) Notice that the list is alphabetical.

****

A0=<?><CR>

?	*COMPARE*	*COPY*	*CPM*	*DIR*
ERASE	*NEWUSER*	*PROTECT*	*RESTORE*	*RENAME*
RUN	*SIZE*	*SPACE*	*TYPE*	*UNPROTECT*

A0=

****

A0=COMPARE (Quick File Comparison)

<Compare> allows you check whether or not two or more files are identical. Then you know whether or not to ERASE, COPY or TYPE out a file for further work.

****

A0=<compare><CR>

A0: 1=APR83A .INV - 2=MAR83A .INV
A0: 3=MAR83B .INV - 4=MAY83A .INV
A0: 5=JUN83A .INV - 6=JUL83A .INV

select? <3 2><CR>

A0:MAR83B.INV - checksum:D1D8 total:D1D8 dec:53723
A0:MAR83A.INV - checksum:368B total:0866 dec:2150

A0=

****

CHECKSUM: The hexadecimal value of the bit patterns of a file.

TOTAL: The hexadecimal running total of the checksums of the compared files.

DEC: The decimal running total of the checksums of the compared files.

TO COMPARE FILES FROM OTHER DISKS, jot down the CHECKSUM numbers before changing disks.

TO COMPARE ENTIRE DISKS (e.g., original and backup disks), use this syntax:

A0=<compare ***><CR>

Jot down the running total figure, then switch disks and use the same command.

Use with Two Disk Drives

To change the default drive, use this syntax:

A0=<b:compare><CR>

To COMPARE b: drive files from the A: drive default:

A0=<compare b:><CR>

A0=COPY (Copying Files)

<Copy> allows you to copy any number of files FROM any drive TO any drive. People find COPY one of the most useful commands. Once you enter the numbers of the files to be copied, MENU! will copy each file, with the following double-check:

B:=A:FILENAME.EXT (y/n)

If you requested the wrong file, type <n>.

IMPORTANT: Before COPYing large amounts of data, use the SIZE and SPACE commands to be sure you have sufficient room on your destination disk (see SIZE and SPACE). Or, MENU! will simply tell you there is insufficient room on the disk, label files that are too large, and continue COPYing what it can. You can then make a note of the too-large files and change disks to complete COPY.

****

A0=<copy><CR>

A0: 1=APR83 .INV - 2=MAR83 .INV - 3=MAY83 .INV
A0: 4=JUL83 .INV - 5=JUL83 .TXT - 6=JUN83 .INV

select? <1-3 6><CR>

destination drive: <b>

B:=A:APR83 .INV (y/n) <y>
B:=A:MAR83 .INV (y/n) <y>
B:=A:MAY83 .INV (y/n) <y>
B:=A:JUN83 .INV (y/n) <y>

A0=

****

NOTE: If a file of the same name already exists on the destination disk, MENU! will report: FILE EXISTS, <B>ACKUP, <O>VERWRITE, <S>KIP. If you select BACKUP, the old file on the backup disk will have the extension .BAK. However, PROGRAMS (.COM files) will not run if changed to .BAK files.

Important Copy Options

BAD SECTOR ON DISK
If MENU! encounters a bad sector while COPYing a file, MENU! will report BAD SECTOR ON READ. Then you will have the option to ABORT (y/n). If you decide to COPY the file (<y>), the COPY will be made. (If the file is NOT a .COM file, you can look at it with the TYPE command to see what must be rewritten.)

AUTOMATIC RENAME OPTION
You can rename and copy a file at the same time by adding <[Q]> to the COPY command. After you select your file(s), MENU! will prompt for new name(s). (If a file in a series is NOT to be renamed, <CR> will retain the original name.)

You can use WILD CARDS with the [Q] option (see WILD CARDS under MENU! CONVENTIONS).

COPYING FROM ONE USER AREA TO ANOTHER
COPYing into a new USER AREA can be done for a number of situations:

TWO DISK DRIVES, CHANGING THE DEFAULT

A0= <b10:copy><CR>

TWO DISK DRIVES, NOT CHANGING THE DEFAULT

A0= <copy b10:><CR>

ONE DISK DRIVE, CHANGING DEFAULT USER AREA

A0= <10:copy><CR>

ONE DISK DRIVE, SAME DEFAULT USER AREA

A0= <copy A10:><CR>

NOTE: If you are working only with one disk drive, MENU! will MOVE your file instead of COPYing it. MENU! will verify this option by asking:

(C)OPY OR (M)OVE:

TYPE <M> to MOVE these files to a new USER AREA on the same disk.

A0=CPM (Exiting from MENU! to CPM)

<CPM> allows you to leave MENU! and return to CP/M to perform a special CP/M function or operate your system without MENU!.

NOTE: With MENU!, <CTRL C> will NOT return you to the operating system, but will call up the A0= prompt.

If a "?" appears after you type <CPM> or <CTRL C>, this indicates a failure in your computer's memory. Although your ROYAL PC may otherwise appear to be functioning adequately, you should have your system examined by a ROYAL service dealer.

A0=DIR (Disk Directory)

<Dir> allows you to examine the disk's directory where all files have been arranged alphabetically and numbered. In addition, DIR includes a number of options.

ONE DISK, ONE USER AREA

To examine the DEFAULT directory:

A0=<dir><CR> (when A0: is default)

To examine NON-DEFAULT user area:

A0=<dir 10:><CR>

ONE DISK, ALL USER AREAS

[U] globally searches one disk:

A0=<dir [U]><CR>

TWO OR MORE DISK DRIVES

[X] searches the DEFAULT user areas of all accessed drives:

A0=<dir [X]><CR>

To search ALL user areas on all accessed drives:

A0=<dir [XU]><CR>

COLUMN DISPLAY OF DIRECTORY

[number] changes the number of columns (1 to 4) for the display of the directory.

A0=<dir [2]><CR> (2 column display)

A0=<dir [U2]><CR> (2 column display of all user areas on disk)

To Search for a File on a Disk

Enter the filename after DIR to search for a file on a disk OR among accessed disks on your drives:

A0=<dir filename.ext [UX]><CR>

WILDCARD OPTION

Use a WILDCARD option to search for a file or group of files (see WILDCARDS under MENU! CONVENTIONS).

A0=ERASE (Erasing Files)

<Erase> allows you to ERASE files from any specified drive. You can erase any number of files in one operation, following the completion of several built-in safety checks.

****

A0=<erase a5:><CR>

A5: 1=APR83A .INV - 2=MAR83A .INV
A5: 3=MAR83B .INV - 4=MAY83A .INV
A5: 5=JUN83A .INV - 6=JUL83A .INV
select? <2><CR>

erase (y/n): <y>

A: MAR83A .INV erase (y/n): <y>

A0=

****

NOTE: In the above example, the user issued a command to ERASE a file from USER AREA 5 on the A: drive, but did not change the DEFAULT drive.

To Erase a Known File

If you wish to ERASE a known file from a disk, the following syntax may be helpful:

A0=<erase b:filename.ext><CR>

To Restore an Accidental Erase

If you accidentally ERASE the wrong file, use RESTORE to correct the error BEFORE you write to the disk and overwrite the file (see RESTORE).

To Erase a Protected File

If you have previously PROTECTed a file, use the UNPROTECT command to remove the PROTECT marker (see PROTECT and UNPROTECT). Then use ERASE, as described above.

NOTE: You will know a file has been PROTECTed because your display screen will read "FILENAME.EXT is R/O," which means that the file has been designated a "Read Only" file.

A0=PROTECT
A0=UNPROTECT

<Protect> and <Unprotect> allow you to control which files can be ERASEd or changed in any way.

Protect

A PROTECT marker on a file labels that file "Read Only": you cannot write to or ERASE that file. Should you attempt to manipulate a PROTECTed file (e.g., ERASE or write to that file), you will receive the message, "FILENAME.EXT is R/O."

After the PROTECT command, only unprotected files will appear in the directory:

****

A0=<PROTECT><CR>

A0: 1=APR83A .INV - 2=MAR83A .INV
A0: 3=MAR83B .INV - 4=MAY83A .INV
A0: 5=JUN83A .INV - 6=JUL83A .INV

select? <1 3-6><CR>

A0=

****

Unprotect

The UNPROTECT command is effective only on files which you have PROTECTed: it will not change the status of write-protected disks.

PROTECTed files appear in your directory with a * designation. Only PROTECTed files will appear in the directory after the UNPROTECT command:

****

A0=<UNPROTECT><CR>

A0: 1=APR83A .INV - 2=MAR83B .INV**
A0: 3=MAY83A .INV - 4=JUN83A .INV**
A0: 5=JUL83A .INV -*

select? <1-5><CR>

A0=

****

A0=RENAME (Renaming Files)

<Rename> allows you to rename files, either individually or in a series, from any accessed drive. There are several options with RENAME:

```
               ***************
A0=<RENAME><CR>

A0:  1=APR83A  .INV -   2=MAR83B  .INV
A0:  3=MAY83A  .INV -   4=INV83A  .COM

select? <2><CR>

A0:MAR83B .INV = new name: <MAR83A.INV><CR>
A0:MAR83B .INV = MAR83A .INV  rename (y/n)?  <y>
A0=
                              ***************
```

In the above example, the user selected one file to rename MAR83A.INV and verified (Y) that RENAME.

Renaming Files with Wild Card

```
                              ***************
A0=<rename><CR>

A0:  1=APR83A  .INV -   2=MAR83B  .INV
A0:  3=MAY83A  .INV -   4=INV83A  .COM

select? <1-3><CR>

A0:APR83A .INV = new name:<:**DAT><CR>
A0:APR83A .INV = APR83A .DAT newname (y/n)? <y>
A0:MAR83A .INV = MAR83A .DAT newname (y/n)? <y>
A0:MAY83A .INV = MAY83A .DAT newname (y/n)? <y>
A0=
                              ***************
```

With RENAME, a COLON (:) precedes the use of a WILDCARD format. In the above example, the format specifies that selected filenames remain unchanged (**), while all selected extensions become DAT. While this RENAMEING occurs automatically, the user verifies (y) each RENAME before it occurs.

Renaming One File with Wild Card

A WILDCARD can also be used to RENAME only one file, using the same format (above).

A0=RESTORE (Restoring Erased Files)

<Restore> allows you to restore an erased file, so long as you have not written over the file on the disk. <Restore> calls forth a directory ONLY of the ERASEd files on the specified drive: therefore, you do not need to know the specific name or location of an ERASEd file, and you are not limited to one file per RESTORE command.

If an ERASEd file has been significantly overwritten, RESTORE will respond with "Cannot recover: file with bad extent."

If an ERASEd file is recoverable, you will receive the prompt "Recover (y/n)?"

Restoring Multiple Files

```
                          ***************
A0=<restore B:><CR>                       GROUP CONFLICT

B0=PAYROLL  .COM   recover (y/n)? <y>
B0=BUSLTR   .TXT   cannot recover, file with bad extent
B0=PAYROL2  .COM   recover (y/n)? <n>

A0=
                          ***************
```

In the above example, the user asked to RESTORE files on B: drive, without changing the DEFAULT.

Group Conflict

If a selected file is recoverable, but partially overwritten, that file will appear under the heading GROUP CONFLICT. It is recommended that you RESTORE that file right away, before additional data is lost.

Escape

If, in the midst of a multiple RESTORE procedure, you wish to end the RESTORE procedure, you may press the ESCAPE key (and return to A0=).

Restoring One Known File

```
                    ***************
A0=<restore b:payroll.com><CR>

B0=PAYROLL.EXT  recover (y/n)?  <y>

A0=
                    ***************
```

Restoring Files with the Same Name

MENU! cannot RESTORE an ERASEd file if there is already a file by that name in the directory. When you receive the message "File already exists," you may RENAME the existing file first, then RESTORE the ERASEd file. You may not RENAME an ERASEd file. (To RENAME an existing file, press the ESCAPE KEY to return to A0=, and use the RENAME command. See RENAME.)

Working with Restored Files

EVERY RESTOREd file has been PROTECTed (marked "Read Only"). Therefore, a RESTOREd file will appear in the directory with a *, and you will receive a "File is R/O" if you try to write to a RESTOREd file.

Finding All Restorable Files

If you wish to identify all RESTOREable files on a disk, use the following syntax:

```
A0=<restore><CR>
```

MENU!'s response will include a list of GROUP CONFLICT files (damaged, but recoverable). You will then see the following DANGEROUS FILENAME!

```
A0: $$$ .SUB - recover (y/n)?
```

IMPORTANT: YOU MUST TYPE <N> AT THIS POINT OR LOSE THE DISK! AFTER ELIMINATING $$$.SUB (A FILE CREATING A DEADLY ENDLESS LOOP), MENU! WILL LIST ALL RESTORABLE FILES.

IF YOU SHOULD ACCIDENTALLY RESTORE $$$.SUB (gasp!), UNPROTECT AND ERASE IT IMMEDIATELY.

A0=RUN (Running .COM Files)

<Run> calls up any or all executable programs on any accessible drives. Furthermore, RUN will list ONLY the executable programs (i.e., no data or text files) in the directory.

RUN options allow you to call up a directory of executable files, to call up and RUN a specific program, or to call up and display an auxiliary file created within an applications program:

Calling Up the Executable Files

```
                    ***************
A0=<run><CR>

A0: 1= DEMO  .COM    2= INV83 .COM    3= ML    .COM
A0: 4= PC    .COM    5= PT    .COM

select? <5><CR>
                    ***************
```

In the above example, the user has selected to RUN PEACHTEXT (PT) from the A: drive directory.

Running An Applications Program

```
A0=<run ml><CR>
```

In the above example, the user has searched A: drive to select and RUN MAILING LIST MANAGER (ML) with one command.

Typing out an Auxiliary File

```
A0=<run pt letter.doc [UX]><CR>
```

In the above example, the user has searched all accessed disks and selected a specific AUXILIARY FILE (letter) created by the program PEACHTEXT (pt). MENU! will find this file and display it.

IMPORTANT: Following a RUN command, you should have MENU! on an UNPROTECTed disk in your DEFAULT DRIVE. If not, enter the RUN command with the [$] option (A0=run [$]) to return to CP/M after the operation.

A0=SIZE (Creating File Statistics)

For a specified file or series of files, <Size> displays the CP/M allocation and available number of sectors, along with the size of the file in kilobytes and a running total of kilobytes utilized by the selected files.

Used with the SPACE command, SIZE is valuable in determining whether or not a destination disk includes sufficient room for a COPY procedure (see SPACE and COPY).

```
                    ***************
A0=<size b:><CR>

B0:  1=APR83A  .INV -    2=MAR83A  .INV
B0:  3=MAR83B  .INV -    4=MAY83A  .INV
B0:  5=JUN83A  .INV -    6=JUL83A  .INV

select? <5-6><CR>

B0=JUN83A .INV  (Y/N)? <y> 33 sectors 15 empty 6K  6K
B0=JUL83A .INV  (Y/N)? <y> 33 sectors 20 empty 4K 10K

A0=
                    ***************
```

In the above example, the user has selected two files from the B: drive to examine with the SIZE command. After verification (y), the display presents the number of sectors allocated and remaining, then the SIZE of the current file, and the running total of kilobytes used. MENU! then returns the user to the A: DEFAULT DRIVE.

A0=SPACE (Disk Space Statistics)

For all accessed disks, <space> provides data on disk capacity and availability. SPACE is often used in conjunction with SIZE to prepare for a COPY procedure (see SIZE and COPY).

****

A0= <space><CR>

A: R/W used: 232K, Free: 68K, Capacity: 304K
B: R/W used: 210K, Free: 90K, Capacity: 304K

A0=

****

A0=TEST (Testing for Bad Sectors)

<Test> is a non-destructive TEST that identifies bad disk sectors and provides a checksum value for the disk.

By using TEST, you can isolate bad blocks from data and text files ("Repair"), salvaging the remaining disk for safe use. TEST also reports the location of all bad sectors.

