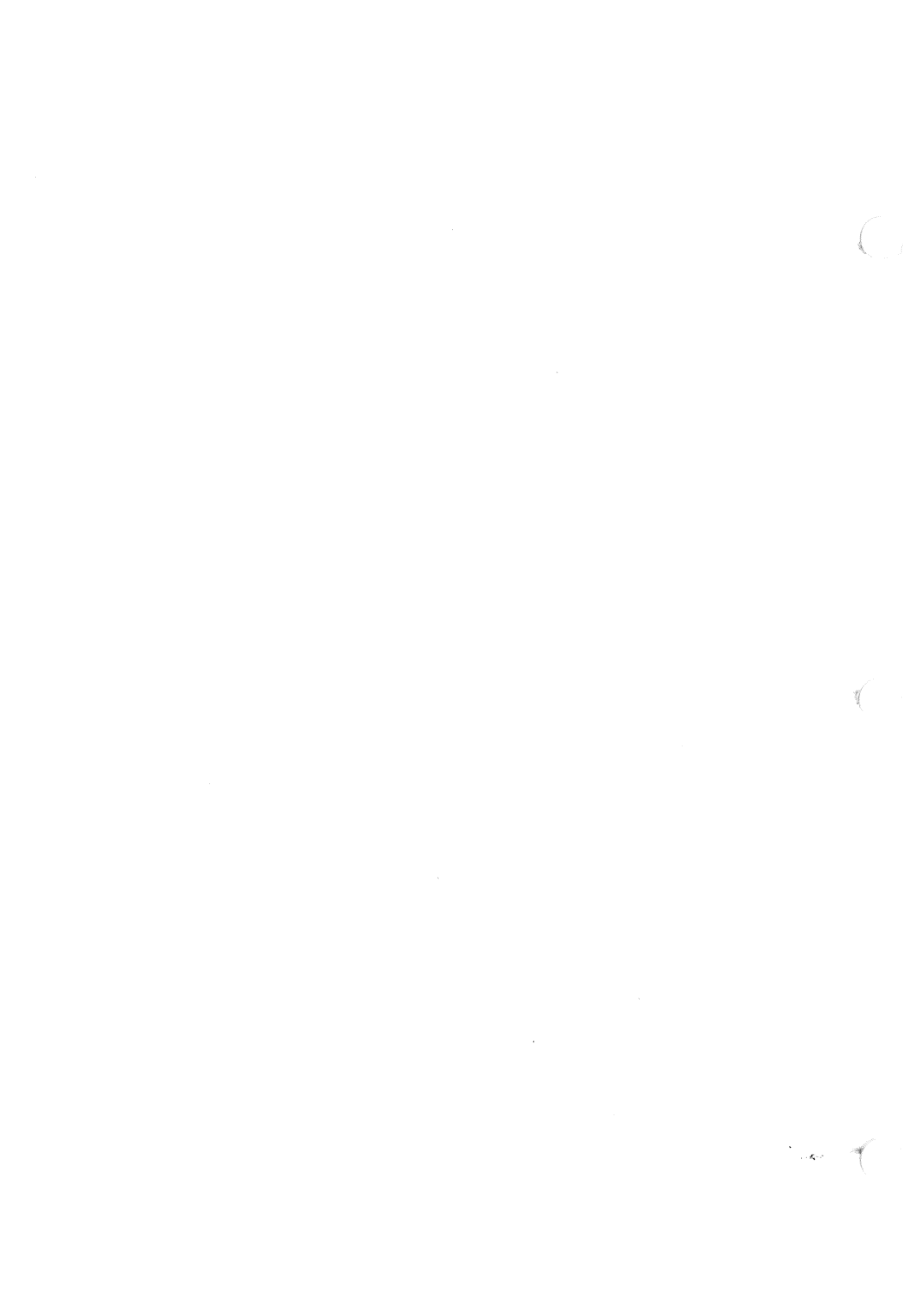# ROYAL
Alphatronic PC
System Handbook

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.

