OSBORNE/McGRAW-HILL

PET™/CBM™ PERSONAL COMPUTER GUIDE

SECOND EDITION

Adam Osborne · Carroll S. Donahue

PET/CBM Personal Computer Guide

PET/CBM Personal Computer Guide

Adam Osborne
Carroll S. Donahue

OSBORNE/McGraw-Hill
Berkeley, California

Published by
OSBORNE/McGraw-Hill
630 Bancroft Way
Berkeley, California 94710
U. S. A.

For information on translations and book distributors outside of the U. S. A. , please write OSBORNE/McGraw-Hill at the above address.

PET/CBM PERSONAL COMPUTER GUIDE
SECOND EDITION

4567890 DODO 8987654321

ISBN 0-931988-55-1

Copyright © 1980 McGraw-Hill, Inc. All rights reserved. Printed in the United States of America. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior written permission of the publishers.

PHOTO CREDITS

Commodore Business Machines: pp. 2, 3, 4 (top, bottom), 40 (bottom)

Joe Mauro: p. 28

Harvey Schwartz: pp. 5, 15, 18, 20; 23, 24, 25, 26, 30, 32 (top, bottom), 35, 37, 38

COVER DESIGN: Timothy Sullivan

Contents

Preface ix

1. Introducing CBM Computers 1

CBM Models.

CBM Features 5

Rear Panel. CRT Display. Power-Up. CBM 8000 and CBM 2001/B Keyboards. PET 2001/N Keyboard. PET 2001/8K. The Cassette Tape Unit. Cassette Tapes. CBM Disk Drive. Floppy Disks. The CBM Printer.

2. Operating the CBM Computer 49

Immediate Mode 50

Keyboard Input in Immediate Mode. Arithmetic Calculations. Cursor Movement.

Program Mode 58

Program Entry. Standard and Alternate Character Sets.

Operating the Cassette Units 64

Operating the Disk Unit 69

Loading a Program from a Diskette using BASIC< 3.0. Loading a Program from Diskette using BASIC 4.0.

Operating the CBM Printer 78

3. Screen Editing 81

Editing Text on the Current Display Line. Editing Text within Quotation Marks. Editing Program Statements. BASIC 4.0 Screen Editing Extensions.

4. Programming the CBM Computer 91

Immediate and Programmed Modes. One Line Immediate Mode Programs. Spaces are not Needed.

Elements of a Programming Language 96
Line Numbers. Data. Operators. BASIC Commands.

BASIC Statements 117
Remarks. Assignment Statement. Branch Statements. Looped Control Statements. Subroutine Statements. Input and Output Statements. PEEK and POKE Statements. END and STOP Statements.

Functions 137
Arithmetic Functions. String Functions. System Functions. User-Defined Functions.

5. Making the Most of CBM Features 141

Hardware Features 141
Keyboard Rollover. Keyboard Buffer.

String Concatenation 145
Graphic Strings. Numeric Strings.

Input and Output Programming 149
PRINT Statement. Cursor Movement. CHR$ Function: Programming Characters in ASCII. Data Entry (Input). Programming Displays and Printouts.

Mathematical Programming 183
Addition. Subtraction. Multiplication.

Graphics 209
Animation.

The Real Time Clock 217
Random Numbers 223
Random Number Seed. Random POKE to the Screen.

6. Peripheral Devices: Tape Cassette Drives, Diskette Drives and the Printer 231

Storing Data on Magnetic Surfaces 232
The Concept of a File. Data Transfer to and from Cassette and Diskette.

Cassette Files 239
Programming Cassette Data Files. Cassette File Formats.

Diskette Files 270
How Diskettes Store Data. Programming Diskette Files. Opening a Diskette File. Closing a Diskette File. Diskette Errors and Error Status.

Diskette Housekeeping Operations 282
Diskette Preparation and Initialization. Collecting a Diskette. Copying Files and Diskettes. Renaming a File. Deleting Files.

Sequential Data Files 291
Sequential File Field Separators. Writing Numeric Data to a Sequential File. Writing String Data to a Sequential File. Adding Data to Sequential Files. End-of-File.

Relative Data Files (BASIC 4.0) 302
Relative File Field Separators. Writing Numeric Data to Relative Files. Writing String Data to Relative Files. Positioning to Records of Relative Files.

Using GET# with Diskette Files 308
Program Files 310
Job Queuing

Programming the Line Printer 312
Printing Data Exactly as Received. Formatted Printer Output. Special Printer Control Characters. Page Format. Defining Your Own Characters. Printer Diagnostic Messages.