IMPORTANT: If a bad sector is found in an executable file (.COM), the file should be ERASEd, and a new COPY made from your original.

A bad sector on the directory means that the disk cannot be used.

TEST will take several minutes to run, and will create row after uninterrupted row of ********** if there are no problems with a disk. If the disk is perfect, TEST will display only these rows of ********, a CHECKSUM total for the disk, and the A0= prompt.

However, the example on the next page illustrates how TEST identifies and works with damaged disk sectors.

A0=<test b:><CR> - disk checksum and test

****
****
bad sector on G=003:02 T=003 S=034 PS=120
****
**********etc.
Save (y/n)? <y>

Show bad files (y/n) <y>

APR83A.INV

Repair (y/n)? <y>

Disk has 1 bad block

Checksum 54BD

A0=

*****

TEST reads each disk sector except those on the SYSTEM tracks. (These *** rows go on and on.)

G=003:02 T=003 S=034 PS=120

The drive head has encountered and noted a bad sector: CP/M's logical location is 003 in GROUP 2, the head's real location is TRACK 3 SECTOR 34, and the PHYSICAL SECTOR location is 120.

SAVE?

To SAVE the disk, MENU! can isolate bad sectors in a special directory file, allowing CP/M to avoid those sectors. (Your file is still damaged.)

SHOW BAD FILES?

If the bad sectors are in a created file, SHOW will identify that damaged file. (REMINDER: .COM files cannot be repaired.)

REPAIR

Unless the disk has been PHYSICALLY damaged, REPAIR can isolate the FILE BLOCKS involved and load the file as though those blocks did not exist, allowing you to reenter lost data.

CHECKSUM

TEST ends with a total checksum for the disk.

A0=TYPE (Displaying File Contents)

<Type> allows you to scan text and data files quickly, without having to load an applications program. A series of files can be displayed sequentially from one TYPE command.

IMPORTANT: Do not attempt to use TYPE with programs (.COM files). TYPE could damage these files, as they are not user readable.

****

A0=<type B:><CR>

B0:1= GREET .DOC - 2= INVCT .DOC - 3= LETR1 .DOC
B0:4= LETR2 .DOC - 5= PRDCT .DOC - 6= PT .COM

select? <1><CR>

B0: GREET .DOC

Greetings!

Now that the warmer months have finally arrived, you are likely to begin thinking seriously about "getting away from it all." If you are like most people, you have not had much (any?) time to spend thinking about or planning an elaborate and exciting vacation.

****

In the above example, the user has selected GREET.DOC to be TYPEd out on the screen. <CR> will advance the letter to a new screen of text.

TYPING A KNOWN FILE

If you already know a file's filename and disk drive, use the following syntax:

A0=<type filename.ext><CR>

PRINTING WITH THE TYPE COMMAND

To PRINT a file available through TYPE, enter <CTRL P> immediately after the selection number.

NOTE: If you are interested in reviewing files to see if they are identical, use the faster COMPARE command (see COMPARE).

MENU! PROGRAM USER REGISTRATION

RETURN THIS REGISTRATION FORM TO
COMPUTING!
2519 Greenwich Street
San Francisco, CA 94123

This software is furnished with the understanding and acceptance by the user that it is solely for his/her own use. The user is licensed to make copies only for personal use on only one computer over which s/he has sole ownership and personal control.

Software is supplied on disk media warranted to be readable by a well-adjusted computer and will be replaced if returned within 15 days of purchase. By initiating the use of this software, the user agrees to accept full responsibility for its use and any results of its use, relieving Pavel Breder, Clyde Steiner, Computing!, and their agents specifically from any responsibility.

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END USER SOFTWARE REGISTRATION
Please fill in, sign and return this registration form to assure service on your software purchase and to assure that you receive any notices of updates, possible bug fixes or enhancements.

** ** ** ** ** ** ** **

YOUR NAME (print) _____

ADDRESS (print) _____

CITY, STATE _____ *ZIP* _____

SOFTWARE DISK NO. _____ *COMPUTER* _____

SIGNATURE OF REGISTERED LICENSEE _____

CHAPTER 6

PROGRAMMING

CHAPTER 6 - PROGRAMMING

6.1 OVERVIEW

If you are new to programming, you probably will find this entire chapter helpful to you. If you have had some programming experience, it is suggested that you read Section 6.5 before turning to the *BASIC 80 MANUAL* included with your ROYAL PC system.

You do not need a degree in computer programming to write computer programs. Eight year old children are writing programs that play games, display graphics, and power robots. Novice programmers with a few weeks of training are writing programs that amaze their friends. Many people have taught themselves programming from books. Others have enrolled in computer classes that meet one evening a week. If and how you learn programming is up to you. As you make those decisions, remember two things: You CAN learn to program, and you do not need to know programming to USE computer programs.

This chapter includes the following topics:

* An overview of computer languages
* How to learn Microsoft BASIC
* Differences between the versions of Microsoft BASIC available for your ROYAL PC
* Information to supplement your *BASIC 80 MANUAL*

6.2 PROGRAMMING LANGUAGES

As you know, there are many different programming languages, and more are being developed all the time. For the most part, these languages are developed to serve distinct purposes. Programming languages fall into three categories: machine language, assembly language, and high-level languages (the ones you hear about, and the ones you are likely to learn):

Machine Language

Machine language is the actual language understood by the computer. Programmers may write programs in machine language, or they may write programs that generate the machine language. Machine language uses binary code (see Chapter 3.3), a series of 0s and 1s. Machine language is also called OBJECT CODE.

Assembly Language

Programmers may write programs in assembly language (or assembler), which generates the machine language understood by the computer. To write an assembly program, programmers must thoroughly understand the computers for which they are programming.

High Level Languages

High level languages are so named because they most closely resemble human speech. BASIC, FORTRAN, COBOL, and Pascal are examples of high level languages. SOURCE CODE is another term for high level language. After a high level language program is entered into a computer, it is translated into that computer's machine language by either an INTERPRETER or COMPILER program.

An INTERPRETER program translates the program one line at a time, and the program remains in its original source code. There is a BASIC INTERPRETER in your ROYAL PC.

A COMPILER translates the entire program into machine language, then executes the program more quickly than does an interpreter. The program remains in machine language.

6.3 SOME POPULAR LANGUAGES

COBOL is a compiler language used mainly for business purposes. COBOL stands for COmmon Business Oriented Language. COBOL was among the first high-level languages, dating back to 1960, and originating in a language called Flowmatic. COBOL programs are generally long and characterized by extensive text, rather than a dense symbolic structure. While these traits do not make COBOL a favorite language among programmers, COBOL programs are relatively easy for programmers to exchange and understand.

FORTRAN was the first high level programming language, developed in 1954. FORTRAN stands for FORmula TRANslator, and was developed by IBM for scientific and mathematical applications. This compiler language is still a popular language for problems in science, mathematics, and engineering, and is sometimes used for business applications.

Pascal has become increasingly popular since its introduction to this country in the early 1970s. Available as both interpreter and compiler languages, Pascal was developed by Niklaus Wirth in Switzerland, and named for the 17th century French mathematician, Blaise Pascal. Pascal's popularity derives from its simplicity and structured design. Many programmers find Pascal the most elegant of the high level languages.

LOGO was developed at the Massachusetts Institute of Technology to introduce children to computing. LOGO is noted for its TURTLE GRAPHICS: the ability to create complex graphic images with minimal programming. The LOGO cursor is called a TURTLE, a triangular shape that can be easily manipulated around the screen. While LOGO is particularly popular among young computer users, the language includes complex programming capabilities.

BASIC was developed at Dartmouth College in the mid 1960s as an easy to learn language for programming novices. This Beginners' All-purpose Symbolic Instruction Code has become a popular language for mathematical and business applications. BASIC is available as both compiler and interpreter languages. Many forms of BASIC have been developed for a wide range of computers: from mainframes (the computers that fill up rooms) to hand-held micros. Probably the most popular BASIC is Microsoft BASIC, developed by the Microsoft Corporation, which is available with your ROYAL PC.

6.4 LEARNING MICROSOFT BASIC

If you have decided to learn to program in Microsoft BASIC, you may prefer to enroll in a class offered in your community. However, if you want to learn Microsoft BASIC on your own, the *BASIC 80 MANUAL* included with your ROYAL PC will be of great help to you. (BASIC 80 refers to the Microsoft BASIC implemented for Z80 microprocessors.) In addition, a good bookstore or computer store carries manuals for learning Microsoft BASIC (and this manual suggests some titles in Appendix F, Help Section). After you compare these various self-teaching options, you can decide which text will be most helpful to you. (While the *BASIC 80 MANUAL* for your ROYAL PC includes certain unique programming features, understanding these features is not essential to learning Microsoft BASIC.)

6.5 ROM BASIC VS. BASIC 80

There are minor differences among the various implementations of Microsoft BASIC (that is, differences among Microsoft BASIC for various computer systems). The language has been modified over time, and different systems enable different features of Microsoft. In fact, Microsoft BASIC for your ROYAL PC includes some unique programming features (see Chapter 4 of the *BASIC 80 MANUAL*).

As you become familiar with Microsoft BASIC, you may note some minor differences between ROM BASIC (i.e., that which is loaded from the ROM BASIC Interpreter) and BASIC 80 (that which is available on disk). These differences have to do with the storage device: ROM BASIC includes instructions to a cassette recorder (CSAVE and CLOAD), while BASIC 80 includes a range of instructions to manipulate disk files.

Appendix A in *THIS MANUAL* reviews the ROM BASIC Reserved Words and Operands - all the terms with pre-defined meanings in ROM BASIC. Appendix B reviews those terms that are defined for BASIC 80, but not for ROM BASIC.

NOTE:  Appendix B includes the additional reserved words for both BASIC 80 and MBASIC (an optional version of Microsoft BASIC).

ROM BASIC: Loading and Exiting

If your disk drive is OFF (rear switch) and no ROM-Pack is inserted, ROM BASIC is *LOADED* into RAM as soon as you switch ON your ROYAL PC.

EXIT ROM BASIC in either of these ways:

* Turn OFF your ROYAL PC *OR*

* Turn ON your disk drive and push the RESET button (see Chapter 4).

To save (CSAVE) and load (CLOAD) ROM BASIC programs with a cassette recorder, see Chapter 2.6.

BASIC 80: Loading and Exiting

To *LOAD* BASIC 80, insert your BASIC 80 DISK and turn on your ROYAL PC system (or push the RESET BUTTON). On your display screen you will see

HOW MANY FILES (0-15)?

The program is asking you how many *new* data files (maximum) you will open during this programming session. Even if you enter <0><CR>, you may still create and SAVE on the disk any number of BASIC 80 programs (since a data file is different from a program file). The default value is 3 files, which you may select by pressing <CR>.

If you plan to open *more* than three data files, select that number, then press <CR>.

After the <CR>, you will see this display:

BASIC-80 Rev. x.xx
Copyright (date) (C) by Microsoft
Created dd-mm-yy
xxxxx Bytes free
OK

If you have forgotten what any of these terms means, refer back to Chapter 2.2, Starting Up Your System.

NOTE: If you try to open more data files than you declared when you booted your BASIC 80 DISK, you will receive an error message. This is a *fatal* error, meaning you must *reboot* your BASIC 80 DISK, and increase the number of files to be opened.

Consult your *BASIC 80 MANUAL* to assist you in programming under BASIC 80.

To *EXIT* BASIC 80, be sure you have CLOSEd any open data files, and SAVEd all your files on your disk (see your *BASIC 80 MANUAL*). Reboot CP/M from your SYSTEM DISK or an applications disk that includes CP/M.

NOTE: Your BASIC 80 DISK includes its own operating system. Exit BASIC 80 and return to the CP/M A> prompt only by *rebooting* CP/M.

6.6 DEFINING SOME BASIC 80 TERMS

You will find the following three terms in your *BASIC 80 MANUAL*. These terms denote three versions of Microsoft BASIC pertaining to that manual.

8K	A subset of Extended BASIC. (All references to 8K BASIC apply to Extended BASIC.)
Extended	ROM BASIC, accessible through the ROM BASIC Interpreter.
Disk	BASIC 80, Microsoft BASIC available on the BASIC 80 DISK.

6.7 CONVERTING BASIC PROGRAMS TO MICROSOFT BASIC

IF YOU ARE NOT AN EXPERIENCED BASIC PROGRAMMER, SKIP THIS SECTION FOR NOW.

If you have programs written in another version of BASIC, the following statements and functions will help you make your conversions to Microsoft BASIC.

For...Next

FOR...NEXT statements may be written to replace the MAT functions used in some versions of BASIC.

: Multiple Statements

If you have previously used the backslash (\) to separate multiple statements, rewrite each backslash as a colon (:).

: Multiple Variable Assignments

Versions of BASIC may include multiple variable statements in this format:

```
Let X=Y=10
```

Rewrite each of these statements in this format for Microsoft BASIC:

```
X=10:Y=10
```

String Dimensions

+ *STRING CONCATENATIONS*

BASIC string concatenations may use a comma (,) or ampersand (&). Rewrite all string concatenations to use the plus sign (+).

DIM

DIM statements in some BASICs declare the LENGTH of strings. For example, in A$=(I,J) A$ is defined as a string array with J elements of length I. Delete the length declaration for all string dimensions, using this format for Microsoft BASIC:

```
DIM A$(J)
```

MID$, RIGHT$, LEFT$

These three Microsoft BASIC functions take substrings of strings. For your BASIC programs using substrings, use the following Microsoft BASIC formats:

MICROSOFT BASIC	OTHER BASICS
A$=MID$(X$,I,1)	A$=X$(I)
B$=MID$(X$,I,J-I+1)	B$=X$(I,J)

6.8 BASIC 80 FILENAMES

⟨files⟩

Load BASIC 80 and use the following command to list the files on your BASIC 80 disk:

<files><CR>

You will notice that your disk includes four files, the BASIC 80 utility programs discussed in Section 6.9 to follow.

The format for listing BASIC 80 filenames includes the following specifications:

* A filename has six or fewer characters, and may include upper or lower case letters, followed by a period (.).

* A three-character extension (.EXT) is optional. BASIC 80 will accept a filename larger than six characters by assigning characters 7, 8 and 9 to the .EXT.

* A version number is automatically assigned to each filename by BASIC 80, with number 1 as the default.

To access a file on your BASIC 80 Disk, you must

* use the .EXT with the filename, and

* use the correct upper or lower case letters.

However, you do *not* have to include the period.

Therefore, to run a program listed as List.#2, the following syntax would be correct:

<run"List.#2><CR> *or* <run"List#2><CR>

The following would *not* be correct in this case:

<run"LIST.#2><CR> *or* <run"list.#2><CR>

6.9 BASIC 80 UTILITIES

The BASIC 80 utilities are high speed, easy-to-use utility programs for your BASIC 80 files. Each includes clear instructions for one or two drives. Be sure to use the following format to access a BASIC 80 utility (where XXXXXX is the utility filename in CAPITAL LETTERS).

```
<run"XXXXXX><CR>
```

"FORMAT

FORMAT prepares blank disks for your BASIC 80 operating system. You must FORMAT any disk you plan to use with BASIC 80.

"DISCOP

Use DISCOP immediately with a FORMATted disk to make a back-up copy of your BASIC 80 Disk. DISCOP copies any BASIC 80 disk, and checks ("reads") each track after it copies ("writes"). This process tells you immediately if you have problems with your disk.

"SYSCOP

SYSCOP copies BASIC 80, including its operating system, onto another disk.

"PCDUMP

PCDUMP examines the contents of a BASIC 80 disk. This program allows you to select a particular sector on the disk and examine the characters and hexadecimal codes for each of the 256 bytes (see pages 3-7 and 3-8).

NOTE: If you are an inexperienced programmer, you may want to use PCDUMP to familiarize yourself with hexadecimal notation.

6.10 Monitor Program

IF YOU ARE NOT AN EXPERIENCED PROGRAMMER, SKIP THIS SECTION FOR NOW.

