

# COMMODORE 64K

## PROGRAMMER'S REFERENCE GUIDE



 **commodore**  
COMPUTER

**COMMODORE 64 ■  
PROGRAMMER'S  
REFERENCE GUIDE**

Published by  
Commodore Business Machines, Inc.  
and  
Howard W. Sams & Co., Inc.

FIRST EDITION  
THIRD PRINTING—1983

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## INTRODUCTION

The **COMMODORE 64 PROGRAMMER'S REFERENCE GUIDE** has been developed as a working tool and reference source for those of you who want to maximize your use of the built-in capabilities of your **COMMODORE 64**. This manual contains the information you need for your programs, from the simplest example all the way to the most complex. The **PROGRAMMER'S REFERENCE GUIDE** is designed so that everyone from the beginning BASIC programmer to the professional experienced in 6502 machine language can get information to develop his or her own creative programs. At the same time this book shows you how clever your **COMMODORE 64** really is.

This **REFERENCE GUIDE** is not designed to teach the BASIC programming language or the 6502 machine language. There is, however, an extensive glossary of terms and a "semi-tutorial" approach to many of the sections in the book. If you don't already have a working knowledge of BASIC and how to use it to program, we suggest that you study the **COMMODORE 64 USER'S GUIDE** that come with your computer. The **USER'S GUIDE** gives you an easy to read introduction to the BASIC programming language. If you still have difficulty understanding how to use BASIC then turn to the back of this book (or Appendix N in the **USER'S GUIDE**) and check out the Bibliography.

The **COMMODORE 64 PROGRAMMER'S REFERENCE GUIDE** is just that; a reference. Like most reference books, your ability to apply the information creatively really depends on how much knowledge you have about the subject. In other words if you are a novice programmer you will not be able to use all the facts and figures in this book until you expand your current programming knowledge.

What you can do with this book is to find a considerable amount of valuable programming reference information written in easy to read, plain English with the programmer's jargon explained. On the other hand the programming professional will find all the information needed to use the capabilities of the **COMMODORE 64** effectively.

## WHAT'S INCLUDED?

- Our complete "BASIC dictionary" includes Commodore BASIC language commands, statements and functions listed in alphabetical order. We've created a "quick list" which contains all the words and their abbreviations. This is followed by a section containing a more detailed definition of each word along with sample BASIC programs to illustrate how they work.
- If you need an introduction to using machine language with BASIC programs our layman's overview will get you started.
- A powerful feature of all Commodore computers is called the **KERNAL**. It helps insure that the programs you write today can also be used on your Commodore computer of tomorrow.
- The Input/Output Programming section gives you the opportunity to use your computer to the limit. It describes how to hook-up and use everything from lightpens and joysticks to disk drives, printers, and telecommunication devices called *modems*.
- You can explore the world of **SPRITES**, programmable characters, and high resolution graphics for the most detailed and advanced animated pictures in the microcomputer industry.
- You can also enter the world of music synthesis and create your own songs and sound effects with the best built-in synthesizer available in any personal computer.
- If you're an experienced programmer, the soft load language section gives you information about the **COMMODORE 64's** ability to run CP/M\* and high level languages. This is in addition to BASIC.

Think of your **COMMODORE 64 PROGRAMMER'S REFERENCE GUIDE** as a useful tool to help you and you will enjoy the hours of programming ahead of you.

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\*CP/M is a registered trademark of Digital Research, Inc.

## HOW TO USE THIS REFERENCE GUIDE

Throughout this manual certain conventional notations are used to describe the syntax (programming sentence structure) of BASIC commands or statements and to show both the required and optional parts of each BASIC keyword. The rules to use for interpreting statement syntax are as follows:

1. BASIC keywords are shown in capital letters. They must appear where shown in the statement, entered and spelled exactly as shown.
2. Items shown within quotation marks (" ") indicate variable data which you must put in. Both the quotation marks and the data inside the quotes must appear where shown in each statement.
3. Items inside the square brackets ([ ]) indicate an optional statement parameter. A parameter is a limitation or additional qualifier for your statements. If you use an optional parameter you must supply the data for that optional parameter. In addition, ellipses ( . . . ) show that an optional item can be repeated as many times as a programming line allows.
4. If an item in the square brackets ([ ]) is UNDERLINED, that means that you **MUST** use those certain characters in the optional parameters, and they also have to be spelled exactly as shown.
5. Items inside angle brackets (<>) indicate variable data which you provide. While the slash (/) indicates that you must make a choice between two mutually exclusive options.

### EXAMPLE OF SYNTAX FORMAT:

```
OPEN<file-num>,<device> [,<address>], ["<drive>: <file-name>"] [,<mode>]"
```

### EXAMPLES OF ACTUAL STATEMENTS:

```
10 OPEN 2,8,6,"0:STOCK FOLIO,S,W"  
20 OPEN 1,1,2,"CHECKBOOK"  
30 OPEN 3,4
```

When you actually apply the syntax conventions in a practical situation, the sequence of parameters in your statements might not be exactly the same as the sequence shown in syntax examples. The examples are not meant to show every possible sequence. They are intended to present all required and optional parameters.

