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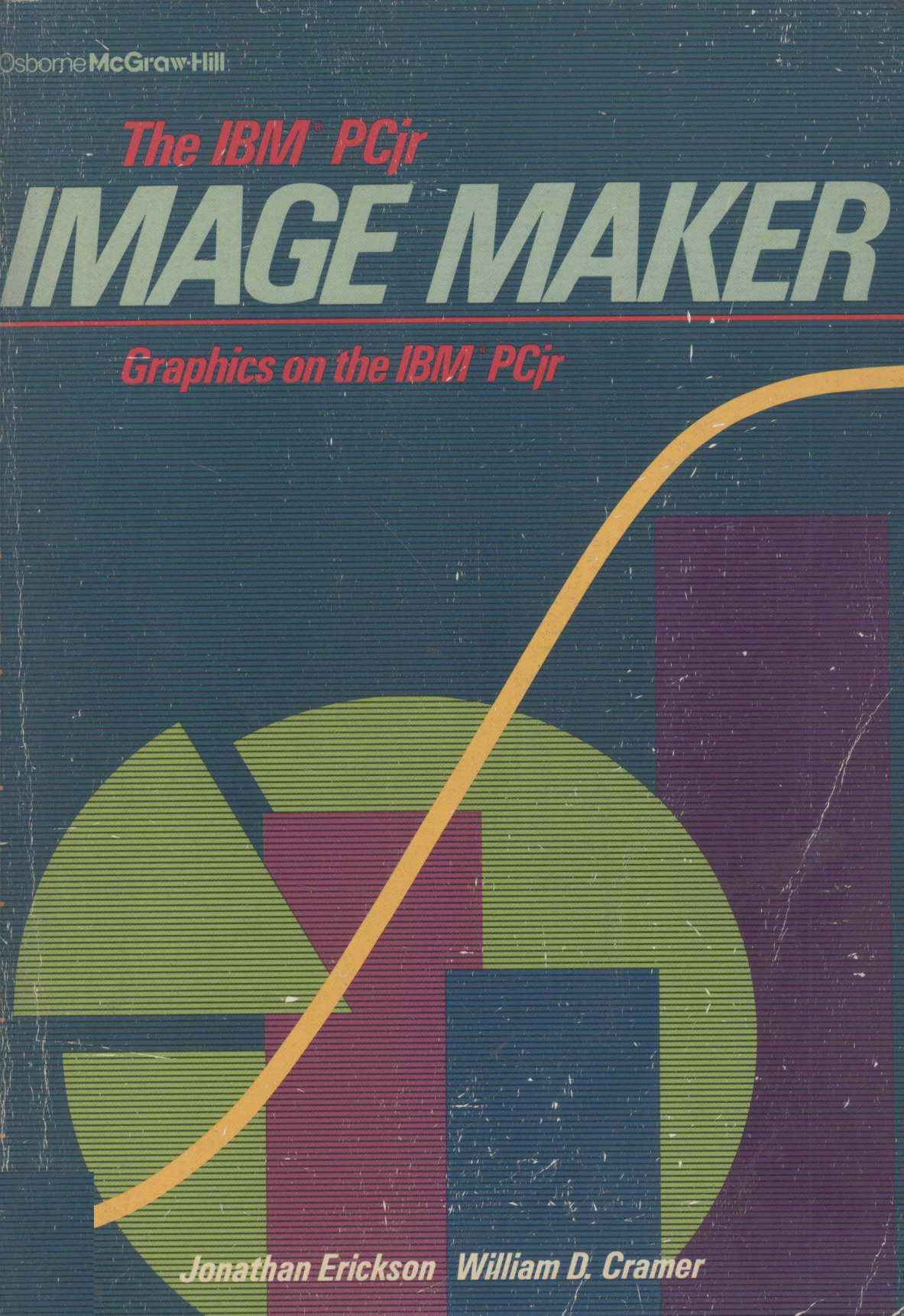
The IBM® PCjr IMAGE MAKER

Graphics on the IBM® PCjr



Jonathan Erickson William D. Cramer

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INTRODUCTION

The PCjr Image Maker

Vivid, full-color computer graphics is one of the most exciting applications of the IBM PCjr. *The PCjr Image Maker* provides you with the necessary tools to understand and use the powerful graphics capabilities of your PCjr. We start by describing each graphics statement in detail. Then we show you how to use those commands to create everything from business graphs to video games.

