VIC 20™ User Guide

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Introduction

The VIC 20 is a remarkable computer. Despite its low price and small size, it has more features than larger and more expensive computers did even a few years ago.

If you want to solve math problems, the VIC can run them for you. If you need to type letters or mailing lists, the VIC will do the job quickly and easily.

But in addition to these functions, common to most computers, the VIC offers color text and graphics.

Furthermore, the VIC 20 can produce tones within a range of nine octaves. These can be combined to imitate anything from the patter of rain to a cannonade.

Chapter 1 explains how to unpack and set up the VIC 20 and its accessories. It contains a description of all the controls on the VIC, from connectors to keyboard functions.

Chapter 2 guides you through the VIC screen editor and explains the two operating modes of the VIC: immediate mode and programmed mode. This is followed by an introduction to the Datassette, the 1540 disk drive, and the 1515 printer.

Chapter 3 introduces you to programming. All the BASIC instructions are covered as well as the concepts of loops, branching, Boolean operators,

floating point versus integer numbers, and scientific notation. The chapter also describes variable types and the construction of arrays.

Advanced BASIC programming is the subject of Chapter 4. It will teach you practical applications of concepts covered in Chapter 3. You will learn how to write screen display programs, include cursor movement and string variables as commands in your programs, and develop easy-to-use I/O intensive programs requiring considerable data entry. Chapter 4 also discusses the VIC 20's real time clock and random number generator.

Chapter 5 is a tutorial on game controllers. It will show you how to use the keyboard as a game controller and how to write programs that access a joystick or paddle controller.

Chapter 6 covers graphics. It explains how the video display works, how colors are produced, and how to put characters on the screen. You will learn how to animate pictures and produce high-resolution graphics using BASIC.

Chapter 7 discusses sound generation on the VIC including the VIC sound registers, the components of sound, and how to use them. You will learn how to program music into the VIC 20 and how to save it for playback later on.

Chapter 8 explains the operation of the major VIC peripherals: the Datassette, 1540 disk drive, and 1515 printer. It contains a complete discussion of data file creation, program storage, and high-level disk operations. It also discusses all the printer commands including double width characters, reverse printing, and high-resolution graphics.

The appendixes contain tables on all the details discussed in the text, from the system architecture and block diagrams to the memory maps. You will also find diagrams showing pinouts for all of the connectors as well as color, screen, and sound value tables.

*   *   *

As the electronic industry continues to grow at an incredible rate, manufacturers are constantly introducing new equipment. Some of these products are new; others are designed to replace existing equipment.

Two that were released when this book was being written are the 1525 printer and the 1541 disk drive.

The 1525 printer is essentially an upgrade of the 1515 printer. It operates like the 1515 and interfaces to the VIC in the same way. The major differences are its slightly improved operation resulting from new internal software and its redesigned case that allows it to accept standard 9-inch (including perforations) paper.

The 1541 disk drive was introduced to provide compatibility between the VIC 20 and Commodore 64 computers. If you are using the VIC 20 alone, you can use either disk drive. Except for this compatibility difference, the two disk drives are identical.

All the information in this book applies to both new and old units of the 1515/1525 printers and the 1540/1541 disk drives.

Contents

Introducing the VIC 20 Computer

When you first unpack the VIC 20, you will find the equipment shown in Figure 1-1:
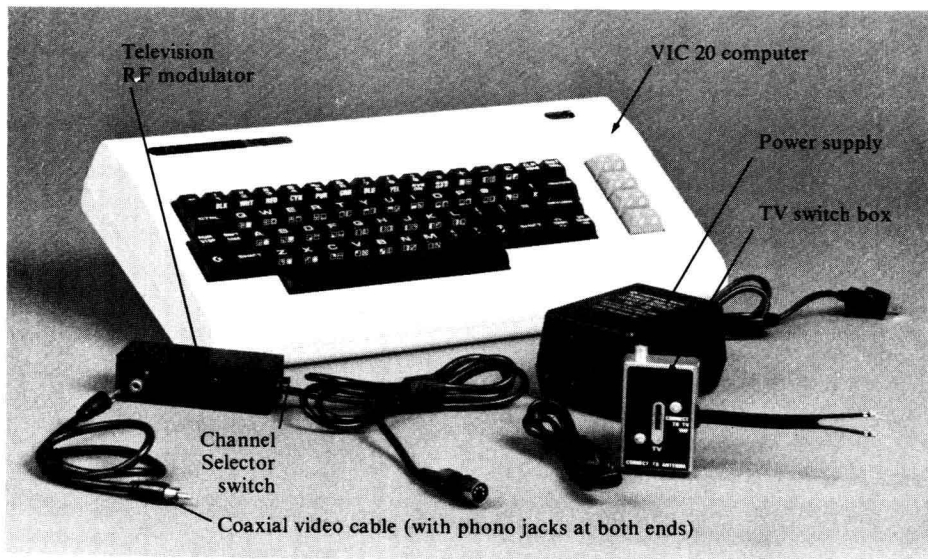
- · The VIC 20 computer
- · Television RF modulator (small black box)
- · Power supply (larger plastic box)
- · TV switch box
- · Video cable

While your system may include additional components, all systems include this basic equipment. This chapter identifies each component and connector provided by Commodore and introduces the function of each.