TABLE OF CONTENTS

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)

ROM-PACK
INSERT

ON/OFF COMPUTER
LIGHT

KEYBOARD

VIDEO PORT
*(for RGB monitor
or home TV)*

CASSETTE PORT
*(for cassette
recorder)*

BAS VIDEO PORT
(for monochrome monitor)

(rear and right-hand side)

ON/OFF
SWITCH

RESET
BUTTON

DISK DRIVE
PORT
(+ port shield)

SERIAL
PORT

AC
INLET

CENTRONICS
PORT
(+ port shield)
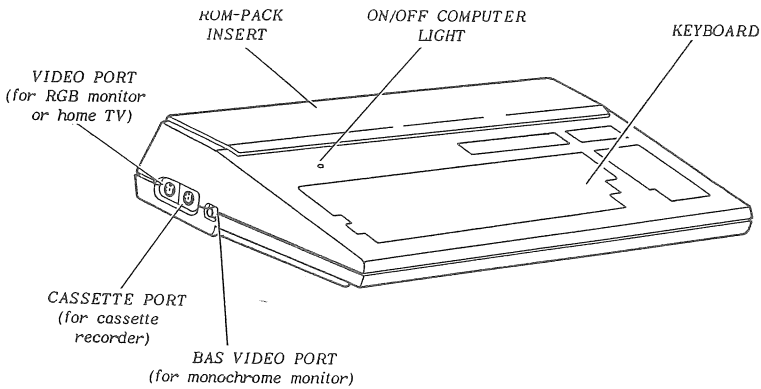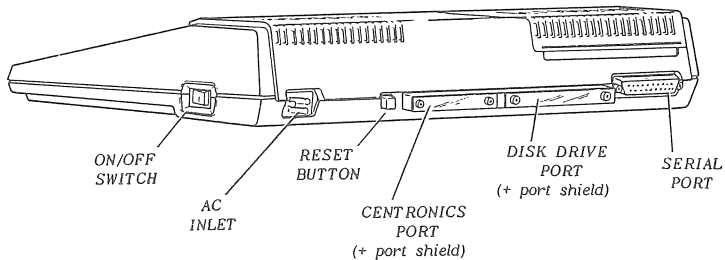
PERMANENT ROYAL PC INSTALLATIONS

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)

DRIVE LIGHT

DRIVE SLOT

ON/OFF
LIGHT

DRIVE
LEVER

(rear view)

ON/OFF
SWITCH

DC POWER PORT
*(to connect
optional 2nd disk drive)*

AC
INLET

SIGNAL
CABLE PORT
*(to connect optional
2nd disk drive)*
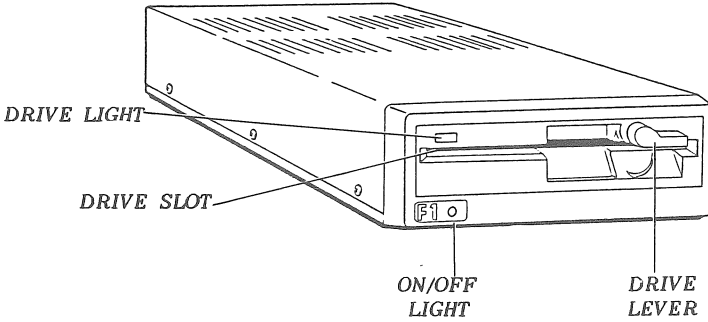
CONNECTING
PORT (to PC)
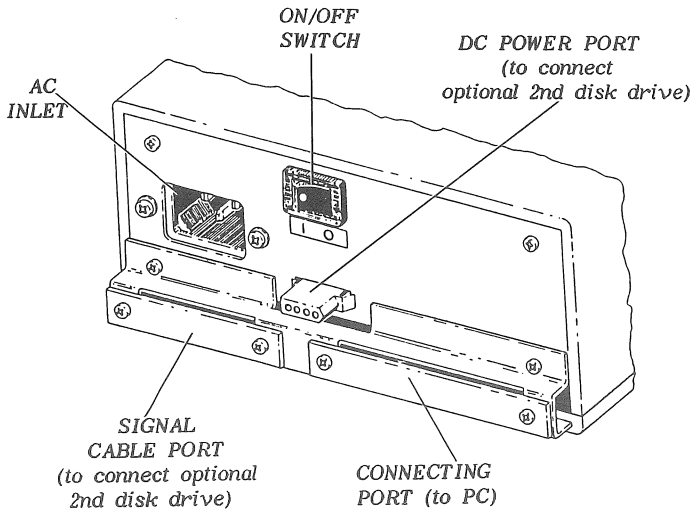
DISK DRIVE (continued)