Under the ROM BASIC Interpreter, you have access to a resident program called MONITOR. The MONITOR PROGRAM allows you to display and change the contents of specific memory locations in RAM. Programmers use the MONITOR PROGRAM to DEBUG (correct errors in) their programs. They refer to these debugging processes as PEEKs and POKEs.

To access the MONITOR PROGRAM, be sure your screen width is set to 80 (<WIDTH 80>). Then follow this format:

<mon><CR>

** MONITOR * (V. 1.2) date*
Memory Area? (<CR> or <memory limitation>)
***

The asterisk (*) denotes MONITOR at the command level.

Monitor Commands

The following commands may be used in the MONITOR PROGRAM:

COMMAND	MEANING
D	Dump (display) memory
G	Go
C	Change memory
M	Move memory
R	Dump (display) register content
E	End monitor program

D - Dump Memory

To display (dump) the memory contents of a memory area (defined by the hexadecimal limits xxxx to yyyy), use the following format:

**<d xxxx,yyyy><CR>*

Example:
```
*<d a000,a00f><CR>
A000 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
*
```

NOTE: In all MONITOR command formats, a space is automatically inserted after the command.

G - Go

To branch to memory location xxxx (in hexadecimal code), use the following format:

**<g xxxx><CR>*

C - Change Memory

To display the contents of memory address xxxx (in hexadecimal code), use the following format:

**<c xxxx><CR>*

Example:
```
*<c af03><CR>
AF03 FF-
```

Terminate the C command by entering a character other than one of the digits 0-9 or letters A-F or a space. <SPACE BAR> displays the next memory location.

M - Move Memory

To move a memory area (defined by the hexadecimal limits xxxx to yyyy) to a new memory address nnnn (in hexadecimal code), use the following format:

**<m xxxx,yyyy,nnnn><CR>*

Example:
```
*<m b000,c000,d000><CR>
Completed
*
```

R - Dump Register Content

To display (dump) the contents of the active registers, use the following format:

```
*<r><CR>
 PC  B  C  D  E  H  L  A  F  I  IX    IY
0000 00 00 00 3B A0 10 0D 68 00 E489 3902
*
```

E - End Monitor Program

When you input <e> after the * prompt, the MONITOR PROGRAM immediately returns to ROM BASIC and the OK prompt.

CHAPTER 7

ADDING ON

CHAPTER 7 - ADDING ON

7.1 OVERVIEW

Chapter 7 introduces you to many of the options available to enhance the capabilities of your ROYAL PC. You may or may not be ready to explore these options at this time. It is suggested that you read through this chapter when you have your system up and running. With some knowledge of your system's expansion capabilities, you can better evaluate your own changing needs, and the expanding array of computer peripherals. Because this expansion is occurring so quickly, it is suggested that you explore sources of on-going information: computer user groups, microcomputer periodicals, and so on.

This chapter takes a brief look at the enhancement features of three kinds of options: the second disk drive (or the third and fourth); printers; modems and telecommunications. Instructions for the installation and operation of each of these options is included with the device. Your authorized ROYAL dealer can help you select options that are compatible both with your needs and the design of your ROYAL PC.

7.2 THE SECOND DISK DRIVE

Why an Additional Disk Drive?

You may or may not ever need to add a second drive to your ROYAL PC. However, many computer operators find the second disk drive essential to meet their regular computing needs. With a second drive, you can benefit in two ways: speed and accessible disk storage. If you find that you are frequently changing disks, you are likely to benefit from a second disk drive. For example, you may have extensive data files to manipulate with PeachCalc. Instead of changing from one disk to another to access those files, you will have immediate access to twice as much disk storage space with two drives. Or, if you often use the CP/M utility programs DISK COPY, PCFORM, and FILECOPY, you will save considerable "housekeeping time" with two disk drives.

Using Two Drives at Once

With two drives connected to your ROYAL PC, access to either drive is as simple as

A> <b:><CR> OR B> <a:><CR>

To access the B: drive directory or a .COM file on the B: drive, use these formats:

A> <dir b:><CR> OR A> <b:filename><CR>

To access the A: drive from B: drive default:

B> <dir a:><CR> OR B> <a:filename><CR>

Full instructions for using the second disk drive are included in Chapter 10.

7.3 Printers

For many computer operators, the most useful peripheral is the printer. This discussion focuses on three printing modes: interfaceable typewriters, daisywheel printers, and dot matrix printers. Because your ROYAL PC includes both serial (RS232) and parallel (Centronics) interfaces, you may choose from a wide range of devices to meet your printing needs, without worrying about costly adaptors. Be sure to consider the printer interface as you evaluate printers. You may want to consider other factors as well, such as print speed (and bi-directional printing), available type faces and type pitches (characters per inch), and the range of print features (e.g. proportional spacing).

A *PARALLEL PRINTER* receives information through eight wires, one character at a time. Control signals between the printer and the computer are handled by additional wires. The highest speed printers are parallel printers: you are likely to see them attached to large computing systems. However, the print speed of a printer reflects the mechanics of the printing process, not the interface. Therefore, conversion from serial to parallel will not affect the maximum print speed for a particular printer.

A *SERIAL PRINTER* receives information one bit at a time, using a single wire (remember: eight bits to a character). An additional wire carries the control signals. If you have one printer connected to your parallel port, you may want to find a serial printer for different quality printing needs. On the other hand, if you have telecommunications hardware connected to your serial port (see section 7.4 to follow), you may prefer to look at parallel printers.

Interfaceable Typewriters

Included in the ROYAL typewriter family are electronic typewriters capable of interfacing with the ROYAL PC system as LETTER QUALITY (i.e., highest print quality) printers. These typewriters may include either serial or parallel interfaces. If you purchase a typewriter with a built-in serial or parallel interface, ask your ROYAL dealer about an interface cable. With that cable connecting your typewriter to your ROYAL PC, letter quality printing is as easy a a key-stroke.

NOTE: A non-ROYAL interfaceable typewriter may perform successfully as a printer for the ROYAL PC. Be sure to test it carefully. Specifications for the ROYAL PC parallel and serial interfaces are included in Appendix E. Contact your ROYAL dealer for your shielded cable.

Daisywheel Printers

Like interfaceable typewriters, daisywheel printers produce letter quality printing. To print out text, a print hammer strikes the appropriate characters on the ends of the daisy-like print wheel moving across the page.

Daisywheel printers may include serial or parallel interfaces. Your ROYAL dealer can give you more information about the complete line of daisywheel printers available for your ROYAL PC.

Dot Matrix Printers

Dot Matrix printers tend to be faster than daisywheel printers, because they use a different print mechanism: a tiny needle strikes the paper at precise intervals to display a series of closely spaced dots as characters of text. While faster than daisywheel printers, dot matrix printers also tend to produce a lower print quality at a lower price. However, the dot display of some matrix printers approaches letter quality.

7.4 MODEMS AND TELECOMMUNICATIONS

A modem and communications software can introduce you to the world of computer telecommunications. Through your RS232 interface, a modem can access large data bases over telephone lines at relatively low costs. A box-like device that attaches to your telephone, a modem (MOdulator-DEModulator) converts electrical signals from your ROYAL PC into tones that can be transmitted across telephone wires, and vice versa.

The selection of modems includes an assortment of 300 baud and 1200 baud devices. (Baud rates measure the number of bits per second moving within a system or from one system to another.) While 1200 baud modems are considerably faster, they are also more expensive. Most users will probably find that a 300 baud modem meets their needs. Appendix E includes the RS232 specifications you need to select a modem and cable that are compatible with your ROYAL PC. With the help of a computer store, you can select a modem that is compatible with your computing needs.

The following telecommunications services are among those available:

1. The Source* and Compuserve** Consumer and Executive Services are three of the subscription news services available at relatively low cost to you (an initial fee plus monthly user-fee). These services include access to AP and UPI wire services, other news agencies, airline fares and flight schedules, as well as user-developed communications networks.

*The Source is a service mark of Source Telecomputing Corporation, a subsidiary of the Reader's Digest Association, Inc.

**CompuServe is a trademark of CompuServe Information Services, a subsidiary of H & R Block.

Many university and public libraries provide computer access to their card catalogs and other reference services.

University computing centers are accessible to authorized users (i.e., users with account numbers).

Using their telephones and modems, users can communicate directly with other users via their computers.

7.5 A-B SWITCH BOXES

Two parallel or serial peripherals can be simultaneously connected to your ROYAL PC via an A-B Switch Box. As the name suggests, you control which peripheral receives your ROYAL PC output by flipping the A-B switch. Be sure to consult Appendix E for the technical specifications of your serial or parallel interface, then examine the A-B switch boxes at a local computer store.

NOTE:  If you are attaching peripherals to your RS232/serial port, remember to consult your ROYAL dealer to have the RS232/serial interface activated.

7.6 GRAPHICS TABLETS

Usually through the serial interface, a graphics tablet picks up and transmits to the display screen the drawings of a special pen on the face of the tablet. Originally, these tablets were used primarily for engineering design. However, as the cost of these tablets has been markedly reduced, they have become increasingly popular for children's use.

7.7 CO-POWER 88[1] MODULE

The ROYAL CO-POWER 88 Module is shaped like a disk drive and plugs into your ROYAL PC. This powerful unit enhances your system's computing capabilities so that you virtually have two computers in one.

The CO-POWER 88 Module allows you to run MS[2]-DOS as well as CP/M 80[3]. Thus, most MS-DOS disks will run on your ROYAL PC without modification. (The CP/M 86[3] operating system is an optional feature with the CO-POWER 88.)

The CO-POWER 88 Module also includes a 16-bit 8088 high-speed microprocessor, and 128K RAM (expandable to 256K).

In addition, the CO-POWER 88's RAM DISK feature virtually eliminates disk access time.

The CO-POWER 88 includes all necessary cabling and operating instructions. If you are interested in learning more about this powerful and versatile option, contact your ROYAL dealer.

7.8 AND ALL THE REST

You may want to explore peripherals not included in this chapter (for example, graphics printers and plotters). Be sure to examine the specifications of your ROYAL PC (Appendix E) before purchasing any peripheral. And, if you have any questions, let your ROYAL dealer help you to find the right answers.

[1]CO-POWER 88 is a trademark of SWP, Inc.
[2]MS is a trademark of Microsoft Corp.
[3]CP/M 80 and CP/M 86 are registered trademarks of Digital Research, Inc.

CHAPTER 10

SECOND DRIVE

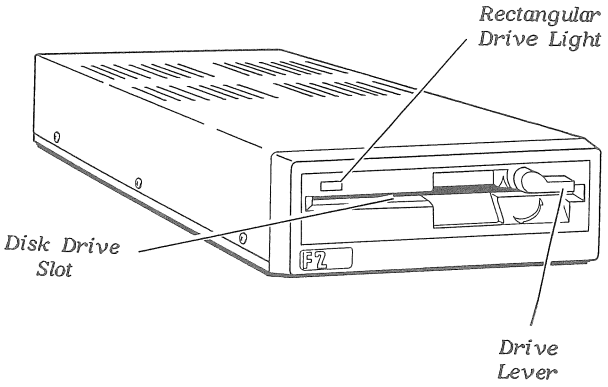
CHAPTER 10 - SECOND DISK DRIVE

10.1 OVERVIEW

This chapter explains how to use a second disk drive with your ROYAL PC System. Specifically, these instructions include

* installation
* changing the default drive
* running applications programs with two drives
* using CP/M utility programs with two drives

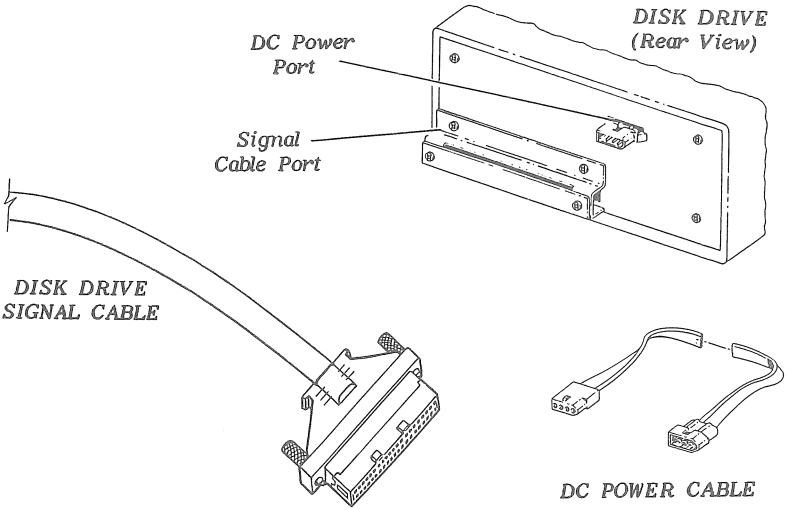
IMPORTANT: Your first ROYAL Disk Drive is called F1 and your second ROYAL Disk Drive is called F2. Traditionally, the first drive is referred to as the A: drive in software and software manuals. The second is referred to as the B: drive.



Because the F2 Drive (B:) is powered by the F1 Drive (A:) it has no On/Off Signal. However, the F2 Drive light monitors the F2 Drive in the same way that the F1 Drive light monitors the F1 Drive (see section 4.2).

10.2 INSTALLATION

According to popular convention, the A: drive (F1 with the controller) sits on top of the B: drive (F2 supplementary unit).



IMPORTANT: Before installing your F1 drive, be sure to disconnect your F1 drive from the wall socket, and turn off your ROYAL PC.

1. *PORT SHIELDS.* Use a screw driver to remove the Rear Port Shield from the Signal Cable Port on each disk drive. *SAVE THE SHIELDS AND SCREWS!*

2. *CARDBOARD INSERT.* Open the drive lever to remove the cardboard insert from the drive. *SAVE THE INSERT!*

3. *CABLE CONNECTIONS.* Connect the two drives with the Disk Drive Signal Cable (to the Signal Cable Ports).

   Connect the two drives with the DC Power Cable (to the DC Power Ports).

4. *POWER.* Reconnect your F1 drive to a wall socket.

10.3 CHANGING FROM A: TO B:

Default Drive

Use the following syntax to change the default drive. (Note: Type only what is enclosed in < >).

(from A: to B:)	*(from B: to A:)*
A> <b:><CR>	B> <a:><CR>

CP/M Resident Commands

To look at a B: drive directory from the A: default drive, type

A> <dir b:><CR>

This syntax does *not* change the default drive.

Use this same format to execute the other CP/M RESIDENT COMMANDS (see Chapter 4.6) involving B: drive files and the A: drive default. For example:

```
A> <era b:filename.ext> <CR>
A> <ren b:NEWNAME.BAS=OLDNAME.BAS><CR>
```

Loading Files

To load a B: drive file when A: is the default drive, use this format:

A> <b:filename><CR>

10.4 RUNNING APPLICATIONS PROGRAMS

In general, you will use two disk drives when the capacity of one drive (320K bytes) is insufficient to store the operating system, an applications program, and the data files you need to use with that program. Therefore, boot your applications program (and CP/M) on the A: drive, and insert into the B: drive the disk upon which you will store supplementary data files.

Saving Auxiliary Files

Once RAM contains a data file, you can easily SAVE it onto the disk in the B: drive. Instructions for SAVEing files on the B: drive are included in your applications program manuals.

PeachCalc

You will see the > prompt at the bottom of your worksheet. After you type </S> (for SAVE), you will see

```
Enter File Name
>/Save,
```

To SAVE a file on the B: drive, type

```
<b:filename><CR>
```

PeachText

With PEACHTEXT, there are two likely occasions for SAVEing a document on the B: drive:

1. Create a file specifically for the B: drive by giving it a B: drive name. When asked "What document do you wish to edit?" type

   ```
   <b:filename><CR>
   ```

2. Create a file for the A: drive, but decide to SAVE it onto the B: drive. When you see the \ prompt on the edit screen, type

   ```
   <x=b:filename><CR>
   ```

   NOTE: X stands for eXtract.