Place the VIC 20 on a flat surface such as a table. Make sure that you have room to put a television near the VIC 20, ideally directly behind it.

REAR AND SIDE PANEL

All of the switches, connectors, and interfaces are located at the side and back of the VIC 20 computer. These components are labeled in Figure 1-2. It is important that you learn the function and location of each

FIGURE 1-1. Equipment packed with the VIC 20
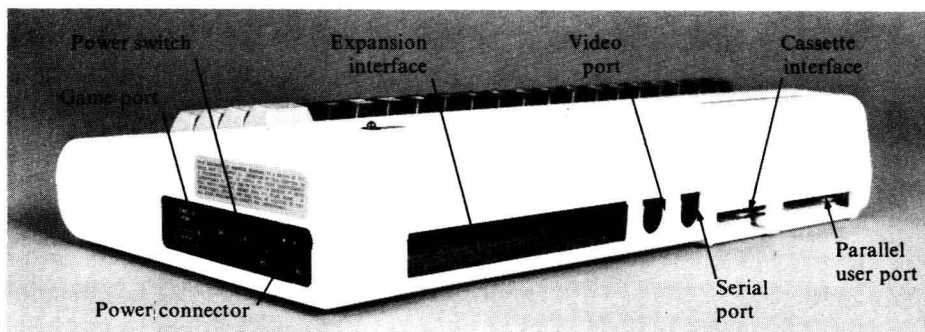
FIGURE 1-2. Rear/side view of the VIC 20

component as you hook up the computer to avoid damaging it by using connections incorrectly.

Power Switch

Make sure the VIC 20 is OFF at this point. The power switch is located on the right side of the computer. It is a two-position "rocker" switch.

When you turn the power switch ON, the VIC will display a dark screen for a short time. During this period it is *initializing* itself; that is, it is checking out its internal systems and determining how much memory it has available.

When you turn the power OFF, all programs and data in memory that were not stored onto either diskette or tape will be lost.

Power Connector

The power supply has two cables attached to it. One plugs into any standard 110 volt AC outlet. The other plugs directly into the power connector next to the ON/OFF switch on the side of the VIC 20.

Game Port

This connector is used for the various game controllers available for the VIC 20, as well as for the light pen and some special application devices. ATARI joysticks and paddles will work with this port, as well as those made by Commodore.

Parallel User Port

The parallel user port is a connector that allows you to hook up devices (such as the VIC modem) to the VIC 20.

More advanced users may use this connector for custom applications as well, since the signals coming from it can be programmed directly by the VIC 20.

Cassette Interface

The cassette interface is used to connect the Datassette, which is a special digital tape recorder. You can use it to store and reload programs and data into the VIC 20. The Datassette is described later in this chapter.

Serial Port

The serial port is used to connect the computer to the model 1515 printer, the disk drive, and other devices using a serial input/output

configuration. Instructions for connecting the printer and disk drive to the VIC 20 are provided later in this chapter.

Video Port

The VIC 20 produces the sound and pictures displayed on your television by combining them into a signal called *composite video*. This signal is sent out through the video port.

A video monitor (a television without a tuner) is able to convert the composite video directly into pictures and sound. A television, however, must be tuned to a particular channel. That signal is produced and combined with the composite video by the RF (radio frequency) modulator (the small black box in Figure 1-1).

When you use the VIC 20 you can select either channel 3 or channel 4 by flipping the channel switch on the side of the modulator.

Expansion Interface

The expansion interface gives you access to the computer's memory lines. Through it you may increase the memory size of your VIC 20 to as much as 32K (more than 32,000 bytes).

NOTE: Increasing the memory size may cause the computer's memory to be reconfigured. This will cause the screen display information and some parts of user memory to be moved to other locations in memory. Generally, this will cause no noticeable changes. In some cases, however, it will cause program run failures. Look at the memory map in Appendix B for specific information on memory expansion and reconfiguration.

Video Display

When you first power up the VIC 20 it displays 23 rows with 22 characters per row. The computer generates these characters by lighting the appropriate pattern of dots within an 8 × 8 matrix. This is illustrated in Figure 1-3. The VIC 20's character set is quite extensive, containing 256 letters, numbers, and symbols. It is also possible to program custom characters for special applications. This will be discussed in Chapter 6.

a. 8 × 8 dot matrix   b. Sample letter A   c. Sample Graphic
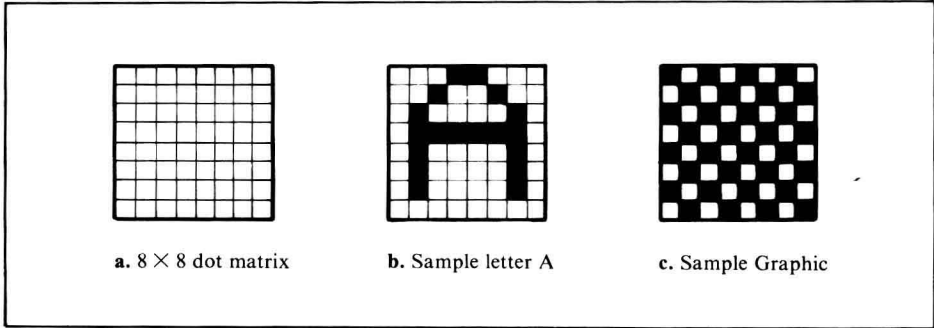
FIGURE 1-3. The 8 × 8 dot matrix

POWER UP

Connect the TV switch box to the back of the television by attaching one end of the cable with the phono jacks (Figure 1-4) to the switch box.