CONNECTING CABLE

(between Disk Drive and ROYAL PC)

TOP RIDGES   TOP RIDGES

CONNECTING SCREWS
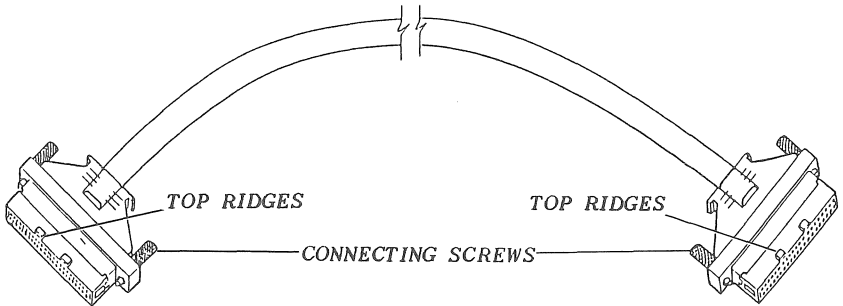
DISK DRIVE AND CONNECTING PORTS

EYELET   NOTCHES   EYELET

PORT PINS
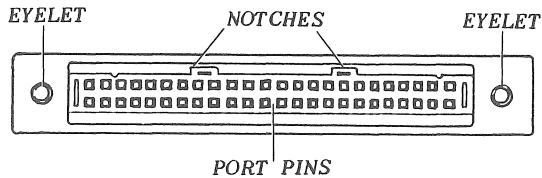
Installation of Disk Drive

1. PORTS. The ports for the connecting cable are
   <u>keyed</u> (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)

'8-PIN CONNECTOR
(to PC)

CONNECTORS
TO CASSETTE PLAYER
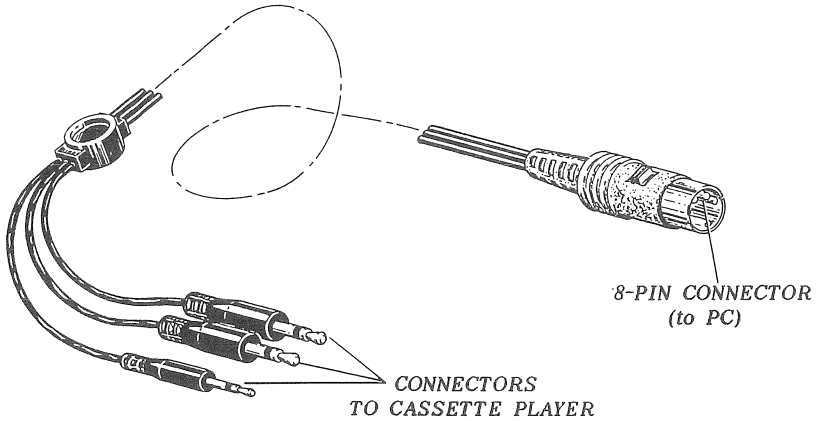
Installation of Cassette Recorder

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)
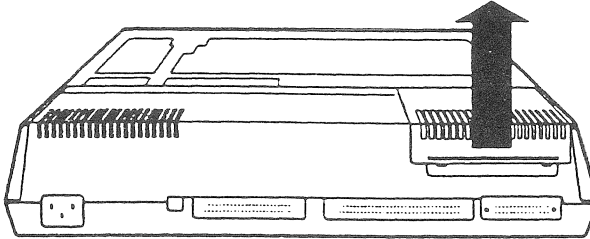
Lifting from the back,
pull up on the ROM-Pack cover of the ROYAL PC.
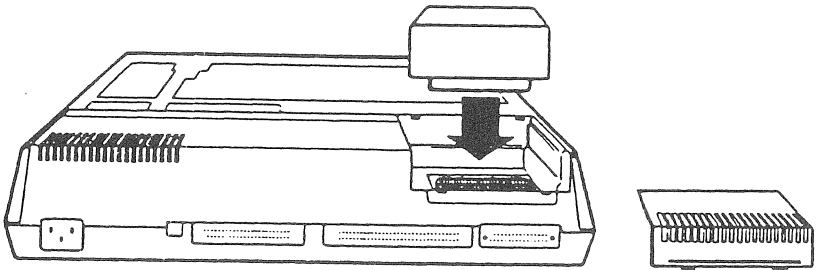
Insert ROM-Pack (label toward you) until it
fits SECURELY. Replace ROM-Pack cover,
beginning with the front edge.