Loading Auxiliary Program Files

Often you will want an applications program on your A: drive and a previously created data file on your B: drive. First, load your applications program (see Chapter 4.2), then load your B: drive file:

PeachCalc

If you are using PEACHCALC, you will see the > prompt on your worksheet. After you type </L> (for LOAD), you will see

```
Load File Name
> /Load,
```

To load a B: drive file, type

```
<b:filename><CR>
```

PeachText

If you are using PEACHTEXT, you will be asked, "What document do you wish to edit?" Respond with

```
<b:filename><CR>
```

If you cannot load a file, consult your disk DIRectories (<dir or dir B:> to review the exact filenames. Be sure you type names EXACTLY. Do you need the extension (.EXT)? Does the syntax require CAPITAL LETTERS?

Complete instructions for LOADing files from the B: drive are included in your applications program manuals.

10.5 RUNNING CP/M UTILITIES

Formatting Disks: PCFORM

To format blank disks with two drives, insert the SYSTEM DISK in A: drive and the blank disk in B: drive. When you see "Which drive (A..D)?" type <b>. Then follow the directions on the screen.

Backing Up Disks: DISKCOPY

To copy a disk with two drives, insert the SYSTEM DISK in A: drive and the formatted blank disk in B: drive. After the A> prompt, type

```
<diskcopy a: b:> <CR>
```

IMPORTANT: Do NOT omit the space between a: and b:

Adding CP/M: SYSCOPY

To add CP/M to a disk, insert the SYSTEM DISK in A: drive and the second disk in B: drive. Follow the SYSCOPY instructions in Chapter 4.14 until the screen asks, "Destination Drive Name?" Type <b>, then proceed with SYSCOPY.

Copying Files: PIP

To copy a file from A: drive to B: drive, use PIP (Peripheral Interchange Program) on your SYSTEM DISK. (FILECOPY works only with one disk drive.) After the A> prompt, type <pip><CR> to display a *. After this * prompt, type the name of the file to be copied:

```
<b:=a:filename.ext><CR>
```

Note that the LEFT side of the "equation" represents the DESTINATION drive and the RIGHT side represents the SOURCE drive.

If you wish to COPY AND RENAME a file at the same time, use this format:

```
<b:newname.ext=a:oldname.ext><CR>
```

PIP will also work with CP/M WILDCARDS (see Chapter 4.7). For example,

```
<b:=a:*.doc>
```

will copy all .DOC files from A: drive to B: drive.

10.6 BASIC 80

BASIC 80 recognizes 2: as the name of the second disk drive (while CP/M recognizes B:). Use the following formats with a two-drive system (where XXXXXX is a filename on the second drive).

<files 2:><CR>

<run"2:XXXXXX><CR>

<load"2:XXXXXX><CR>

<save"2:XXXXXX><CR>

To use the BASIC 80 utility programs with two drives, follow the instructions within the BASIC 80 programs.

APPENDICES

VERSION 1.1

APPENDIX A
ROM BASIC RESERVED WORDS AND OPERANDS

ROM BASIC Commands

AUTO	generates a line number automatically after <CR>
CLOAD	loads a program from cassette into memory
CONT	resumes program operation after CTRL C, END, or STOP
CSAVE	saves a program file to cassette
DELETE	deletes program lines
EDIT	enters edit mode at the specified line
KEY	defines the specified function key
KEY LIST	displays the contents of function keys
LIST	lists at terminal all or part of program in memory
LLIST	lists at the line printer all or part of program in memory
MON	changes the control to monitor
NEW	deletes the program currently in memory
RENUM	renumbers program lines
RUN	executes the program currently in memory
TRON	starts trace mode to trace execution of program statements
TROFF	terminates trace mode

ROM BASIC Program Statements

BEEP	beep sounds
CALL	calls an assembly language subroutine
CLEAR	clears all variables, closes open files, and sets the end of memory area
CLS	clears the display screen
COLOR	sets color and attribute
CONSOLE	sets the mode and scroll window of the display
DATA	stores data accessed by READ statement(s)
DEFDBL	declares variable types as double precision
DEF FN	defines and names a function written by the user
DEFINT	declares variable types as integer

ROM BASIC Program Statements

(continued)

DEFSNG	declares variable types as single precision
DEFSTR	declares variable types as string
DEF USR	specifies the starting address of USR function
DIM	specifies array variable subscripts
END	terminates program execution and returns to command level
ERASE	eliminates arrays from a program
ERL	returns line number of the line in which an error was detected
ERR	returns the error code for an error
ERROR	simulates the occurrence of an error
FOR-TO-[STEP]	allows a series of instructions to be performed in a loop
GOSUB-RETURN	branches to and returns from a subroutine
GOTO	branches to a specified line number
IF-THEN-[ELSE] (or)IF-GOTO	makes a decision regarding program flow based on the result returned by an expression
INPUT	inputs from the terminal during program execution
LET	assigns the value of an expression to a variable
LINE	draws a line, box
LINE INPUT	inputs an entire line to a string variable
LOCATE	sets a cursor position
LPRINT	prints data at the line printer
LPRINT USING	prints data at the line printer using specified format
MID$	replaces portion of one string with another string
NEXT	terminates the FOR loop
NULL	sets the number of nulls to be printed at the end of each line
ON ERROR [GOTO]	enables error trapping
ON-GOSUB	branches to one of several specified subroutines
ON-GOTO	branches to one of several specified line numbers

ROM BASIC Program Statements

(continued)

OPTION BASE	declares the minimum value for array subscripts
OUT	sends a byte to a peripheral output port
POKE	writes a byte into a memory location
PRESET	sets the foreground color of a specified point on the screen
PRINT	outputs data at the terminal
PRINT USING	outputs data at the terminal using specified format
PSET	sets the background color of a specified point on the screen
RANDOMIZE	reseeds the random number generator
READ	reads values from a DATA statement and assigns them to variables
REM	allows explanatory remarks
RESTORE	allows DATA statements to be reread from a specified point
RESUME	concludes error trapping and continues program execution
STOP	terminates program execution and returns to command level
SWAP	exchanges the values of two variables
WAIT	suspends program execution while monitoring the status of a machine input port
WHILE	executes a loop as long as a given condition is true
WEND	terminates WHILE loop
WIDTH	sets the screen width
WIDTH LPRINT	sets the line printer width
WRITE	outputs data at the terminal

ROM BASIC Functions

ABS	returns the absolute value of an expression
ASC	returns the ASCII code of the first character of a string
ATN	returns the arctangent in radians
CDBL	converts X to a double precision number
CHR$	returns a string having specified ASCII code
CINT	returns the truncated integer value of X
COS	returns the cosine in radians
CSNG	converts X to a single precision number
CSRLIN	returns the current line position of the cursor
EXP	returns E to the power of X
FIX	returns the truncated integer value of X
FRE	returns the number of bytes in memory not being used
HEX$	returns a string which represents the hexadecimal value of the decimal argument
INKEY$	checks for characters pending at the terminal
INP	returns the byte read from the input port
INSTR	searches for occurrence of string within a string
INT	returns the largest integer <= X
LEFT$	returns a string comprised of the leftmost specified characters of a string
LEN	returns the numbers of characters in a string
LOG	returns the natural logarithm
LPOS	returns the current position of the line printer print head within the line print buffer
MID$	returns a string of specified length within another string
OCT$	returns a string which represents the octal value of the decimal argument

ROM BASIC Functions

(continued)

PEEK	returns the contents of a specified memory location
POINT	returns data of a specified position on the screen
POS	returns the current column position of the cursor
RIGHT$	returns a string comprised of the rightmost specified characters of a string
RND	returns random number between 0 and 1
SGN	returns a sign (- or +)
SIN	returns the sine in radians
SPACE$	returns a string of spaces of specified length
SPC	prints a specified number of blanks at the terminal
SQR	returns the square root
STR$	returns a string representation of the value
STRING$	returns a string of specified length whose characters all have specified ASCII code (or the first character of a specified string)
TAB	spaces to specified column on the terminal
TAN	returns the tangent in radians
USR	calls the user's assembly language program
VAL	returns the numerical value of the string
VARPTR	returns the address of the first byte of specified data

Logical Operands

Returns a result which is either TRUE (not 0) or FALSE (0). Performed AFTER arithmetic and relational operands. Outcomes determined as shown below. Operands are listed in order of precedence.

NOT

X	NOT X
1	0
0	1

AND

X	Y	X AND Y
1	1	1
1	0	0
0	1	0
0	0	0

OR

X	Y	X OR Y
1	1	1
1	0	1
0	1	1
0	0	0

XOR

X	Y	X XOR Y
1	1	0
1	0	1
0	1	1
0	0	0

EQV

X	Y	X EQV Y
1	1	1
1	0	0
0	1	0
0	0	1

IMP

X	Y	X IMP Y
1	1	1
1	0	0
0	1	1
0	0	1

NOTE: For further explanation, see Chapter 1 of BASIC 80 Manual.

Relational Operands

Compare two values, resulting in comparisons which are TRUE (-1) or FALSE (0). Used to make decisions regarding program flow.

OPERATOR	TESTED RELATIONSHIP
=	Equality
<>	Inequality
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to

Arithmetic Operands

The arithmetic operands are (in order of precedence)

OPERATOR	OPERATION
^	Exponentiation
-	Negation
*,/	Multiplication and Floating Point Division
\	Integer Division
MOD	Modulus Arithmetic
+,-	Addition, Subtraction

NOTE: For further explanation, see Chapter 1 of BASIC 80 Manual.

APPENDIX B

ADDED COMMANDS, STATEMENTS AND FUNCTIONS FOR BASIC 80 AND MBASIC

Except as noted, the following reserved words apply to both of these versions of DISK BASIC:

BASIC 80: Available on BASIC 80 DISK with ROYAL F1 Disk Drive

MBASIC: Optional version of Microsoft BASIC available for ROYAL PC under CP/M Operating System.

Commands

FILES[1]	displays the list of files on the disk
KILL	deletes a file from the disk
LFILES[1]	prints the list of disk files at the printer
LOAD	loads a file from disk into memory
MERGE	merges specified disk file with program in memory
NAME	changes the name of a disk file
SAVE	saves a program file on disk

Program Statements

CHAIN	calls a program and passes variables to it from current program
CLOSE	concludes I/O to a disk file
COMMON	passes variables to a CHAINed program
FIELD	allocates space for variables in a random file buffer
GET	reads a record from a random disk file into a random buffer
GET@	reads data on screen into an array
INPUT#	reads data items from a sequential disk file and assigns them to program variables
LINE INPUT#	reads a line from a sequential disk data file to a string variable
LSET	moves data from memory to a random file buffer (left justified)
OPEN	allows I/O to a disk file

[1]Supported by BASIC 80 only.

Program Statements (continued)

PRINT#	writes data to a sequential disk file
PRINT# USING	writes data to a sequential disk file using a specified format
PUT	writes a record from a random buffer to a random disk file
PUT@	transfers array data to terminal
RSET	moves data from memory to a random file buffer (right justified)
SET[1]	determines the attributes of current drive, open file, or closed file
WRITE	outputs data at the terminal
WRITE#	writes data to a sequential file

Functions

ATTR$[1]	returns a string of current attributes for a drive, open file, or closed file
CVD	converts an 8-byte string to a double precision number
CVI	converts a 2-byte string to an integer
CVS	converts a 4-byte string to a single precision number
DSKF	returns the remaining capacity of a disk (1 cluster = 8 sectors)
DSKI$[1]	returns the contents of a specified sector to a string variable name
DSKO$[1]	writes a record from random buffer #0 to a specified sector
EOF	checks for end of a sequential file
FPOS[1]	returns the physical sector number of a file
INPUT$	returns a string of specified length, read from the terminal or from file
LOC	returns the record number (with random disk file) or the number of sectors (with sequential file)
LOF[1]	returns the number of records in random access file accessed by GET or PUT statement
MKD$	converts a double precision number to an 8-byte string
MKI$	converts an integer to a 2-byte string
MKS$	converts a single precision number to a 4-byte string
RESET[2]	closes all disk files and rewrites directory information to disk

[1]Supported by BASIC 80 only.
[2]Supported by MBASIC only.

APPENDIX C
ESCAPE SEQUENCES

I. CONSOLE OUTPUT (CO) WITH CONTROL CODE INTERPRETATION

One character is passed in register C, where the control codes (below) are interpreted. The contents of all registers, with the exception of the accumulator and the flags, remain unchanged. Exceptions are ESC, 17H, and ESC, 1CH. A number of control functions must be preceded by an escape character (1BH).

CONTROL CODES WITHOUT ESCAPE

HEX (H) CODE

07 *Bell (BEL)*
The bell sounds for approximately 1/2 second.

08 *Backspace (BS)*
The cursor is moved one position to the left. From the beginning of the line, the cursor moves to the end of the preceding line. From the upper left hand corner, the cursor is set to the last line, last column.

0A *Line feed (LF)*
The cursor is moved down one line. When it reaches the last line, the contents of the screen scroll up one line and the top line scrolls out. The column position of the cursor remains unchanged. Code 0AH can also be used for Down Cursor. (With Down Cursor, the contents of the screen do not scroll.)

0C *Clear Screen (FF)*
The screen controller is initialized and the screen driver routine reset. Cursor moves to the left upper corner of the screen; cursor is activated and inverse representation deactivated.

0D *Carriage Return (CR)*
Cursor moves to the start of the next line. A code 0AH directly after the 0DH is ignored.

12 *Inverse Off*
All subsequent characters are displayed in standard representation.

1C *Inverse On*
All subsequent characters are displayed in inverse representation.

II. CONTROL CODES WITH ESCAPE(1BH)

1BH, 0CH, XX INITIALIZE SCREEN DRIVER ROUTINE

A third parameter must be included in this code sequence. Individual bits are described below.

BIT 0=1	Scroll after writing last screen position (scroll mode).
BIT 0=0	Cursor at home position after writing to last screen position (page mode).
BIT 2=0	Control Key returns code 7FH.
BIT 2=1	Control Key is processed internally and returns, when pressed together with another key, the character -40H (e.g., C returns 03H).
BIT 3=0	Without function.
BIT 3=1	Control Key returns code 84H in conjunction with Console Input (CI).
BIT 6=1	Same color is available for back- and foreground color.
BIT 6=0	Inhibited use of same color for background and foreground color.
BIT 7=0	The call clears the screen.
BIT 7=1	The call does not clear the screen.

When the display unit is switched on, the screen driver routine is initialized to 05H.

HEX (H) CODE	
1B,09	*Accesses alternate keyboard table* The *user* key code table (accessing top address in DE register) is replaced with *default* key code table.
1B,10,xx	*Outputs blanks* xx blanks are output, moving the cursor to the right.
1B,1D,xx,yy	*Outputs character(s)* xx character(s) with the code yy are output.
1B,11 (1B,48)	*Cursor home* The cursor is positioned to the upper left corner of the screen.
1B,12	*Cursor off* The cursor is deactivated, but the position is tallied internally.
1B,13	*Cursor on* The cursor is activated.
1B,16	*Sets cursor (line, column)* This ESCAPE sequence requires two further parameters to be passed in register C. Note that the columns are numbered beginning with 0, and the lines beginning with 1. The cursor is set to the highest possible line and column when a value is passed which lies outside the legal bounds.
1B,17	*Returns cursor position* The current position of the cursor is returned in register DE. The value is returned when CO is called with 17H in register C. The line is returned in D and the column in E.

HEX (H) CODE	
1B,18	*Writes character at current cursor position* The character in register E is written at the current cursor position. The character is passed when CO is called with 18H in register C. The character in register E is not evaluated as a control character: it is possible to represent characters otherwise read as control characters. The cursor remains stationary after reaching the last screen position (no scroll).
1B,19 (1B,4B)	*Erases rest of line*
1B,1A (1B,43)	*Cursor moves right*
1B,1C	*Reads character from current position* The character at the current cursor position is returned in register E. The same rules apply as for 1BH,18H. Note that the cursor is moved one position to the right each time.