FIGURE 1-4. Television switch box and connections

Connect the larger plug of the video cable to the round five-pin video port on the back of the VIC 20 (see Figure 1-2).

Finally, plug the power supply cord into the VIC 20 power connector. *Do not turn on the VIC yet!*

To start using your VIC 20, follow these steps:

1. Plug the AC power cord into a wall outlet.

2. Switch the power ON. The power switch is located on the right side near the AC plug.

3. Wait for the READY display. This can take several seconds, during which the VIC is going through a self-checking and initialization process.

The following display should now appear:

```
****  CBM  BASIC  V2  ****

3583  BYTES  FREE

READY.
■
```

If you not not get this display, turn the power OFF, wait about ten seconds, and turn the power ON again. If you still don't get this display, check the connections. If that does not help, contact your Commodore dealer.

THE KEYBOARD

In almost every application the keyboard is used to communicate with the VIC 20. The keys are arranged much like those on a standard typewriter. Unlike typewriter keys, however, the VIC 20's keys can be used to access as many as three or four different symbols, characters, or functions.

The keys on the VIC 20 may be classified by function as follows:

· Alphabetic keys
· Numeric keys
· Special symbol keys
· Graphic keys
· Function keys
· Cursor control keys

Alphabetic Keys

The alphabetic keys include the 26 letters of the alphabet in both upper and lower case. When the VIC 20 is powered up, letters are displayed in upper-case. To display lower-case letters, press the COMMODORE and SHIFT keys simultaneously. If you are typing lower-case letters and wish to insert an occasional upper-case letter, use the SHIFT key as you would on a typewriter. Press SHIFT-COMMODORE again to return to upper-case mode.
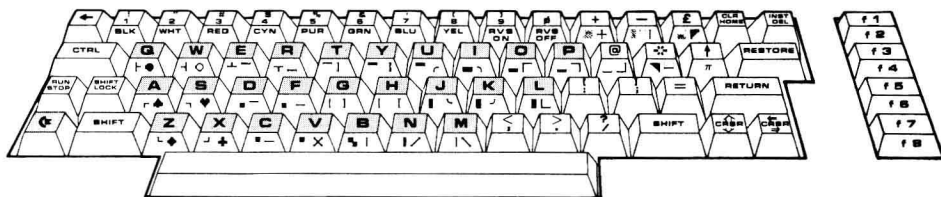
Numeric Keys

The numeric keys are used to enter the digits 0 through 9.
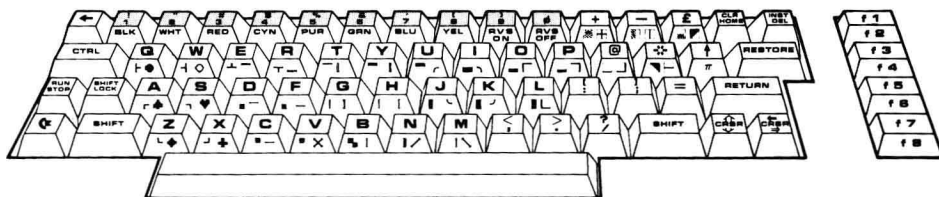
Special Symbol Keys

The special symbol keys include the following standard punctuation marks: ! ' " . , ; : ?. They also include the following mathematical symbols: + — / * ↑ = (note that a slash is used for division, an asterisk for multiplication, and an up arrow for exponentiation). Other special symbols available on the VIC 20 include # $ & @ % £ π < > [ ] ←.
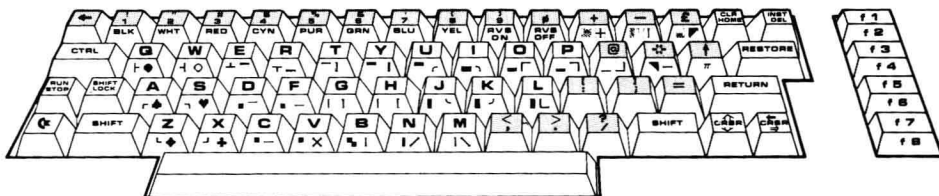
Graphic Keys

The VIC 20 also has 62 graphic symbols that may be accessed through the SHIFT or COMMODORE function keys. Using these graphic symbols, you can create fairly sophisticated display drawings.

The graphic symbols and their names are listed in Table 1-1. Similar symbols have been grouped to make graphic options immediately obvious. Note that the square enclosing each of the graphic symbols shown in Table 1-1 and Figure 1-3 is not actually part of the symbol, but has been added to show the symbol's location within its 8 × 8 grid.