RGB or MONOCHROME MONITOR

Monitor Cable Ports on ROYAL PC

RGB VIDEO PORT
(for RGB Monitor)

BAS VIDEO PORT
(for Monochrome Monitor)
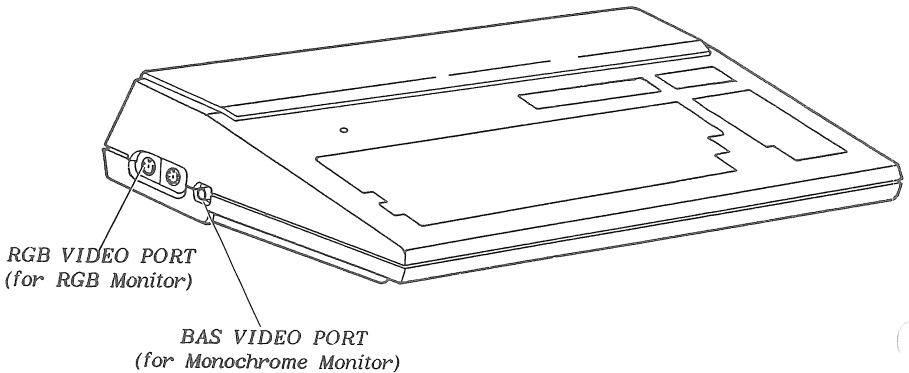
Installation of Monitor

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

ROYAL   *TV*   *TV ADAPTOR*   *SWITCH*   *TV*
PC ←—— *ADAPTOR* ←—— *CABLE* ——→ *BOX* ——→ *SET*
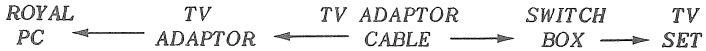
TV Adaptor

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

COMPUTER CABLE
(to ROYAL PC)

GROUNDING WIRE
(to ROYAL PC)

TV ADAPTOR
SWITCH

CABLE PORT
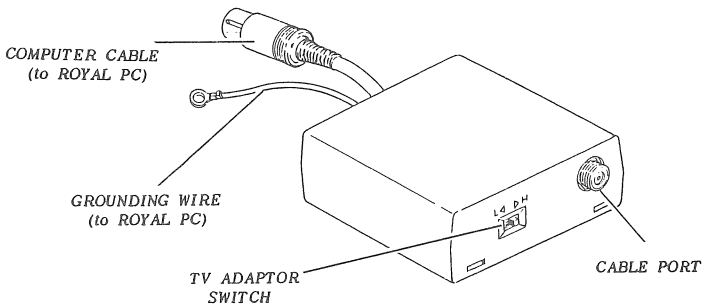
TV Adaptor Port:

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

DISK: THIS SIDE UP

Manufacturer's Label

Notch that write-enables the disk

Read-Write Slot

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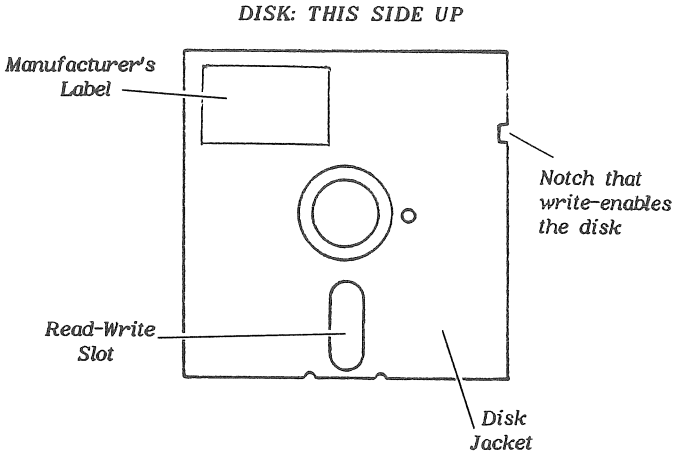
To avoid possible damage to your disks, be
sure to following these procedures:

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   *MICROSOFT BASIC VERSION x.xx*
the top left of the   *COPYRIGHT (c) 198x BY MICROSOFT*
keyboard. You will hear a   *xxxxx BYTES FREE*
beep and see this display: *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).