All of the following code sequences are equivalent to DEC VT-52, fulfilling most requirements placed on screen-oriented software. Note that the four directional cursor movement codes do not enable the cursor to exit the line or column.

1B,41	*Cursor up* The cursor moves up one line, same column.
1B,42 (0A)	*Cursor down* The cursor moves down one line, same column.
1B,43 (1B,1A)	*Cursor right* The cursor moves one column to right.
1B,44 (08)	*Cursor left* The cursor moves one column to left.
1B,45 (0C)	*Erases screen (ES)* The screen is erased and the cursor returns to home position.

The following ERASE functions do not change the position of the cursor:

HEX (H) CODE	
1B,46	*Erases line (EL)* The line in which the cursor is positioned is erased, regardless of cursor position.
1B,4A	*Erases rest of screen (EOS)* The screen is erased beginning at the current position of the cursor.
1B,4B (1B,19)	*Erases rest of line (EOL)* The line containing the cursor is erased from the current cursor position to the end.
1B,48 (1B,11)	*Cursor Home*
1B,59	*Positions cursor with line and column offset*

(The following two codes position the cursor. An offset of 20H is added to the line and column to circumvent difficulties with lines/columns 8 and 9. Also note that the line and column counts begin with 0, unlike the count in 1BH,16H. All other conditions are identical to those for 1BH,16H.

1B,31	*Graphic mode on* This code sequence enables all 64 (semi) graphic chracters to be represented. ASCII characters (from 20H to 5FH) are represented as block graphic characters. All other ASCII characters except in conjunction with 1BH,32H are ignored.
1B,32	*Graphic mode off* All characters are displayed in standard representation.
1B,49,xx	*Inserts characters up to xx* A blank is inserted at the current current cursor position and characters up to column xx are shifted right one position. The last character is deleted. When parameter xx is not logical, the function is not executed.

HEX (H) CODE	
1B,47,xx	*Deletes characters up to column xx* The character at the current cursor position is deleted and the remainder of the line, up to column xx, is shifted to the left. The last character is replaced by a blank. The same parameter conditions apply as for the preceding code sequence.
1B,53,ss	*Selects screen width* Screen width is changed and all display contents (character and attribute) are cleared. Cursor returns to the home position. ss = 30H: 40 character mode ss = 32H: 80 character mode
1B,54,ff,bb	*Screen erases with appointed color* Screen is erased with the color attribute ff,bb. ff = foreground color code (30H-37H) bb = background color code (30H-37H) If the screen has been initialized (by 1BH,0CH) to allow the same color for ff and bb, no character appears when the same color is called for ff and bb. Otherwise, the same color for ff and bb is ignored. See 1BH,0CH,xx.
1B,55,ff,bb	*Color attribute set* Color attribute is set for the following display sequences. Color codes and conditions are the same as for 1BH,54H.
1B,56,vv	*Screen attribute set* The character attribute is set for the following display sequences: vv = 30H: Normal 31H: Blink 32H: Inverse 33H: Blink and inverse

III. CONSOLE INPUT (CI)

This routine waits until a key has been depressed, then returns the key code (7-bit ASCII characters and 8-bit control and graphic patterns) in the accumulator. The contents of all other registers remain unchanged.

The "cursor left" function returns code 08H (backspace).

The "CTRL KEY" or "RESERVED FUNCTION KEY" returns the code if the screen driver is initialized (see 1B,0C).

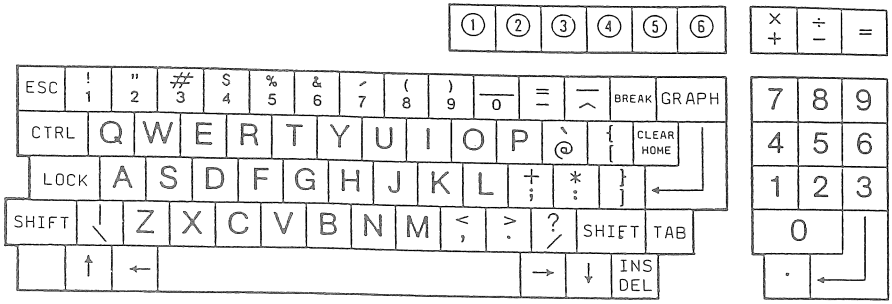
IV. INTERROGATE CONSOLE STATUS (CSTS)

This routine is used to ascertain whether or not a key has been pressed. The respective value is returned in Register A.

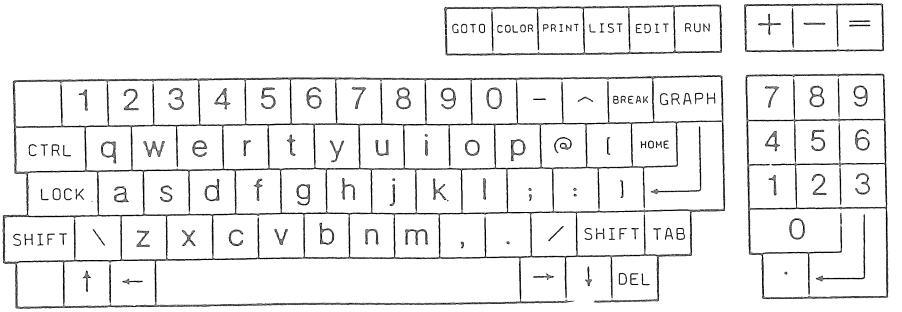
A = 00 and Z = 1: no key pressed
A = FF and Z = 0: key pressed

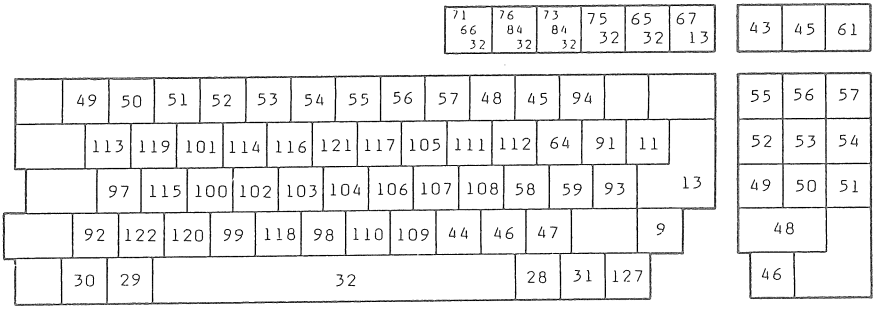
APPENDIX D

KEYBOARD LAYOUTS
(ASCII CODE CHARTS)



ROM BASIC/BASIC 80
no shift





Translation Table

MODE OF OPERATION

ROM BASIC/BASIC 80 - NO SHIFT

MAIN KEYBOARD		
KEY	ASCII	IMAGE
ESC		
! 1	49	1
" 2	50	2
# 3	51	3
$ 4	52	4
% 5	53	5
& 6	54	6
' 7	55	7
(8	56	8
) 9	57	9
_ 0	48	0
= -	45	-
~ ^	94	^
BREAK		
GRAPH		
CTRL		
Q	113	q
W	119	w
E	101	e
R	114	r
T	116	t
Y	121	y
U	117	u
I	105	i
O	111	o

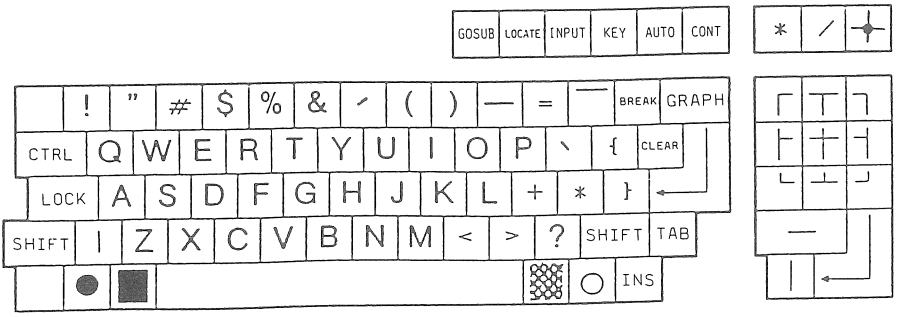
KEY	ASCII	IMAGE
P	112	p
` @	64	@
{ [	91	[
CLEAR HOME	11	
LOCK		
A	97	a
S	115	s
D	100	d
F	102	f
G	103	g
H	104	h
J	106	j
K	107	k
L	108	l
+ ;	59	;
* :	58	:
}]	93	]
←	13	
SHIFT		
| \	92	\
Z	122	z
X	120	x
C	99	c
V	118	v
B	98	b
N	110	n

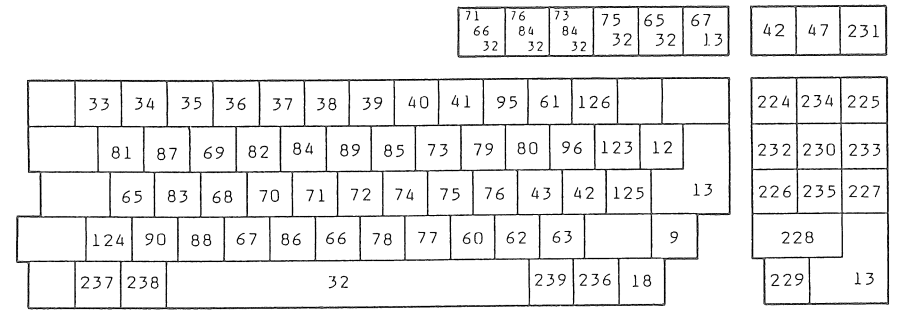
KEY	ASCII	IMAGE
M	109	m
< ,	44	,
> .	46	.
? /	47	/
SHIFT		
TAB	9	
↑	30	
←	29	
SPACE	32	
→	28	
↓	31	
INS DEL	127	

SPECIAL FUNCTION KEYS		
KEY	ASCII	IMAGE
1	71 32	GOTO
2	67 82 32	COLOR
3	80 84 32	PRINT
4	76 32	LIST
5	69 32	EDIT
6	82 13	RUN

NUMERIC KEYPAD		
KEY	ASCII	IMAGE
× +	43	+
÷ −	45	-
=	61	=
7	55	7
8	56	8
9	57	9
4	52	4
5	53	5
6	54	6
1	49	1
2	50	2
3	51	3
0	48	0
.	46	.
←	13	

ROM BASIC/BASIC 80
shift





Translation Table

MODE OF OPERATION

ROM BASIC/BASIC 80 - SHIFT

MAIN KEYBOARD		
KEY	ASCII	IMAGE
ESC		
! 1	33	!
" 2	34	"
# 3	35	#
$ 4	36	$
% 5	37	%
& 6	38	&
' 7	39	'
(8	40	(
) 9	41	)
_ 0	95	_
= -	61	=
~	126	~
BREAK		
GRAPH		
CTRL		
Q	81	Q
W	87	W
E	69	E
R	82	R
T	84	T
Y	89	Y
U	85	U
I	73	I
O	79	O

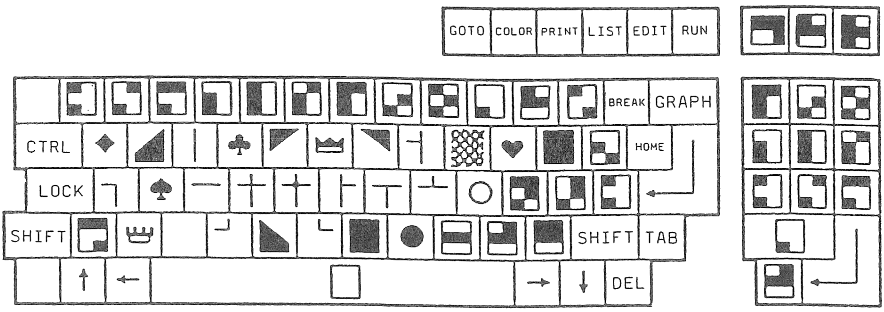
KEY	ASCII	IMAGE
P	80	P
@ `	96	`
{ [	123	{
CLEAR HOME	12	
LOCK		
A	65	A
S	83	S
D	68	D
F	70	F
G	71	G
H	72	H
J	74	J
K	75	K
L	76	L
+ ;	43	+
* :	42	*
}]	125	}
↵	13	
SHIFT		
| \	124	|
Z	90	Z
X	88	X
C	67	C
V	86	V
B	66	B
N	78	N

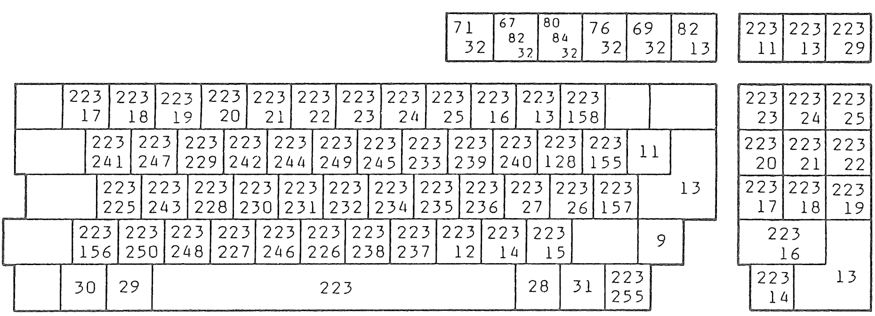
KEY	ASCII	IMAGE
M	77	M
< ,	60	<
> .	62	>
? /	63	?
SHIFT		
TAB	9	
↑	237	●
←	238	■
SPACE	32	
→	239	▒
↓	236	○
INS DEL	18	

SPECIAL FUNCTION KEYS		
KEY	ASCII	IMAGE
1	71 66 32	GOSUB
2	76 84 32	LOCATE
3	73 84 32	INPUT
4	75 32	KEY
5	65 32	AUTO
6	67 13	CONT

NUMERIC KEYPAD		
KEY	ASCII	IMAGE
× +	42	*
÷ -	47	/
=	231	┼
7	224	┌
8	234	┬
9	225	┐
4	232	├
5	230	┼
6	233	┤
1	226	└
2	235	┴
3	227	┘
0	228	—
.	229	|
↵	13	

ROM BASIC
graph - no shift





Translation Table

MODE OF OPERATION

ROM BASIC WITH GRAPH

MAIN KEYBOARD		
KEY	ASCII	IMAGE
ESC		
! 1	223 17	
" 2	223 18	
# 3	223 19	
$ 4	223 20	
% 5	223 21	
& 6	223 22	
' 7	223 23	
(8	223 24	
) 9	223 25	
_ 0	223 16	
= -	223 13	
~ ^	223 158	
BREAK		
GRAPH		
CTRL		
Q	223 241	
W	223 247	
E	223 229	
R	223 242	
T	223 244	
Y	223 249	
U	223 245	
I	223 233	
O	223 239	

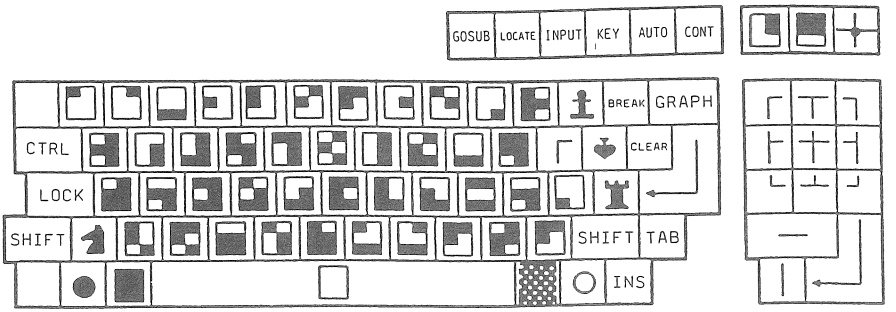
KEY	ASCII	IMAGE
P	223 240	
@ `	223 128	
{ [	223 155	
CLEAR HOME	11	
LOCK		
A	223 225	
S	223 243	
D	223 228	
F	223 230	
G	223 231	
H	223 232	
J	223 234	
K	223 235	
L	223 236	
+ ;	223 27	
* :	223 26	
}]	223 157	
↵	13	
SHIFT		
| \	223 156	
Z	223 250	
X	223 248	
C	223 227	
V	223 246	
B	223 226	
N	223 238	