The PCjr Image Maker is divided into four sections. Part 1 gives you an overview of graphics: what graphics is in general and computer graphics in particular. Part 2 explains individual graphics commands, starting with the statements you will use first in your programs. Each explanation includes sample programs that illustrate the concept under discussion. Part 3 shows you how to apply the commands introduced in the previous section. Complicated graphics applications (animation, icon creation, and others) are presented and explained so that you can easily adapt any of the routines in programs you write. Part 3 also contains a color photo section of actual screen displays produced by the programs. Although the photo section follows Chapter 15, it contains photos from Chapter 14 on. Finally, Part 4 provides a number base conversion chart and a graphics worksheet to plot your images before you create them.

What this book won't do is teach you all there is to know about programming the PCjr. If you have not already done so, you should read *Hands-On BASIC* and become familiar with programming concepts (loops, arrays, and so forth) before you begin to read *The PCjr Image Maker*. If you are familiar with *Hands-On BASIC*, you know

that it discusses graphics in a very perfunctory manner. We begin where it left off.

To use the programs described in this book, you must have an enhanced PCjr system—Cartridge BASIC, at least 128K of RAM, and a minimum of one disk drive. Furthermore, all programs require that you use BASICA, not BASIC. This means that you must type **BASICA** and press ENTER when the DOS A> prompt is displayed.

Each chapter in Part 2 of *The PCjr Image Maker* focuses on one or two graphics commands. Individual commands are summarized in a special *syntax block* introduced at the beginning of each command description. This summary includes the command statements that *must* be typed in as well as all of the options and parameters associated with the command. **BOLDFACE** words in all capital letters and punctuation must be typed in *exactly* as shown. Words in *lowercase italics* are variables for which you must supply a value.

About the Authors

Jonathan Erickson, a senior editor at Osborne/McGraw-Hill, is a former newspaper reporter and technical writer. He is also the author of *C-64 Telecommunications* and co-author of *The Model 100 Book: A Guide to Portable Computing*. He has written numerous magazine articles on a variety of topics and also contributed to the *McGraw-Hill Computer Handbook*.

William Cramer, who graduated from Texas Christian University with degrees in computer science and chemistry, is a software engineer specializing in graphics, communications and real-time vehicle monitoring.

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The 8086 Book

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PART ONE

Graphics And Your PCjr

*Part I provides you with the background information you need to get started with computer graphics. Many important terms and concepts used throughout the book (*pixel, coordinates, *and so on) are introduced and defined in this section. If you are already familiar with computer graphics to some degree, reading this section will make you aware of some of the unique graphics features and capabilities of the PCjr.*

CHAPTER ONE

Graphics Overview

Drawings, photographs, charts, and other forms of pictorial representation are collectively referred to as "graphics." The term graphics has evolved to describe not only the pictures, but also the technologies that produce them. Today, graphics includes cartoons, video games, business graphs, architectural drafting, mechanical design, greeting cards, printing, typesetting, photography, and a host of other technologies and applications.

Most people grasp ideas and concepts that are presented visually much faster than those read in text. In fact, if you think back to the storybooks of your childhood, the pictures probably told you more than the words. People everywhere respond readily to all forms of graphics because pictures possess universal significance and therefore cross linguistic barriers. A picture of a house means the same to a speaker of French as to a speaker of English.

Throughout history, artists and scientists have applied the available technologies and mediums to produce graphics. Plant dyes were used to paint cave walls, paper and ink for hand-lettered and illustrated books and maps. Later, artists used woodcuts, lead type, silk screens, and eventually photography to transfer images and convey ideas.

Today, computers are being used to make the entire process of graphics design and production easier and more expressive. Everything from calendars to skyscrapers is being designed with the help of computers. (This is referred to as CAD—"computer-aided design.") Computer graphics is not intended to replace artists and their materials, but

to free graphics artists from mechanical tasks, allowing them to concentrate on creative expression. Computers also provide artists with a number of different media—the most common being a television screen and the paper in a printer.

WHAT IS COMPUTER GRAPHICS?

Technically speaking, "graphics" uses lines to represent a three-dimensional object on a two-dimensional surface. In most instances, these lines are laid out according to standard mathematical rules; that's why graph paper is drawn with mathematically precise lines and distances. A line can be any length—from a dash that is so short you can't see it, to a line that continues into infinity. Furthermore, a line doesn't have to be straight; it can be an arc or a curve. Figure 1-1 provides enough information for you to visualize a three-dimensional object, even though the drawing is rendered on a flat surface.