HELP *If your ROYAL PC does not respond 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.
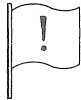
2.3 ADDING ROM-PACKS

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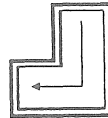
   As a rule, <CR> or "hit the carriage
   return," enters your input into the ROYAL
   PC's RAM, and drops your cursor to the
   beginning of the next line. In most cases,
   you will see your input appear right away
   on your screen. And you can change it
   easily, as you will soon discover.

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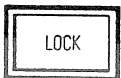
SHIFT LOCK. Locate the LOCK Key above the
left SHIFT Key. Notice that an amber LOCK
light comes on when this key is depressed.
To release the LOCK Key, depress it again
(and the light goes off).

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

GRAPH

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
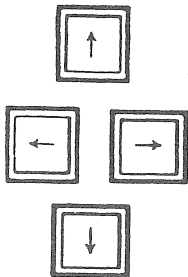
Along the bottom of your keyboard are four
keys marked with arrows. These CURSOR
Keys move the cursor one or more spaces in
the indicated directions. (If a CURSOR
Key is held down longer than one second,
the cursor will move more than one space.)
Using the CURSOR Keys, you can locate an
error and "strike 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.)
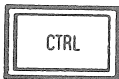
CONTROL KEYS. On the left of your keyboard is a key labeled CTRL. This CONTROL Key is ALWAYS used in conjunction with another key (just as you use the SHIFT key) to perform a special function on your ROYAL PC. There are a number of CONTROL Key functions built into your ROM BASIC system. The most commonly 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.
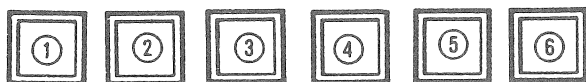
In addition, you will use these keys with
various software commercial software (as
explained in the software manuals).

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,"1print"><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.

Console

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:

<center><console 0,14> <CR></center>

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:

<center><console 0,14,0> <CR></center>

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:

<center><console 0,14,0,0></center>

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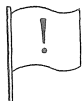
6. *STOP BUTTON.* If your cassette player has
   not stopped (some will; some won't),
   press the STOP BUTTON on the recorder.

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.

HELP
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.
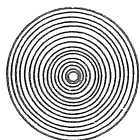
double sided disk
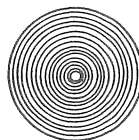
40 tracks   *40 tracks*

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.)

16 sectors per track
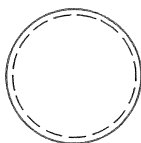
256 bytes per sector (128 bytes per block)

2 blocks per sector

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.

<div align="center">*****PCFORM*****</div>

SCREEN   A>

TYPE   <pcform><CR>

SCREEN   PCFORM PROGRAM   Version x.x
          COPYRIGHT by TA   (date)

          Which Drive (A..D)?____   *("A..D" means "A <u>through</u> 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)

<div align="center">****************</div>

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    RRRRRRRRRRRRRRRRRRRRR   (reading CP/M for new disk)
          Function Complete
          Destination Drive Name (or <CR> to reboot)

TYPE      <a>                      (using A: drive)


SCREEN    Destination on A, then type <CR>

TYPE      <CR>                     (insert new disk, then <CR>)


SCREEN    WWWWWWWWWWWWWWWWWWWWW   (writing CP/M on new disk)
          Function Complete
          Destination Drive Name
          (or <CR> to reboot)

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 <u>not</u> 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   (unless you are using
   DISK IN DRIVE A   AUTO with a program on
   THEN ENTER <CR>   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:

AO=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.

AO=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 AO= 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.

<p style="text-align:center">***************</p>

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=

<p style="text-align:center">***************</p>

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:

<div align="center">***************</div>

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=

<div align="center">***************</div>

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:

<div align="center">***************</div>

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=

<div align="center">***************</div>

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.

AO=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

****

AO=⟨run⟩⟨CR⟩

AO: 1= DEMO .COM   2= INV83 .COM   3= ML   .COM
AO: 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

AO=<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

AO=<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 [$] option
(AO=run [$]) 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.

AO=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).

<p align="center">***************</p>

AO= ⟨space⟩⟨CR⟩

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

AO=

<p align="center">***************</p>

AO=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
AO= 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.