KEY	ASCII	IMAGE
M	223 237	
< ,	223 12	
> .	223 14	
? /	223 15	
SHIFT		
TAB	9	
↑	30	
←	29	
SPACE	223	
→	28	
↓	31	
INS DEL	223 255	

SPECIAL FUNCTION KEYS		
KEY	ASCII	IMAGE
1	71 32	GOTO
2	67 82 32	COLOR
3	80 84 32	PRINT
4	76 32	LIST
5	69 32	EDIT
6	82 13	RUN

NUMERIC KEYPAD		
KEY	ASCII	IMAGE
x +	223 11	
÷ -	223 13	
=	223 29	
7	223 23	
8	223 24	
9	223 25	
4	223 20	
5	223 21	
6	223 22	
1	223 17	
2	223 18	
3	223 19	
0	223 16	
.	223 14	
↵	13	

ROM BASIC
graph - shift



	223 1	223 2	223 3	223 4	223 5	223 6	223 7	223 8	223 9	223 159	223 29	223 254							
	223 145	223 151	223 133	223 146	223 148	223 153	223 149	223 137	223 143	223 144	223 224	223 251	12						
	223 129	223 147	223 132	223 134	223 135	223 136	223 138	223 139	223 140	223 11	223 10	223 253	13						
	223 252	223 154	223 152	223 131	223 150	223 130	223 142	223 141	223 28	223 30	223 31		9						
	223 237	223 238	223								223 239	223 236	18						

71 66 32	76 84 32	73 84 32	75 32	65 32	67 13														
223 10	223 15	223 231																	
223 224	223 234	223 225																	
223 232	223 230	223 233																	
223 226	223 235	223 227																	
223 228																			
223 229	13																		

Translation Table

MODE OF OPERATION

ROM BASIC WITH SHIFT AND GRAPH

MAIN KEYBOARD		
KEY	ASCII	IMAGE
ESC		
! 1	223_{1}	
" 2	223_{2}	
# 3	223_{3}	
$ 4	223_{4}	
% 5	223_{5}	
& 6	223_{6}	
' 7	223_{7}	
(8	223_{8}	
) 9	223_{9}	
_ 0	223_{159}	
= -	223_{29}	
~ ^	223_{254}	
BREAK		
GRAPH		
CTRL		
Q	223_{145}	
W	223_{151}	
E	223_{133}	
R	223_{146}	
T	223_{148}	
Y	223_{153}	
U	223_{149}	
I	223_{137}	
O	223_{143}	

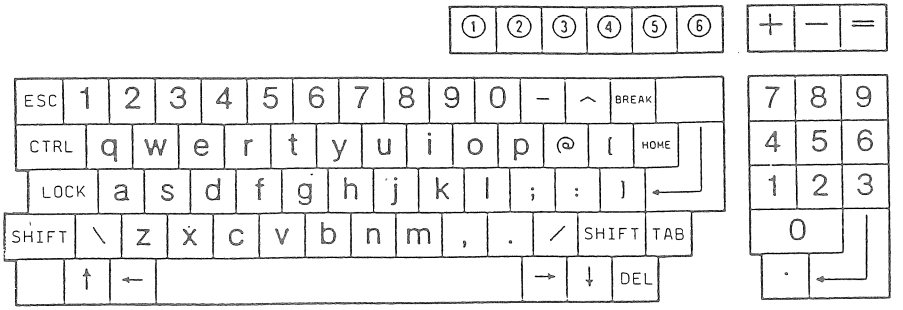
KEY	ASCII	IMAGE
P	223_{144}	
` @	223_{224}	
{ [	223_{251}	
CLEAR HOME	12	
LOCK		
A	223_{129}	
S	223_{147}	
D	223_{132}	
F	223_{134}	
G	223_{135}	
H	223_{136}	
J	223_{138}	
K	223_{139}	
L	223_{140}	
+ ;	223_{11}	
* :	223_{10}	
}]	223_{253}	
↵	13	
SHIFT		
| \	223_{252}	
Z	223_{154}	
X	223_{152}	
C	223_{131}	
V	223_{150}	
B	223_{130}	
N	223_{142}	

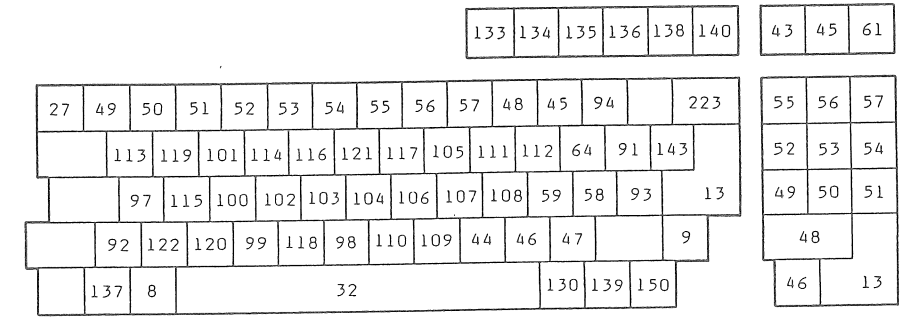
KEY	ASCII	IMAGE
M	223_{141}	
< ,	223_{28}	
> .	223_{30}	
? /	223_{31}	
SHIFT		
TAB	9	
↑	223_{237}	
←	223_{238}	
SPACE	223	
→	223_{239}	
↓	223_{236}	
INS DEL	18	

SPECIAL FUNCTION KEYS		
KEY	ASCII	IMAGE
1	$71_{66_{32}}$	GOSUB
2	$76_{84_{32}}$	LOCATE
3	$73_{84_{32}}$	INPUT
4	75_{32}	KEY
5	65_{32}	AUTO
6	67_{13}	CONT

NUMERIC KEYPAD		
KEY	ASCII	IMAGE
× +	223_{10}	
÷ -	223_{15}	
=	223_{231}	
7	223_{224}	
8	223_{234}	
9	223_{225}	
4	223_{232}	
5	223_{230}	
6	223_{233}	
1	223_{226}	
2	223_{235}	
3	223_{227}	
0	223_{228}	
.	223_{229}	
↵	13	

CP/M
no shift


① ② ③ ④ ⑤ ⑥
+ − =
ESC 1 2 3 4 5 6 7 8 9 0 - ^ BREAK
CTRL q w e r t y u i o p @ [HOME
LOCK a s d f g h j k l ; :]
SHIFT \ z x c v b n m , . / SHIFT TAB
↑ ← → ↓ DEL
7 8 9
4 5 6
1 2 3
0
.


133 134 135 136 138 140
43 45 61
27 49 50 51 52 53 54 55 56 57 48 45 94 223
113 119 101 114 116 121 117 105 111 112 64 91 143
97 115 100 102 103 104 106 107 108 59 58 93 13
92 122 120 99 118 98 110 109 44 46 47 9
137 8 32 130 139 150
55 56 57
52 53 54
49 50 51
48
46 13

Translation Table

MODE OF OPERATION

CP/M

MAIN KEYBOARD		
KEY	ASCII	IMAGE
ESC	27	
! 1	49	1
" 2	50	2
# 3	51	3
$ 4	52	4
% 5	53	5
& 6	54	6
7	55	7
(8	56	8
) 9	57	9
_ 0	48	0
=	45	-
~ ^	94	^
BREAK		
GRAPH	223	
CTRL		
Q	113	q
W	119	w
E	101	e
R	114	r
T	116	t
Y	121	y
U	117	u
I	105	i
O	111	o

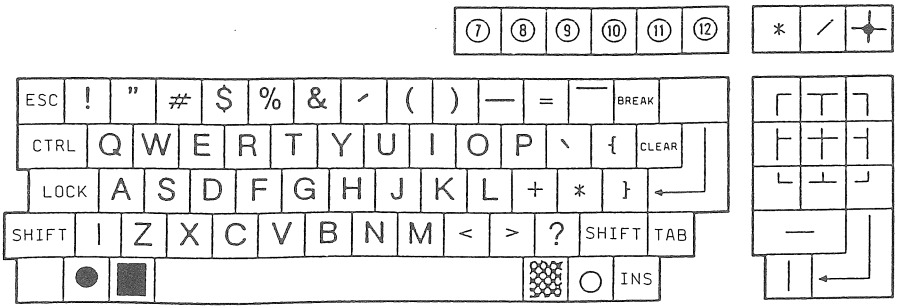
KEY	ASCII	IMAGE
P	112	p
` @	64	@
{ [	91	[
CLEAR HOME	143	
LOCK		
A	97	a
S	115	s
D	100	d
F	102	f
G	103	g
H	104	h
J	106	j
K	107	k
L	108	l
+ ;	59	;
* :	58	:
}]	93	]
↵	13	
SHIFT		
| \	92	\
Z	122	z
X	120	x
C	99	c
V	118	v
B	98	b
N	110	n

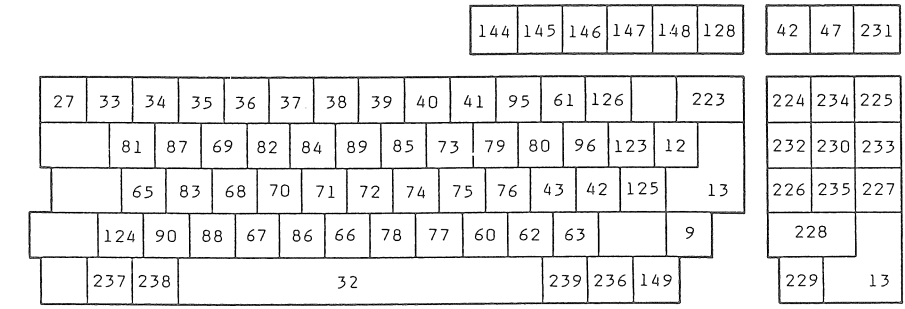
KEY	ASCII	IMAGE
M	109	m
< ,	44	
> .	46	
? /	47	
SHIFT		
TAB	9	
©		
↑	137	
←	8	
SPACE	32	
→	130	
↓	139	
INS DEL	150	

SPECIAL FUNCTION KEYS		
KEY	ASCII	IMAGE
1	133	
2	134	
3	135	
4	136	
5	138	
6	140	

NUMERIC KEYPAD		
KEY	ASCII	IMAGE
× +	43	+
÷ −	45	-
=	61	=
7	55	7
8	56	8
9	57	9
4	52	4
5	53	5
6	54	6
1	49	1
2	50	2
3	51	3
0	48	0
.	46	.
↵	13	

CP/M
shift


⑦ ⑧ ⑨ ⑩ ⑪ ⑫
* / +
ESC ! " # $ % & ' ( ) — = ~ BREAK
CTRL Q W E R T Y U I O P ` { CLEAR
LOCK A S D F G H J K L + * }
SHIFT | Z X C V B N M < > ? SHIFT TAB
INS


144 145 146 147 148 128
42 47 231
27 33 34 35 36 37 38 39 40 41 95 61 126 223
81 87 69 82 84 89 85 73 79 80 96 123 12
65 83 68 70 71 72 74 75 76 43 42 125 13
124 90 88 67 86 66 78 77 60 62 63 9
237 238 32 239 236 149
224 234 225
232 230 233
226 235 227
228
229 13

Translation Table

MODE OF OPERATION

CP/M WITH SHIFT

MAIN KEYBOARD		
KEY	ASCII	IMAGE
ESC	27	
! 1	33	!
" 2	34	"
# 3	35	#
$ 4	36	$
% 5	37	%
& 6	38	&
' 7	39	'
(8	40	(
) 9	41	)
_ 0	95	_
= -	61	=
~ ^	126	~
BREAK		
GRAPH	223	
CTRL		
Q	81	Q
W	87	W
E	69	E
R	82	R
T	84	T
Y	89	Y
U	85	U
I	73	I
O	79	O

KEY	ASCII	IMAGE
P	80	P
` @	96	\
{ [	123	{
CLEAR HOME	12	
LOCK		
A	65	A
S	83	S
D	68	D
F	70	F
G	71	G
H	72	H
J	74	J
K	75	K
L	76	L
+ ;	43	+
* :	42	*
}]	125	}
↵	13	
SHIFT		
| \	124	|
Z	90	Z
X	88	X
C	67	C
V	86	V
B	66	B
N	78	N

KEY	ASCII	IMAGE
M	77	M
< ,	60	<
> .	62	>
? /	63	?
SHIFT		
TAB	9	
©		
↑	237	●
←	238	■
SPACE	32	
→	239	▒
↓	236	○
INS DEL	149	

SPECIAL FUNCTION KEYS		
KEY	ASCII	IMAGE
1	144	
2	145	
3	146	
4	147	
5	148	
6	128	

NUMERIC KEYPAD		
KEY	ASCII	IMAGE
x +	42	*
÷ -	47	/
=	231	┼
7	224	┌
8	234	┬
9	225	┐
4	232	├
5	230	┼
6	233	┤
1	226	└
2	235	┴
3	227	┘
0	228	—
.	229	|
↵	13	

VI. DIP SWITCH *(SW 102)*

Switch 1-3 Selects the national subset of the character set.
Switch 4 Selects the printer interface (parallel/serial).
Switch 5 TV color system (PAL/NTSC)
Switch 6 No function

PRESET POSITIONS OF SWITCHES

1	2	3	4	5
ON	ON	ON	OFF RS232C/serial	OFF NTSC
			ON Centronics/parallel	ON PAL

VII. BAUD RATE

The baud rate is preset to 4800 bd.
Adjustments should be made as follows:

1	2	3	4	5	6		Baud
						1)	9600
						2)	4800
0	0	0	0	0	0	3)	2400
Jumper Plug						4)	1200
0	0	0	0	0	0	5)	600
						6)	300

VIII. ROM PACK INTERFACE

The 30-pin socket of the ROM-Pack interface is underneath a protective cover at the top left of the computer housing.

IX. EXPANSION BUS INTERFACE

The Expansion Bus Interface connects the disk drive(s) and other expansion peripherals. The 50-pin socket of this interface is at the rear of the PC (see Chapter 1). A special cable is needed to access this interface.

Consult the manual of your peripheral device.

V. Serial Interface

The output signals for the serial (RS232) interface are located at the back of the computer (on the right hand side as you face the rear - see Chapter 1). RS232/serial cables must meet the following specifications:

Technical Specifications:

Signal level : RS232
Baud Rate : 3000, 600, 1200, 2400, 4800, 9600 bps (hardware select)

IMPORTANT: You must use a SHIELDED cable to attach a printer to your ROYAL PC.

Input/Output Signals

No.	Signal	Meaning
1	NC	Not Connected
2	TxD	Transmitted Data
3	RxD	Received Data
4	RTS	Request to Send
5	CTS	Clear to Send
6	DSR	Data Set Ready
7	GND	Signal Ground
8	DCD	Date Carrier Detect
9	NC	Not Connected
10	NC	
11	NC	
12	NC	
13	NC	
14	NC	
15	TxC	Transmitter Clock
16	NC	
17	RxC	Receiver Clock
18	NC	
19	NC	
20	DTR	Data Terminal Ready
21	NC	
22	NC	
23	NC	
24	NC	
25	NC	

IV. Printer Interface (Parallel)

The ROYAL PC has a Centronics/parallel interface to connect a parallel printer. The output signals are at a 34-pin port at the rear of the housing (see Chapter 1).

IMPORTANT: You must use a SHIELDED cable to attach a printer to your ROYAL PC.