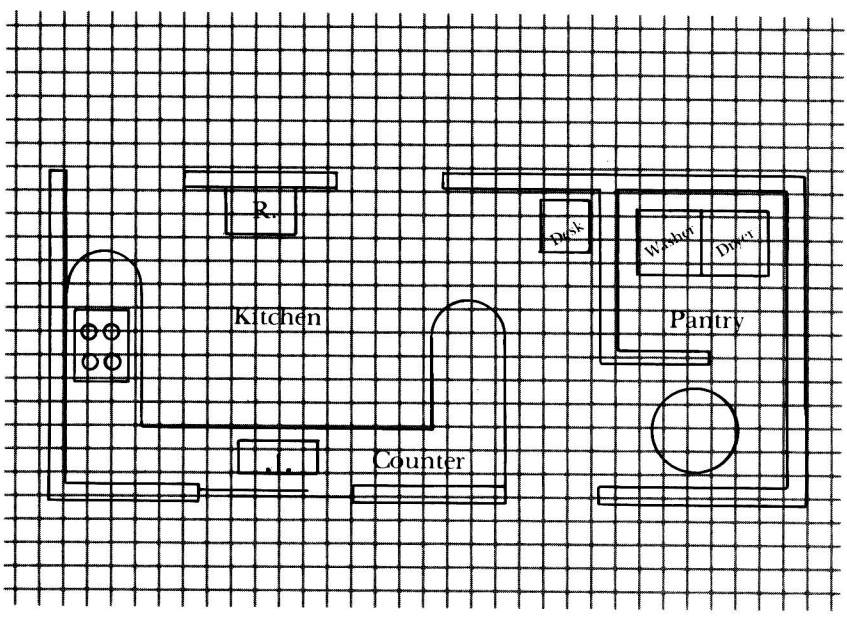

Figure 1-1. *Partial house plan*

With computer graphics like those generated on your PCjr, the two-dimensional surface is usually a television screen. In other cases, it may be paper on which your IBM graphics printer prints. Typically, computer-generated graphics includes graphs, illustrations, symbols, cartoons, animation, and other forms of artwork. Video games found in arcades and weather maps shown on the 6 o'clock news require machines far more powerful than the PCjr.

For computers like your PCjr, all of the lines that create artwork are based on a single dot or picture cell on the screen called a *pixel.* A line is simply a row of pixels. When the pixels are very close together, they appear to be a solid line. (You may have heard of half-tone photography or of the "pointillism" school of painting. Both techniques are similiar to pixel graphics in that they depend on thousands of dots to create an image.) Other types of computers use different forms of technology to create a line, but for low cost and maximum flexibility, pixel graphics is the best.

Besides having the capability to draw lines of varying lengths and directions, computers like your PCjr can display colors. Of course, to see those colors, you will need a color monitor or color television attached to your computer. If you have a color printer attached to your computer, you can also make printouts. Most personal computers can display 4 to 16 colors; your IBM PCjr provides 16. You can still give the appearance of additional colors by using a shading technique called "tiling," which is discussed later in this book.

If you have ever played a video game, you know that computer graphics systems also allow you to simulate motion or animation. Different computers accomplish this differently. Your PCjr lets you simulate motion in two ways. One way is by drawing an object and moving it around the screen. Another is by drawing objects at slightly different locations on different "pages," then flipping or displaying the pages very quickly. Of course, all of this requires a great deal of speed, but that's another thing computers are good at—getting things done in a hurry.

As you become familiar with your PCjr's graphics capabilities, your computer will provide more fun and challenges than you ever expected.

CHAPTER TWO

Graphics And the PCjr

There are two elements you must consider when displaying graphics: color (both foreground and background) and image resolution. These display capabilities are interrelated; the number of available colors depends on the resolution desired—and vice versa. Examining each of the capabilities and understanding how they interrelate is the first step toward writing a graphics program.

The PCjr can display two types of information on the screen: text (letters and numbers) and graphics (circles and lines). To display these types of information, the computer must first be set to the appropriate method of display, called a *mode*. The PCjr has two display modes:

- *Text Mode* displays numbers and letters only.
- *Graphics Mode* displays circles, lines, and other graphics forms, in addition to numbers and letters.

When you first turn on your PCjr's power and load BASICA, the computer is automatically set to display text only; it won't display graphics even if you try. To display graphics information (or to change from Graphics Mode back to Text Mode), you must switch from one mode to the other using the SCREEN statement. This is sometimes called a *software switch,* since it is similar to turning a switch like a television's channel selector. In this case, however, you don't physically turn a knob; you just type in the SCREEN statement and the computer "turns" the switch for you, changing the display mode.