Programming examples in this book are shown with blanks separating words and operators for the sake of readability. Normally though, BASIC doesn't require blanks between words unless leaving them out would give you an ambiguous or incorrect syntax.

Shown below are some examples and descriptions of the symbols used for various statement parameters in the following chapters. The list is not meant to show every possibility, but to give you a better understanding as to how syntax examples are presented.

<b>SYMBOL</b>	<b>EXAMPLE</b>	<b>DESCRIPTION</b>
<file-num>	50	A logical file number
<device>	4	A hardware device number
<address>	15	A serial bus secondary device address number
<drive>	0	A physical disk drive number
<file-name>	"TEST.DATA"	The name of a data or program file
<constant>	"ABCDEFGH"	Literal data supplied by the programmer
<variable>	X145	Any BASIC data variable name or constant
<string>	ABS	Use of a string type variable required
<number>	12345	Use of a numeric type variable required
<line-number>	1000	An actual program line number
<numeric>	1.5E4	An integer or floating-point variable

## **COMMODORE 64 APPLICATIONS GUIDE**

When you first thought about buying a computer you probably asked yourself, "Now that I can afford to buy a computer, what can I do with it once I get one?"

The great thing about your **COMMODORE 64** is that you can make it do what YOU want it to do! You can make it calculate and keep track of home and business budget needs. You can use it for word processing. You can make it play arcade-style action games. You can make it sing. You can even create your own animated cartoons, and more. The best part of owning a **COMMODORE 64** is that even if it did only one of the things listed below it would be well worth the price you paid for it. But the **64** is a complete computer and it does do EVERYTHING listed and then some!

By the way, in addition to everything here you can pick up a lot of other creative and practical ideas by signing up with a local Commodore Users' Club, subscribing to the **COMMODORE** and **POWER/PLAY** magazines, and joining the **COMMODORE INFORMATION NETWORK** on CompuServe™.

APPLICATION	COMMENTS/REQUIREMENTS
<b>ACTION PACKED GAMES</b>	You can get real Bally Midway arcade games like Omega Race, Gorf and Wizard of Wor, as well as "play and learn" games like Math Teacher I, Home Babysitter and Commodore Artist.
<b>ADVERTISING &amp; MERCHANDISING</b>	Hook your <b>COMMODORE 64</b> to a TV, put it in a store window with a flashing, animated, and musical message and you've got a great point of purchase store display.
<b>ANIMATION</b>	Commodore's Sprite Graphics allow you to create real cartoons with 8 different levels so that shapes can move in front of or behind each other.
<b>BABYSITTING</b>	The <b>COMMODORE 64 HOME BABYSITTER</b> cartridge can keep your youngest child occupied for hours and teach alphabet/ keyboard recognition at the same time. It also teaches special learning concepts and relationships.
<b>BASIC PROGRAMMING</b>	Your <b>COMMODORE 64 USER'S GUIDE</b> and the <b>TEACH YOURSELF PROGRAMMING</b> series of books and tapes offer an excellent starting point.
<b>BUSINESS SPREADSHEET</b>	The <b>COMMODORE 64</b> offers the "Easy" series of business aids including the most powerful word processor and largest spreadsheet available for any personal computer.
<b>COMMUNICATION</b>	Enter the fascinating world of computer "networking." If you hook a VICMODEM to your <b>COMMODORE 64</b> you can communicate with other computer owners all around the world.

Not only that, if you join the **COMMODORE INFORMATION NETWORK** on CompuServe™ you can get the latest news and updates on all Commodore products, financial information, shop at home services, you can even play games with the friends you make through the information systems you join.

#### COMPOSING SONGS

The **COMMODORE 64** is equipped with the most sophisticated built-in music synthesizer available on any computer. It has three completely programmable voices, nine full music octaves, and four controllable waveforms. Look for Commodore Music Cartridges and Commodore Music books to help you create or reproduce all kinds of music and sound effects.

#### CP/M\*

Commodore offers a CP/M\* add-on and access to software through an easy-to-load cartridge.

#### DEXTERITY TRAINING

Hand/Eye coordination and manual dexterity are aided by several Commodore games . . . including "Jupiter Lander" and night driving simulation.

#### EDUCATION

While working with a computer is an education in itself, The **COMMODORE** Educational Resource Book contains general information on the educational uses of computers. We also have a variety of learning cartridges designed to teach everything from music to math and art to astronomy.

#### FOREIGN LANGUAGE

The **COMMODORE 64** programmable character set lets you replace the standard character set with user defined foreign language characters.

#### GRAPHICS AND ART

In addition to the Sprite Graphics mentioned above, the **COMMODORE 64** offers high-resolution, multi-color graphics plotting, pro-

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\*CP/M is a Registered trademark of Digital Research, Inc.

## INSTRUMENT CONTROL

grammable characters, and combinations of all the different graphics and character display modes.

Your **COMMODORE 64** has a serial port, RS-232 port and a user port for use with a variety of special industrial applications. An IEEE/488 cartridge is also available as an optional extra.