Input/Output Signals

No.	Signal	Direction	No.	Signal	Direction
1	STB	OUT	18	GND	
2	DATA-1	OUT	19	GND	
3	DATA-2	OUT	20	GND	
4	DATA-3	OUT	21	GND	
5	DATA-4	OUT	22	GND	
6	DATA-5	OUT	23	GND	
7	DATA-6	OUT	24	GND	
8	DATA-7	OUT	25	GND	
9	DATA-8	OUT	26	GND	
10	ACK	IN	27	GND	
11	BSY	IN	28	GND	
12	NC		29	GND	
13	NC		30	RESET	OUT
14	GND		31	NC	
15	NC		32	GND	
16	GND		33	NC	
17	NC		34	NC	

STB	This signal is used as the strobe pulse. Negative logic, TTL level.
DATA-1 to DATA-8	These signals contain information on the first to eighth bit of the data to be transmitted in parallel. Negative logic, TTL level.
ACK	The printer returns the ACKnowledge signal to the computer, indicating that it has received data and is waiting for more.

III. Cassette Recorder Interface

The ROYAL PC has an interface to attach a cassette recorder for I/O storage. The port is located between the two video ports (RGB and BAS, left side of housing).

A cable is needed to connect the cassette recorder. If you do not want to use the remote control, you simply need the standard cable which you normally use for connecting a cassette recorder to your stereo equipment.

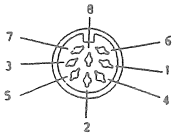
Technical Specification:

1. Method
   Mark 2400Hz
   Space: 1200Hz
   FKS modulation
2. Speed: 1200bd
3. Remote control funciton
   Using the remote control function (if present) enables the auto start/stop function.

Input/Output Signals

No.	Signal	Meaning	Direction
1.	REC	Connected to 4	
2	GND	Signal Ground	
3	MON	Connected to 5	
4	REC	Write Signal TTL Level	OUT
5	MON	Read Signal TTL Level	IN
6	REM1	Remote Control	OUT
7	REM2	Remote Control	OUT
8	GND	Signal Ground	

PIN ASSIGNMENT
(actual pins are numbered in backing)



OUTPUT SIGNALS FOR RGB 8-PIN CONNECTOR

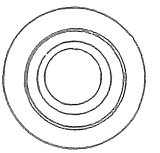
No.	Signal	Meaning	Direction
1	VDD	+ 12V	OUT
2	GND	Signal Ground	
3	BSTCLK	Color Burst Clock	OUT
4	HSYNC	Horizontal Sync.	OUT
5	VSYNC	Vertical Sync.	OUT
6	R	Video Signal(Red)	OUT
7	G	Video Signal(Green)	OUT
8.	B	Video Signal (Blue)	OUT

(1)	VDD	Power supply for TV Adaptor
(2)	GND	Signal Ground
(3)	BSTCLK	Subcarrier clock frequency, positive logic, TTL level, 3.57954MHz (NTSC). 4.43362MHz (PAL)
(4)	HSYNC	Horizontal sync. signal, negative logic TTL level
(5)	VSYNC	Vertical sync. signal, negative logic TTL level
(6)	R	Video signal , positive logic, TTL level
(7)	G	Video signal, positive logic, TTL level
(8)	B	Video signal, positive logic, TTL level

II. Monochrome Monitor Interface

The ROYAL PC has an interface for connecting a monochrome monitor. The output signals are at the jack marked BAS. You need a coaxial cable to connect the monochrome monitor to the PC.

Composite Video Signal
Positive logic, TTL Level
Composite Video Input



INPUT/OUTPUT INTERFACES

The I/O interfaces listed below have standard specifications:

Interfaces for
1. RGB monitor
2. Monochrome monitor
3. Cassette recorder
4. Printer (parallel)
5. Serial interface
6. Interface for ROM cartridges
7. Expansion bus interface (e.g. for connecting disk drives).

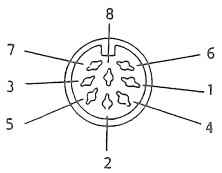
You can upgrade your system with I/O devices that are compatible with the ROYAL PC.

I. Color Monitor Interface (RGB)

The PC has an interface for connecting a color monitor. The output signals are at the 8-pin connector which you find at the left side of the housing. A special cable is needed to connect the computer to the color monitor. The pin assignment is shown on the picture below:

Note: RGB is short for Red, Green, Blue.

PIN ASSIGNMENT
(actual pins are numbered on backing)



IV. CRT Controller

The PC has the CRT controller HD46505S to display the characters and semigraphics characters on the screen.

The data codes for characters and semigraphics characters which are displayed on the screeen are stored in the Video RAM. The Video RAM is mapped at F000H to F7FFH (2 KB: see diagram E-2).

The Attribute RAM is mapped at F800H to FFFH (2KB; see diagram E-2).

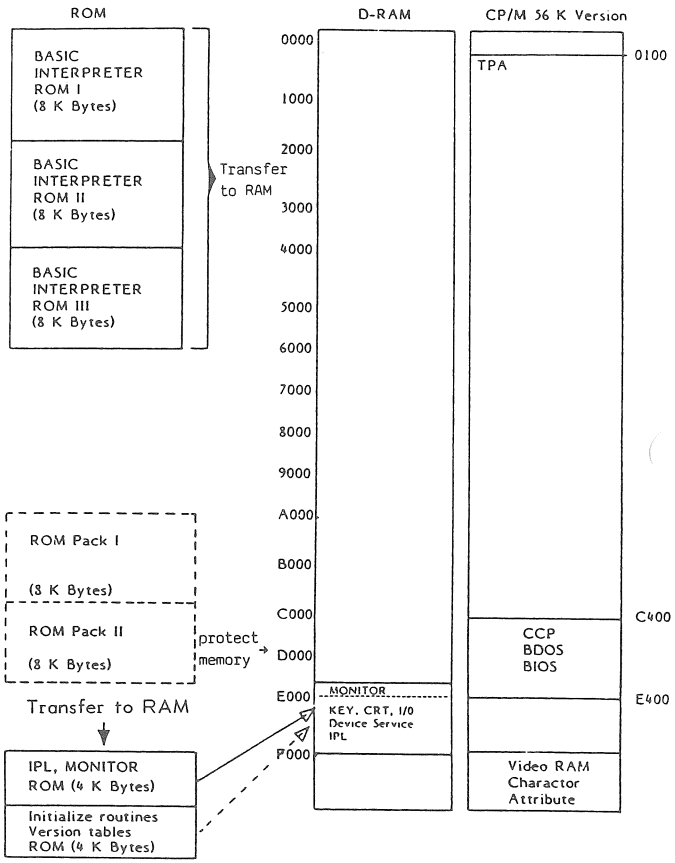
The Video RAM addresses correspond to the position of the characters and semigraphics characters on the screen. The relative adresses of the Attribute RAM correspond to that of the Video RAM.

The bit structure of the Attribute RAM is as follows:

bit	0	: Foreground color	blue
bit	1	: Foreground color	red
bit	2	: Foreground color	green
bit	3	: background color	blue
bit	4	: background color	red
bit	5	: background color	green
bit	6	: flashing	
bit	7	: inversion	

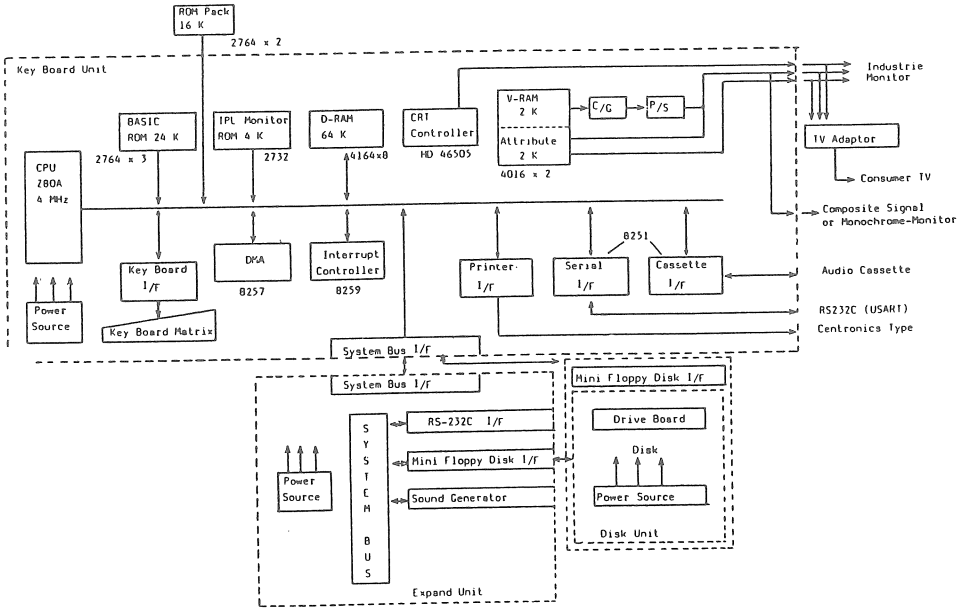
MEMORY MAP

DIAGRAM E-2



BLOCK DIAGRAM: SYSTEM CONFIGURATION

DIAGRAM E-1



**EXPANSION BUS INTERFACE*

: e.g., for connecting 2 disk drives or a module expansion box

**BUZZER*

: Piezoelectronic buzzer

**POWER SOURCE*

AC : 115V +/- 10 %, 60 Hz

**POWER CONSUMPTION*

: 25W

**ENVIRONMENTAL CONDITIONS*

Operating temperature : 6-40° Centigrade
Humidity : 20% - 80%
Storage Temp : -15 - 60° Centigrade

**DIMENSIONS*

405 (W) x 225 (D) x 75 (H) mm

**WEIGHT*

: 3.9 kg (approx.)

II. Block Diagram

: See diagram E-1.

III. Memory Address Map

: See diagram E-2.

Semi-Graphic	: 72 x 160 dot matrix
Color	: 8 different colors
Other Attributes	: flashing, inversion
Display Size	: 48 x 24
	: 80 x 24
Output	: RGB = Separate signals for color monitor. BAS = Composite signal for monochrome monitor

****KEYBOARD**

Scanning	: Software scanned
Keys	: A total of 85 keys (alphanumeric, function, numeric key pad, and 6 programmable function keys)
Key Layout	: See Appendix D

****CASSETTE INTERFACE**

Controller	: uPd-8251C-5
Modulation	: 1200 Baud, Kansas City Standard (FSK modulation 1200/2400 Hz)
Remote Function	: Relay

****UNIVERSAL SERIAL INTERFACE**

Controller	: uPD-8251C-5
Signal level	: RS 232C (program select)
Baud Rate	: 300, 600, 1200, 2400, 4800, 9600 bps (hardware select)

****PARALLEL INTERFACE**

: Centronics type compatible

****ROM-PACK INTERFACE**

APPENDIX E
TECHNICAL SPECIFICATIONS

HARDWARE SPECIFICATIONS

I. Electronic Characteristics

CPU (CENTRAL PROCESSOR UNIT)

CPU	: Z80A
Clock Frequency	: 4MHz
Reset	: Power ON. After power ON or after manual reset, the memory protect function (d000 hex.) is enabled.
Interrupt	: 2 interrupt terminals are provided on the expansion Bus.

MEMORY (ROM)

BASIC ROM	: uPD-2764D, 64K bits/chip
Capacity	: 24 bytes
Monitor ROM	: uPD-2764D, 64K bits/chip
Capacity	: 4K bytes

MEMORY (RAM)

Main Memory	: uPD-4164C-3, 64K bits/chip
Capacity	: 64K bytes

CRT INTERFACE

Controller	: HD-46505s
Video RAM	: uPD-4016C/D, 8K bits/chip.
Capacity	: 2k bytes for characters : 2K bytes for attributes
Character Font	: 8 x 10 dot matrix

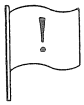
APPENDIX F
HELP SECTION

OVERVIEW

Part I: Problem Solving

PROBLEM SOLVING is devoted to correcting those problems an operator may encounter with the ROYAL PC. PROBLEM SOLVING is arranged alphabetically by component.

IMPORTANT:



* Often a problem which seems to be located in one part of the computer system is really a combination of problems in different components. Therefore, if you need to consult your dealer about a problem, you are urged to bring the ROYAL PC, cabling, and symptomatic peripheral with you.

* Do not open your ROYAL PC, as this will void your Warranty.

Part II: Service Information

SERVICE INFORMATION lists the addresses and phone number you will need if your ROYAL PC or a ROYAL peripheral requires servicing beyond that available from your local ROYAL dealer.

Part III: Suggestions for Reading

SUGGESTIONS FOR READING includes a few of the many books you may enjoy as you learn about your ROYAL PC.

PART I: PROBLEM SOLVING

Preliminary Checklist

If you have a problem with your ROYAL PC system, review the following checklist first. If you cannot correct the problem using this Preliminary Checklist, proceed to the checklist for the specific component.

1. Review Chapter 1 in this manual, or the assembly instructions in a peripheral manual.

2. Check power plugs and connector cables: Are all connections CORRECTLY attached and SECURE?

3. Be sure wall sockets have power: Will a lamp or appliance work off the outlet?

4. Quickly turn device off and on.

5. If the problem persists, proceed to the appropriate checklist below.

Cassette Recorder Checklist

LOAD AND SAVE PROBLEMS. Some recorders, in particular high fidelity recorders, do not work well as data recorders. If the following measures do not correct the problem, you may need to use a different cassette recorder.

1. Adjust the volume setting (up or down from midrange).

2. Insert a different cassette.

3. Make sure the correct side of the cassette is inserted.

4. Be sure the tape is correctly rewound, and is past the clear leader.

5. Inspect the recording heads: Do they need a cleaning?

Computer Checklist

ERROR MESSAGES. Error messages under the ROM BASIC Interpreter or BASIC 80 are explained in the back of the *BASIC 80 MANUAL*. Error messages under applications programs are explained in the corresponding user manuals.

KEY FAILURE. If a key fails to produce the expected character on the screen, DO NOT TRY TO REMOVE THE KEY. This will void your Warranty.

1. If you are trying to type a GRAPHICS CHARACTER, you must be working under the ROM BASIC Interpreter. If you are operating under BASIC 80 (that is, with a disk drive), consult the Graphics keyboard charts in APPENDIX E (KEYBOARD LAYOUTS). When you have located the desired character, note the corresponding ASCII Code (#). To display that character, type

   <print CHR$ #><CR>

2. If this is not the problem, mark ALL problem keys. (Masking tape works well.) Then contact your dealer.

POWER LIGHT OFF. If you see no Power Light when you turn on your ROYAL PC, consult the PRELIMINARY CHECKLIST on the previous page. If you still have no power, contact your dealer.

UNABLE TO LOAD ROM BASIC. To access the ROM BASIC Interpreter or a ROM-Pack, you must *turn off your disk drive (rear switch),* then push the RESET BUTTON. (To load RAM, the IPL first searches for a disk, then a ROM-Pack; if neither is available, the IPL loads ROM BASIC.)

UNABLE TO LOAD ROM-PACK. Review the previous paragraph, "Unable to Load ROM BASIC." Then check for the following problems:

1. Be sure the ROM-Pack label is facing you.

2. If the pins appear to be bent, consult your ROYAL dealer. DO NOT TRY TO STRAIGHTEN BENT PINS!

Disk and Disk Drive Checklist

BOOT PROBLEM. If a disk does not boot, but the power lights on your ROYAL PC and disk drive F1 are glowing, consider the following:

1. Check the basics:
   * Be sure cables are securely connected.
   * Check that the cardboard insert has been removed from the drive.
   * Be sure the drive lever is down.
2. Check that you are working off the default drive (see Chapter 4).
3. Check your disk:
   * Be SURE it includes the operating system. Try adding CP/M with SYSCOPY.
   * Check that the disk is not upside down. The label should be face up and toward you.
   * Be sure the disk has been formatted for the ROYAL PC.
4. Do the drive heads need to be cleaned? Use a disk drive head cleaner kit.