THIS SOFTWARE IS PUBLISHED AND SOLD WITH NO
COMMERCIAL USE OF ANY KIND INTENDED OR IMPLIED.

By initiating the use of this software, the user
agrees to accept this software "as is" as furnished.
No other terms are implied.

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

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.

Rectangular
Drive Light

Disk Drive
Slot
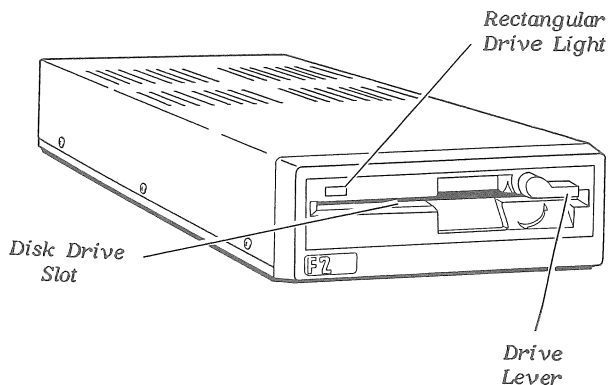
Drive
Lever

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).

DC Power Port

Signal Cable Port

DISK DRIVE (Rear View)

DISK DRIVE SIGNAL CABLE

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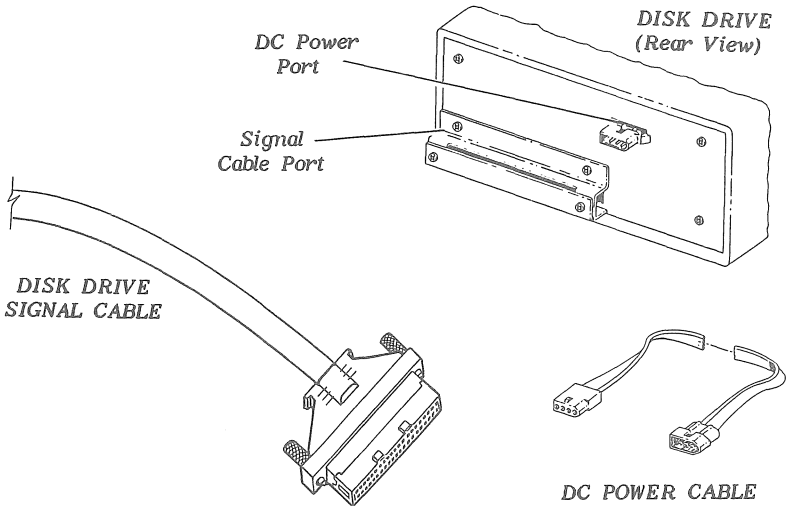
IMPORTANT: Before installing your F1 drive, be sure to disconnect your F1 drive from the wall socket, and turn off your ROYAL PC.

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>

HELP
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

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

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   *Cursor home*
(1B,48)   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 O, 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.

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   *Erases rest of line*
(1B,4B)

1B,1A   *Cursor moves right*
(1B,43)

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   *Cursor down*
(0A)   The cursor moves down one line, same
           column.

1B,43   *Cursor right*
(1B,1A)   The cursor moves one column to right.

1B,44   *Cursor left*
(08)   The cursor moves one column to left.

1B,45   *Erases screen (ES)*
(0C)   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   *Erases rest of line (EOL)*
(1B,19)   The line containing the cursor is
             erased from the current cursor position
             to the end.

1B,48   *Cursor Home*
(1B,11)

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.

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

GOTO	COLOR	PRINT	LIST	EDIT	RUN

+	−	=

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | − | ^ | BREAK | GRAPH |

7	8	9

CTRL | q w e r t y u i o p @ [| HOME

| 4 | 5 | 6 |

LOCK | a s d f g h j k l ; :]

| 1 | 2 | 3 |

SHIFT | \ z x c v b n m , . / | SHIFT | TAB

| 0 |

↑ ← → ↓ DEL

| · |

---

71 66 32	76 84 32	73 84 32	75 32	65 32	67 13

43	45	61

49	50	51	52	53	54	55	56	57	48	45	94	

55	56	57

| 113 | 119 | 101 | 114 | 116 | 121 | 117 | 105 | 111 | 112 | 64 | 91 | 11 |

| 52 | 53 | 54 |

| 97 | 115 | 100 | 102 | 103 | 104 | 106 | 107 | 108 | 58 | 59 | 93 | 13 |

| 49 | 50 | 51 |

| 92 | 122 | 120 | 99 | 118 | 98 | 110 | 109 | 44 | 46 | 47 | 9 |

| 48 |

| 30 | 29 | 32 | 28 | 31 | 127 |

| 46 |

Translation Table

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	a
{ [	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
X + / +	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