7. System Information 333

CBM Computer System Organization. Memory Map. BASIC Statement Storage. User Program Area Initialization. Data Formats. Constants. Character Representation. Assembly Language Programming. SYS. USR. Random Access Files.

8. CBM BASIC 359

Immediate and Program Modes. BASIC Revisions. Format Conventions.

BASIC Statements 362
Functions 394
CBM 8000 Editing Functions 405

Appendices

A. CBM Character Codes 409
B. CBM Error Messages 417
C. BASIC Bibliography 429
D. CBM Newsletters and References 431
E. Conversion Tables 433
F. Revision Level 2 ROMs 443

Index 495

Preface

This edition of the *PET/CBM Personal Computer Guide* is a major revision of the original book published under the same title.

This book describes all models of CBM computers: the original PET 2001 which made Commodore famous, and the more recently introduced PET 2001/N, CBM 2001/B and the 80-column CBM 8000. Peripherals described include cassette drives, two floppy disk units (the Model 2040 and the Model 8050), and two printers (the Model 2022 and the Model 2023).

Also described are recent software products introduced by Commodore: BASIC 4.0, the most recent version of Commodore's BASIC programming language, and two new versions of the disk operating system, DOS 2.1 and DOS 2.5, collectively referred to as DOS 2.0 in product literature.

The discussion of BASIC programming has been greatly expanded. Even if you have never programmed a computer before, this book will teach you how to write your own BASIC programs for any CBM computer system.

This is a large book, containing a great deal of information about CBM computer systems. Depending on your needs you may not use all of the information provided.

Perhaps you have no intention of ever becoming a programmer. Chapters 1, 2 and 3 tell you everything you need to know in order to run programs that have already been written. You can skip the rest of the book until you become more ambitious and want to do a little programming for yourself.

Chapters 4, 5 and 8 teach BASIC programming. Every CBM BASIC statement is described rigorously, but concisely, in Chapter 8. Chapter 4 describes elementary BASIC programming, while Chapter 5 covers more advanced programming techniques. Both of these chapters rely on Chapter 8 for actual statement definitions.

Chapter 6 explains programming techniques required by peripheral units including cassette drives, diskette drives and printers.

Chapter 7 is for the programming expert only. This chapter covers advanced topics such as random diskette access and assembly language programming.

Nothing teaches you programming as effectively as examples. Therefore this book is full of short programs. Whenever you encounter a programming example, key it into your computer and run it. You should also save it for future use (assuming that you have cassette or diskette drives). Every programming example presented in this book has been run on a CBM computer. That guarantees the programs are accurate as run. But only an arrogant or foolish programmer will claim that his or her programs are truly free of errors. The programs presented in this book may well have errors which you will stumble on when you try to run them in novel ways. When you enter a program and try to run it, if it does not work, do not immediately assume that the program is wrong. Carefully check your entry and execution procedure. But remember that programming errors may exist, and if you do find any, please tell us about them.

CBM computers all have two character sets: standard and alternate. Throughout this book we have used the standard character set to illustrate programs and program execution examples. If your computer is to reproduce these illustrations exactly, then you must make sure that you are using the standard character set. Using the alternate character set will make the program or illustration appear different.

The different versions of disk operating systems affect the way you program a CBM computer, but these effects are largely masked by the different versions of BASIC. Therefore we will continuously refer to different levels of CBM BASIC, but we will only occasionally identify a different version of disk operating system.

There have been three releases of CBM BASIC, designated by numbers 1.*x*, 3.*x*, and 4.*x*. '*x*' is a number specifying a subrelease. The most significant changes in CBM BASIC were made with release 4.0. In this book we will generally divide BASIC into release 4.0 and earlier releases. These are designated as follows:

1. BASIC 4.0 for any BASIC 4.*x*.
2. BASIC<3.0 for all earlier releases of BASIC.

Acknowledgments

Portions of this book have been taken from the first edition which was co-authored by Janice Enger. The Blanket program was written by Janice Enger, and the manner in which this program is used to illustrate text was her idea.

Patrick L. McGuire was author of the Digital Display Clock program listed in Chapter 5.

Jim Butterfield supplied much of the memory map information included in the first edition, which has been included also in this second edition.

Commodore personnel, in general, and Chuck Peddle, in particular, were very helpful, providing newly released hardware and software products, then arranging for technical review of manuscripts.

The names PET and CBM are registered trademarks with regard to any computer product, and are owned by Commodore Business Machines, a division of Commodore International. Permission to use the trademark names PET and CBM has been granted by Commodore Business Machines, and is gratefully acknowledged.