## JOURNALS AND CREATIVE WRITING

The **COMMODORE 64** will soon offer an exceptional wordprocessing system that matches or exceeds the qualities and flexibilities of most "high-priced" wordprocessors available. Of course you can save the information on either a 1541 Disk Drive or a Datasette™ recorder and have it printed out using a VIC-PRINTER or PLOTTER.

## LIGHTPEN CONTROL

Applications requiring the use of a lightpen can be performed by any lightpen that will fit the **COMMODORE 64** game port connector.

## MACHINE CODE PROGRAMMING

Your **COMMODORE 64 PROGRAMMER'S REFERENCE GUIDE** includes a machine language section, as well as a BASIC to machine code interface section. There's even a bibliography available for more in-depth study.

## PAYROLL & FORMS PRINTOUT

The **COMMODORE 64** can be programmed to handle a variety of entry-type business applications. Upper/lower case letters combined with **C64** "business form" graphics make it easy for you to design forms which can then be printed on your printer.

## PRINTING

The **COMMODORE 64** interfaces with a variety of dot matrix and letter quality printers as well as plotters.

## RECIPES

You can store your favorite recipes on your **COMMODORE 64** and its disk or cassette storage unit, and end the need for messy recipe cards that often get lost when you need them most.

<b>SIMULATIONS</b>	Computer simulations let you conduct dangerous or expensive experiments at minimum risk and cost.
<b>SPORTS DATA</b>	The Source™ and CompuServe™ both offer sports information which you can get using your <b>COMMODORE 64</b> and a VICMODEM.
<b>STOCK QUOTES</b>	With a VICMODEM and a subscription to any of the appropriate network services, your <b>COMMODORE 64</b> becomes your own private stock ticker.

These are just a few of the many applications for you and your **COMMODORE 64**. As you can see, for work or play, at home, in school or the office, your **COMMODORE 64** gives you a practical solution for just about any need.

Commodore wants you to know that our support for users only **STARTS** with your purchase of a Commodore computer. That's why we've created two publications with Commodore information from around the world, and a "two-way" computer information network with valuable input for users in the U.S. and Canada from coast to coast.

In addition, we wholeheartedly encourage and support the growth of Commodore Users' Clubs around the world. They are an excellent source of information for every Commodore computer owner from the beginner to the most advanced. The magazines and network, which are more fully described below, have the most up-to-date information about how to get involved with the Users' Club in your area.

Finally, your local Commodore dealer is a useful source of Commodore support and information.

## **POWER/PLAY** **The Home Computer Magazine**

When it comes to entertainment, learning at home and practical home applications, **POWER/PLAY** is THE prime source of information for Commodore home users. Find out where your nearest user clubs are and what they're doing, learn about software, games, programming techniques, telecommunications, and new products. **POWER/PLAY** is your personal connection to other Commodore users, outside software and hardware developers, and to Commodore itself. Published quarterly. Only \$10.00 for a year of home computing excitement.

## COMMODORE The Microcomputer Magazine

Widely read by educators, businessmen and students, as well as home computerists, **COMMODORE Magazine** is our main vehicle for sharing exclusive information on the more technical use of Commodore systems. Regular departments cover business, science and education, programming tips, "excerpts from a technical notebook," and many other features of interest to anyone who uses or is thinking about purchasing Commodore equipment for business, scientific or educational applications. **COMMODORE** is the ideal complement to **POWER/PLAY**. Published bi-monthly. Subscription price: \$15.00 per year.

**AND FOR EVEN MORE INFORMATION . . .  
. . . DIAL UP OUR PAPERLESS USER MAGAZINE**

## COMMODORE INFORMATION NETWORK

The magazine of the future is here. To supplement and enhance your subscription to **POWER/PLAY** and **COMMODORE** magazines, the **COMMODORE INFORMATION NETWORK**—our "paperless magazine"—is available now over the telephone using your Commodore computer and modem.

Join our computer club, get help with a computing problem, "talk" to other Commodore friends, or get up-to-the-minute information on new products, software and educational resources. Soon you will even be able to save yourself the trouble of typing in the program listings you find in **POWER/PLAY** or **COMMODORE** by downloading direct from the Information Network (a new user service planned for early 1983). The best part is that most of the answers are there before you even ask the questions. (How's that for service?)

To call our electronic magazine you need only a modem and a subscription to CompuServe™, one of the nation's largest telecommunications networks. (To make it easy for you Commodore includes a FREE year's subscription to CompuServe™ in each VICMODEM package.)

Just dial your local number for the CompuServe™ data bank and connect your phone to the modem. When the CompuServe™ video text appears on your screen type G CBM on your computer keyboard. When the **COMMODORE INFORMATION NETWORK'S** table of contents, or "menu," appears on your screen choose from one of our sixteen departments, make yourself comfortable, and enjoy the paperless magazine other magazines are writing about.

For more information, visit your Commodore dealer or contact CompuServe™ customer service at 800-848-8990 (in Ohio, 614-457-8600).

### COMMODORE INFORMATION NETWORK

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