GOSUB	LOCATE	INPUT	KEY	AUTO	CONT

*	/	✦

| ! | " | # | $ | % | & | ´ | (|) | — | = | ⌐ | BREAK | GRAPH |

| CTRL | Q | W | E | R | T | Y | U | I | O | P | ` | { | CLEAR |

| LOCK | A | S | D | F | G | H | J | K | L | + | * | } | ← |

| SHIFT | I | Z | X | C | V | B | N | M | < | > | ? | SHIFT | TAB |

| ● | ■ | ▨ | ○ | INS |

71 66 32	76 84 32	73 84 32	75 32	65 32	67 13

42	47	231

33	34	35	36	37	38	39	40	41	95	61	126

224	234	225

| 81 | 87 | 69 | 82 | 84 | 89 | 85 | 73 | 79 | 80 | 96 | 123 | 12 |

| 232 | 230 | 233 |

| 65 | 83 | 68 | 70 | 71 | 72 | 74 | 75 | 76 | 43 | 42 | 125 | 13 |

| 226 | 235 | 227 |

| 124 | 90 | 88 | 67 | 86 | 66 | 78 | 77 | 60 | 62 | 63 | 9 |

| 228 |

| 237 | 238 | 32 | 239 | 236 | 18 |

| 229 | 13 |

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
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	

ROM BASIC
graph - no shift

GOTO	COLOR	PRINT	LIST	EDIT	RUN

BREAK GRAPH

CTRL · HOME

LOCK

SHIFT · SHIFT TAB

DEL

71 32	67 82 32	80 84 32	76 32	69 32	82 13

223 11	223 13	223 29

223 17	223 18	223 19	223 20	223 21	223 22	223 23	223 24	223 25	223 16	223 13	223 158		

223 23	223 24	223 25

223 241	223 247	223 229	223 242	223 244	223 249	223 245	223 233	223 239	223 240	223 128	223 155	11

223 20	223 21	223 22

223 225	223 243	223 228	223 230	223 231	223 232	223 234	223 235	223 236	223 27	223 26	223 157	13

223 17	223 18	223 19

223 156	223 250	223 248	223 227	223 246	223 226	223 238	223 237	223 12	223 14	223 15	9

223 16	

30	29	223	28	31	223 255

223 14	13

Translation Table

MAIN KEYBOARD KEY	ASCII	IMAGE	KEY	ASCII	IMAGE	KEY	ASCII	IMAGE	NUMERIC KEYPAD KEY	ASCII	IMAGE
ESC			P	223_{240}	♥	M	223_{237}	●	x +	223_{11}	
! 1	223_{17}		` @	223_{128}		< ,	223_{12}		÷ −	223_{13}	
" 2	223_{18}		{ [	223_{155}		> .	223_{14}		=	223_{29}	
# 3	223_{19}		CLEAR HOME	11		? /	223_{15}		7	223_{23}	
$ 4	223_{20}		LOCK			SHIFT			8	223_{24}	
% 5	223_{21}		A	223_{225}		TAB	9		9	223_{25}	
& 6	223_{22}		S	223_{243}	♠				4	223_{20}	
' 7	223_{23}		D	223_{228}	—	↑	30		5	223_{21}	
(8	223_{24}		F	223_{230}		←	29		6	223_{22}	
) 9	223_{25}		G	223_{231}		SPACE	223		1	223_{17}	
− 0	223_{16}		H	223_{232}		→	28		2	223_{18}	
=	223_{13}		J	223_{234}		↓	31		3	223_{19}	
~ ^	223_{158}		K	223_{235}		INS DEL	223_{255}		0	223_{16}	
BREAK			L	223_{236}	○				.	223_{14}	
GRAPH			+ ;	223_{27}		SPECIAL FUNCTION KEYS			↵	13	
CTRL			* :	223_{26}		KEY	ASCII	IMAGE			
Q	223_{241}	◆	} |	223_{157}		1	71 32	GOTO			
W	223_{247}		↵	13		2	67 82 32	COLOR			
E	223_{229}		SHIFT			3	80 84 32	PRINT			
R	223_{242}	♣	\	223_{156}		4	76 32	LIST			
T	223_{244}		Z	223_{250}		5	69 32	EDIT			
Y	223_{249}		X	223_{248}		6	82 13	RUN			
U	223_{245}		C	223_{227}							
I	223_{233}		V	223_{246}							
O	223_{239}		B	223_{226}							
			N	223_{238}							