COPY PROBLEM. If a disk will run but not copy, you may have a disk that is COPY PROTECTED - and you *can't* copy it. However, check the following:

1. Review the procedures for DISKCOPY, FILECOPY, or MENU!'s COPY command. Are you following these procedures EXACTLY? You are most likely to err with DISKCOPY, which has a more complex format.
2. If your drive heads need cleaning, use a disk drive head cleaner kit.

NOISES. A disk drive should make some noise. However, if your drive has developed new sounds, contact your dealer. Do not risk your disks!

POWER LIGHT OFF. No Power Light when you turn on your disk drive may indicate a cable problem. Carefully review the PRELIMINARY CHECKLIST (page F-2) before contacting your dealer.

Modem Checklist

BAUD RATE. The BAUD RATE on your ROYAL PC has been pre-set to 300. At this setting, your modem and telecommunications program or service must ALL be running at a baud rate of 300. Check the user's manuals for specifics about your modem and software.

Some telecommunications services run at a baud rate of 1200. To switch to a baud rate of 1200, you must use hardware set at 1200. DO NOT ATTEMPT TO RESET YOUR ROYAL PC'S BAUD RATE. If you open your computer, you will void your Warranty. Return your ROYAL PC to your dealer to have the baud rate re-set.

Monitor Checklist

NO CURSOR. If your display is on, but you see no cursor, carefully review the PRELIMINARY CHECKLIST (page F-2) before contacting your ROYAL dealer. You may have a problem with your monitor, cable, or ROYAL PC.

LIGHT OFF. If you see no Power Light when you turn on your monitor, be sure you have checked the PRELIMINARY CHECKLIST carefully before contacting your ROYAL dealer.

NO PICTURE. See LIGHT OFF, above.

POOR PICTURE. Carefully check the fine tuning adjustments on your monitor, and the cable connections. If you return your monitor for evaluation, be sure to bring along the cable.

Printer Checklist

PRINTER CABLE DOESN'T FIT. Check that you are not confusing parallel/Centronics with serial/RS232!

1. *Centronics/Parallel Printer.*
   * Be sure to use the parallel port (Centronics) on your ROYAL PC (see Chapter 1).

   * Check that your shielded cable matches the specifications in Appendix E.

2. *RS232/Serial Printer.*
   * Be sure to use the serial (RS232) port on your ROYAL PC (see Chapter 1).

   * Check that your cable ends are identical and your shielded cable matches the specifications in Appendix E.

3. If you need to see your printer dealer, bring along Appendix E (specifications).

PRINTING INCORRECT OR INCOMPLETE. Your printer may not be equipped to print the desired characters. First, examine the print wheel (daisywheel printer) or print test (dot matrix printer) to be sure the desired character is possible. Then proceed:

1. *Centronics/Parallel Printer.* Examine your printer cable as outlined above. You may have an incorrect cable which must be returned.

2. *RS232/Serial Printer.* If your printer is not printing at all, your ROYAL dealer can activate your RS232 port. DO NOT TRY TO OPEN YOUR ROYAL PC.

3. *RS232/Serial Printer..* Determine whether the baud rate on your printer is 300 or 1200. If your printer baud rate is 1200, your ROYAL dealer can reset your PC baud rate to 1200. DO NOT TRY TO OPEN YOUR ROYAL PC.

POWER LIGHT OFF. If your printer has a power light, it should light up as soon as you switch on your printer. Review the PRELIMINARY CHECKLIST (page F-2).

1. Remove all packing material from the printer. Double check around the print head and print head rails on letter quality printers.

Television Set Checklist

NO POWER LIGHT OR NO DISPLAY. If you know your TV set has been working fine otherwise, first check the PRELIMINARY CHECKLIST (page F-2) carefully, and review the installation instructions for your TV Adaptor.

1. Be sure the Switchbox is set to "COMPUTER."

2. Be sure the Switchbox leads are attached to the VHF antenna terminals.

3. If you still have no display, you may need a new TV Adaptor or Switchbox. Contact your dealer.

POOR DISPLAY. Your screen's clarity should be comparable to its clarity as a TV set.

1. Try both channel 7 (TV) with the "L" setting (TV Adaptor) and channel 8 with the "H" setting. Be sure you are using ONLY channels 7 or 8, and ONLY with the correct TV Adaptor setting.

2. If your TV has an AFT switch (Automatic Fine Tuning), try switching it OFF (or ON).

3. Try each of 1. and 2. while adjusting the Fine Tuning.

4. Be sure you have secured the Grounding Wire (TV Adaptor) to the ROYAL PC.

5. Check to see that the Switchbox leads are securely attached to the VHF antenna terminals.

6. Be sure you are using only 40 column software (*not* 80 column) with your adapted TV set.

7. Rearrange the use of your wall outlets: Try your ROYAL PC from different outlets, or unplug appliances that may be sharing the same electrical line.

Part II: Service Information

If you need assistance with your ROYAL PC or peripheral beyond that which is available from your ROYAL dealer, it is suggested that you call the following number and talk to a ROYAL Product Support Specialist:

(203) 688-4977

Should you need to return your ROYAL PC or a ROYAL peripheral to a service facility, remember to pack the machine in its original carton and packing materials. (Additional packing materials may be purchased from Royal Business Machines.) Shipment in non-ROYAL packing will void your warranty. All shipments must be *freight prepaid and insured.* If you need the location of the ROYAL service facility nearest to you, call the number listed above.

Written questions about your ROYAL PC system should be addressed to the following address:

ROYAL BUSINESS MACHINES, INC.
550 Marshall Phelps Road
Windsor, CT 06095
Attn: Product Support Center A495

IMPORTANT: Be sure to keep your ROYAL Warranties in a safe place, and to review your Warranties before making service inquiries.

Part III: Suggestions for Reading

The following books are recommended if you want to know more about your CP/M operating system, the Z80 microprocessor, applications software, or programming.

Understanding CP/M

CP/M Bible
Waite
Howard W. Sams & Co, Inc.
Indianapolis, IN

Soul of CP/M
Waite
Howard W. Sams & Co., Inc.

The CP/M Handbook
Zaks
Sybex, Inc.
Berkeley, CA

The Z80 Microprocessor

Z80 Microcomputer Handbook
Barden
Howard W. Sams & Co., Inc.

Z80 Users Manual
Carr
Reston Publishing Company, Inc.
Reston, VA

Applications Programs

The Best of CP/M Software
Miller
Sybex, Inc.

Using Computer Information Services
Williams and Sturtz
Howard W. Sams & Co., Inc.

Introduction to Word Processing
Glatzer
Sybex, Inc.

Introductory Programming

BASIC Programming Primer (2nd ed.)
Waite and Pardee
Howard W. Sams & Co., Inc.

BASIC for Home Computers
Albrecht, Finkel, and Brown
J. Wiley & Sons
New York, N.Y.

Microsoft BASIC (2nd ed.)
Knecht
dilithium Press
Beaverton, OR

Your First BASIC Program
Zaks
Sybex, Inc.

Introduction to Pascal
Zaks
Sybex, Inc.

Pascal With Your BASIC Micro
Rushton
Howard W. Sams & Co., Inc.

Intermediate Programming

Beyond Beginning BASIC
Vickers
dilithium Press

Microsoft BASIC and Its Files
Boisgontier and Ropiequet
dilithium Press

Executive Programming with BASIC
X. T. Bui
Sybex, Inc.

GLOSSARY

VERSION 1.1

GLOSSARY

ASCII	The acronoym for American Standard Code for Information Interchange: a 6- or 7-BIT code to represent character DATA (letters, digits, punctuation) and placement (space, tab, backspace, etc.)
APPLICATIONS PROGRAM	A PROGRAM to use the computer to perform a specific task (e.g., word processing, graphics). Compare with UTILITY PROGRAM.
ASSEMBLER	A language translator to process an assembly language program into machine language (MACHINE CODE).
BASIC	Beginner's All-Purpose Symbolic Instruction Code. A high-level language designed for programming novices, but now widely used in writing commercial SOFTWARE. Microsoft BASIC, the most popular version of BASIC, is available in three versions for the ROYAL PC: ROM BASIC, BASIC 80 (disk), and MBASIC (disk option).
BAUD RATE	The speed of SERIAL communications, in BITs per second, from one part of the computer system to another.
BINARY	Referring to the base 2 number system, using only 0s and 1s.
BIT	Short for BInary digiT (0 or 1): the smallest unit of information.
BOOT	To LOAD the OPERATING SYSTEM into RAM from the DISK. COLD BOOT: when the computer has been off. WARM BOOT: when the computer has been in use. Compare with LOAD.
BUG	An error in a computer PROGRAM.
BUS	Circuitry for the transfer of DATA or electrical signals between two components of a computer system.

CABLE	A bundle of insulated wires through which electric current is passed.
CENTRONICS	A term often used interchangeably with PARALLEL. Compare with SERIAL.
CHIP	Technically, a piece of silicon onto which an INTEGRATED CIRCUIT is built. Often used synonomously with INTEGRATED CIRCUIT. RAM, ROM, and MICROPROCESSORS are all chips.
COMPILER	A language translator that reads a HIGH LEVEL LANGUAGE, translating an entire PROGRAM before EXECUTing it. Compare with INTERPRETER.
CONTROL CODE	A code understood by the OPERATING SYSTEM to execute a lengthy command. The operator uses control codes within ESCAPE SEQUENCEs.
CP/M	The OPERATING SYSTEM called Control Program for Microcomputers. The ROYAL PC operates under CP/M.
CPU	CENTRAL PROCESSING UNIT, the "brain" of a computer.
CRT	CATHODE RAY TUBE. The display tube in a MONITOR.
CURSOR	The position indicator on a display screen (where the next INPUT or OUTPUT will appear).
DATA	Information coming into or out of a computer.
DESTINATION	Designating the DISK or PERIPHERAL to which DATA are being sent.
DIRECTORY	The list of all FILEs on a DISK, generated by the OPERATING SYSTEM.
DISK	A round piece of mylar-coated (magnetic) plastic, covered by a protective paper envelope, used to store DATA and PROGRAMs. Also called a floppy DISK or DISKette.

DISK DRIVE	A PERIPHERAL device to read, write, and copy information on a DISK.
ESCAPE SEQUENCE	A CONTROL CODE preceded by an Escape Code, alerting the computer to perform a specified command.
EXECUTE	To perform the specified operation(s) in a PROGRAM or instruction.
FILE	A collection of DATA or a PROGRAM stored with a FILEname on a DISK.
FORMAT	To prepare a blank DISK to receive information by dividing up its surface into TRACKs and SECTORs. (Also called "initialize.")
FIRMWARE	The components of a computer system containing PROGRAMs permanently stored in READ-ONLY MEMORY (ROM) or ROM-Packs.
HARDWARE	The electrical or mechanical devices of a computer and its PERIPHERALs.
HEXADECIMAL	The designation of numbers in terms of powers of 16, using the digits 0 to 9 and A to F. Hexadecimals can be easily translated into BINARY form, as each hexadecimal digit corresponds to a four BIT sequence.
HIGH LEVEL LANGUAGE	One of the programming languages that resemble human speech. Compare with LOW LEVEL LANGUAGE.
INPUT	Information fed into the computer from an INPUT/OUTPUT DEVICE (e.g., keyboard, MODEM, DISK DRIVE).
INPUT/OUTPUT DEVICE	Any device used to INPUT or OUTPUT DATA to a computer (e.g., printer, DISK DRIVE, DISK, keyboard, ROM-PACK, cassette recorder).
INTEGRATED CIRCUIT	The electronic component of diodes, transistors, capacitors, etc., mounted on a small piece of semi-conducting material, characteristic of microcomputers. See CHIP.

INTERFACE	The circuitry by which one HARDWARE component communicates with another in a computing system.
INTERPRETER	A language translator that reads a HIGH LEVEL LANGUAGE and carries out the PROGRAM line by line. Compare with COMPILER.
IPL	Initial Program Loader. A built-in program that starts the computer. The ROYAL PC IPL first examines the DISK DRIVE, then the ROM-PACK. If both are empty, the IPL loads ROM BASIC.
KBYTE	A kilobyte: 1024 BYTEs (2^{10} BYTEs) (Thus, 64K BYTEs is 65,536 BYTEs.)
LOAD	To place a copy of a FILE (from a DISK or cassette tape) into the computer's RAM. Compare with BOOT.
MACHINE CODE	The bit patterns directly read by a computer as programming instructions. Compare with SOURCE CODE.
MBASIC	See BASIC.
LOW LEVEL LANGUAGE	A programming language that can be read by the computer, and does not resemble human speech. Compare with HIGH LEVEL LANGUAGE.
MEMORY	INTEGRATED CIRCUIT CHIPs that hold information, either permanently (ROM) or temporarily (RAM) in a computer.
MENU	A list of choices presented by a PROGRAM onto the display screen.
MICRO-PROCESSOR	The INTEGRATED CIRCUIT CHIP that functions as the CPU.
MODEM	MOdulator/DEModulator: the INPUT/OUTPUT DEVICE that allows a computer to receive and transmit information via telephone lines.

MONITOR	A TV-like computer display with higher resolution than a TV set. A PROGRAM to inspect and change specific RAM memory locations.
OPERATING SYSTEM	SOFTWARE that maintains operation of the computer system, especially the handling of DISK FILEs.
OUTPUT	Information transferred from a computer to an INPUT/OUTPUT DEVICE (e.g., printer, DISK DRIVE).
PARALLEL	Characterized by the simultaneous transmission of 8 BITs of information from one computer device to another. PARALLEL INTERFACEs are often CENTRONICS interfaces. Compare with SERIAL.
PERIPHERAL	Any INPUT/OUTPUT DEVICE connected into a computer system (e.g., DISK DRIVE, printer).
PORT	The point of CABLE connection in computer HARDWARE.
PROGRAM	A set of instructions for a computer conforming to the conventions of a particular PROGRAMming language.
RAM	Random Access Memory. Sometimes called Main Memory, User Memory, Volatile Memory. A temporary MEMORY whose contents can be accessed randomly (and therefore quickly).
RESET	A mechanism to interrupt or re-start a computer. Usually a RESET button.
RGB	Red-Green-Blue. A designation for a kind of color MONITOR.
RS232	The industry standards for SERIAL INTERFACEs in DATA transmission.
ROM	Read Only Memory. A permanent MEMORY of PROGRAMs, DATA, language translators, etc. stored in the computer or in cartridges such as ROM-PACKS.

ROM BASIC	See BASIC.
ROM-PACK	In the ROYAL PC, a ROM cartridge containing an APPLICATIONS PROGRAM.
SCROLL	To advance or go back one or more lines on the display screen.
SECTOR	A section of BYTES within a TRACK on a FORMATted DISK. A ROYAL PC-formatted DISK contains 256 BYTEs per SECTOR, 16 SECTORs per TRACK.
SERIAL	Characterized by the sequential transmission of BITs of information in a computer system. Used interchangeably with RS232. Compare with PARALLEL.
SOFTWARE	The components of a computer system that control the behavior of the computer. Synonomous with PROGRAMs. Compare with HARDWARE and FIRMWARE.
SOURCE CODE	Any HIGH LEVEL LANGUAGE. SOURCE CODE PROGRAMS must be processed by a COMPILER or INTERPRETER. Compare with MACHINE CODE.
SOURCE DISK	In a ROYAL PC system with a DISK DRIVE, the DISK containing the CP/M OPERATING SYSTEM, system UTILITY PROGRAMs, and MBASIC (Microsoft BASIC on DISK).
SYNTAX	The rules governing the structure of statements in a PROGRAM or programming language.
UTILITY PROGRAM	A PROGRAM commonly used by APPLICATIONS PROGRAMs within the computer system. Examples include DISKCOPY, PCFORM (formatting), and MENU! Compare with APPLICATIONS.
WILD CARD	A CP/M convention that allows the computer to search for a number of FILEs simultaneously.
WILDCARD	A MENU! convention that allows the computer to search for a number of FILEs simultaneously.

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