ROM BASIC
graph - shift

GOSUB	LOCATE	INPUT	KEY	AUTO	CONT

BREAK GRAPH

CTRL

CLEAR

LOCK

SHIFT

SHIFT TAB

INS

71 66 32	76 84 32	73 84 32	75 32	65 32	67 13

223 10	223 15	223 231

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
	223 252	223 154	223 152	223 131	223 150	223 130	223 142	223 141	223 28	223 30	223 31		
	223 237	223 238			223						223 239	223 236	18

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
x +	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

Top row keys: ① ② ③ ④ ⑤ ⑥   + − =

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

Lower diagram (scan codes):

| 133 | 134 | 135 | 136 | 138 | 140 | | 43 | 45 | 61 |

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

Translation Table

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
x +	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	

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
```

```
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

**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.

BLOCK DIAGRAM: SYSTEM CONFIGURATION

DIAGRAM E-1

MEMORY MAP

DIAGRAM E-2

ROM		D-RAM	CP/M 56 K Version

```
                              0000
  BASIC                                            0100
  INTERPRETER                         TPA
  ROM I
  (8 K Bytes)                 1000

                              2000
  BASIC              Transfer
  INTERPRETER        to RAM
  ROM II                      3000
  (8 K Bytes)

                              4000
  BASIC
  INTERPRETER
  ROM III                     5000
  (8 K Bytes)

                              6000

                              7000

                              8000

                              9000

                              A000

  ┌─────────────┐             B000
  │ ROM Pack I  │
  │             │
  │ (8 K Bytes) │             C000
  ├─────────────┤                                  C400
  │ ROM Pack II │   protect        CCP
  │             │ → memory   D000  BDOS
  │ (8 K Bytes) │                  BIOS
  └─────────────┘             E000  MONITOR
                                    KEY, CRT, I/O
   Transfer to RAM                  Device Service  E400
                                    IPL
            ↓                 F000
  ┌──────────────────┐              Video RAM
  │ IPL, MONITOR     │              Charactor
  │ ROM (4 K Bytes)  │              Attribute
  ├──────────────────┤
  │ Initialize routines
  │ Version tables
  │ ROM (4 K Bytes)  │
  └──────────────────┘
```

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
```

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)
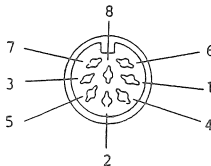
OUTPUT SIGNALS FOR RGB 8-PIN CONNECTOR

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
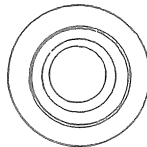
III. Cassette Recorder Interface

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)
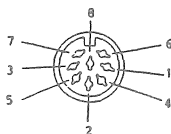
IV. Printer Interface (Parallel)

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.

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	

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	OFF
			RS232C/serial	NTSC
			ON	ON
			Centronics/parallel	PAL

VII. BAUD RATE

The baud rate is preset to 4800 bd.
Adjustments should be made as follows:

```
                                        Baud
          1  2  3  4  5  6      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.

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.
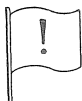
* Do not open your ROYAL PC, as this will void your Warranty.

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

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   A code understood by the OPERATING
CODE   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   A CONTROL CODE preceded by an Escape
SEQUENCE   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   One of the programming languages
LANGUAGE   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   Any device used to INPUT or OUTPUT
DEVICE   DATA to a computer (e.g., printer,
               DISK DRIVE, DISK, keyboard, ROM-
               PACK, cassette recorder).

INTEGRATED   The electronic component of diodes,
CIRCUIT   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   A programming language that can be
LANGUAGE   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-   The INTEGRATED CIRCUIT CHIP that
PROCESSOR   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   A PROGRAM commonly used by
PROGRAM   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.

INDEX

INDEX

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