
Commodore Business Computer

User's Guide

Series 2001



 **commodore**

Commodore Business Computer

User's Guide

Appropriate for use with:

- Series 2001, 16K or 32K
- Series 3000, 16K or 32K
(International Designation)

Part Number 320877



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	Commodore's Dual Drive Floppy Disk	27
	Save "dr:filename",8	28
	Verify "dr:filename", 8	29
	Verify "*",8	30
	Load "dr,filename",8	30
	Load "*",8	30
	Commodore Printer	31
Chapter 6	Error Messages	33
	Device Not Present	33
	Input	34
	Syntax	34
	Load	35
	Redo from Start	35
	Verify	36

List of Illustrations

Figure	Title	Page
1	The Commodore Business System	3
2	The Series 2001/B Computer	5
3	Rear View of Series 2001/B Computer	6
4	The CBM Series 2001/B Keyboard	9
5	Series 2001/B Character Display	9
6	IEEE Peripheral Device Contact Points	20
7	IEEE Interface Cables	20
8	Model C2N Tape Cassette	21
9	Model 2040 Dual Drive Floppy Disk	27
10	Model 2040 Dual Drive Floppy Disk, Rear View	27
11	Commodore Model 2022 Printer	31
12	Commodore Model 2023 Printer	31

List of Tables

Table	Title	Page
1	Suggested Reading List	2
2	Function Keys	10

Chapter 1

INTRODUCTION

Our congratulations on selecting the Commodore Series 2001 Computer, and specifically the “B” (Business) model. You will find that your 2001/B is a flexible and easy-to-use tool—quite suitable for whatever applications you have in mind.

Commodore is the leading innovator and advocate in bringing personal computers into the business office—delivering both professional capability and results. Your computer has been thoroughly tested and certified by Commodore prior to leaving the factory. You will find that your computer can be immediately on-line and ready to go to work.

This guide discusses the computer’s features in an easy-to-understand non-technical manner. This approach will enable you to become familiar with your computer’s basic capabilities without being intimidated by technical sounding jargon.

This guide is comprised of the following chapters:

- INTRODUCTION
- THE COMMODORE BUSINESS SYSTEM
- EXPLORING THE KEYBOARD
- TAKING COMMAND
- PERIPHERALS
- ERROR MESSAGES

The information presented in these chapters will allow you to:

- unpack and install the computer,
- use commercially prepared software,
- attach computer peripherals, and
- recognize and correct error messages.

Commodore makes no assumptions as to the user’s expertise, but does recommend the SUGGESTED READING LIST, Table 1 which, should the user wish to pursue it, can provide detailed programming and technical information. Additionally, your Commodore dealer can assist you in expanding your knowledge and understanding, thereby enhancing your proficiency.

Table 1. Suggested Reading List

- Entering Basic
J. Sack and J. Meadows, *Science Research Associates*, 1973
- BASIC: A Computer Programming Language
C. Pegels, *Holden-Day, Inc.*, 1973
- BASIC Programming
J. Kemeny and T. Kurtz, *Peoples Computer Co.*, 1967
1010 Doyle (P.O. Box 3100), Menlo Park CA 94025
- BASIC
Albrecht, Finkle and Brown, *Peoples Computer Co.*, 1973
1010 Doyle (P.O. Box 3100), Menlo Park CA 94025
- A Guided Tour of Computer Programming in BASIC
T. Dwyer, *Houghton Mifflin Co.*, 1973
- Programming Time Shared Computer In BASIC
E. H. Barnett, *Wiley-Interscience L/C 72-175789*
- Programming Language #2
Digital Equipment Corp., Maynard MA 01754
- 101 BASIC Computer Games
Software Distribution Center, *Digital Equipment Corp.*, Maynard MA 01754
- What to Do After You Hit Return
Peoples Computer Co., 1010 Doyle (P.O. Box 3100), Menlo Park CA 94025
- Basic BASIC
J. S. Coan, *Hayden Book Co.*, Rochelle Park NJ
- Workbooks 1-5
T.I.S., (P.O. Box 921), Los Alamos NM
- BASIC With Style
Hayden Book Co., Rochelle Park NJ
- Programming Proverbs
Hayden Book Co., Rochelle Park NJ
- PET and The IEEE Bus (GPIB)
Osborne/McGraw-Hill, 630 Bancroft Way, Berkeley CA 94710

The best teaching device for learning how the computer works and what it can do is the computer itself. In some cases you will be instructed to use the computer in conjunction with specified procedures in addition to reading what to do. Every effort has been made to provide sufficient documentation to allow you to get started. Essentially, then, the rest is up to you. By constructing similar, and then progressively more sophisticated procedures and examples on your own, any questions which might arise, will, in all probability be answered by the machine itself.

The Business Computer is a complete computer and its potential is virtually limitless. Information is entered via the keyboard, and displayed on the CRT. The computer is programmable using a language called Beginners All-purpose Symbolic Instruction Code (BASIC). BASIC is an English-based computer language designed to permit you and the computer to understand and communicate with each other in a friendly and non-threatening way.

At the heart of your computer is a microprocessor. The microprocessor totally controls the operation of the CRT, keyboard and assorted peripherals. Compatible Commodore peripherals include:

- Model 2040 Dual Drive Floppy Disk
- Model 2022 or 2023 CBM Printer
- Model C2N Cassette Recorder

Chapter 2

THE COMMODORE BUSINESS SYSTEM

Your computer is the brain of the Commodore business system, and, in conjunction with the peripherals is designed to:

- Store information
- Find stored information
- Update stored information
- Calculate
- Manipulate information
- Print information

Your computer is constructed in such a way that it cannot be damaged via the keyboard. The operating system cannot be destroyed because the computer software, or operating instructions, are contained in a fixed memory called a Read-Only-Memory (ROM). This feature allows the user to use the computer with impunity.

Just what is the Commodore business system? See Figure 1. The system consists of five basic components:

- Computer
- Storage Device
- Printer
- Software
- Data file

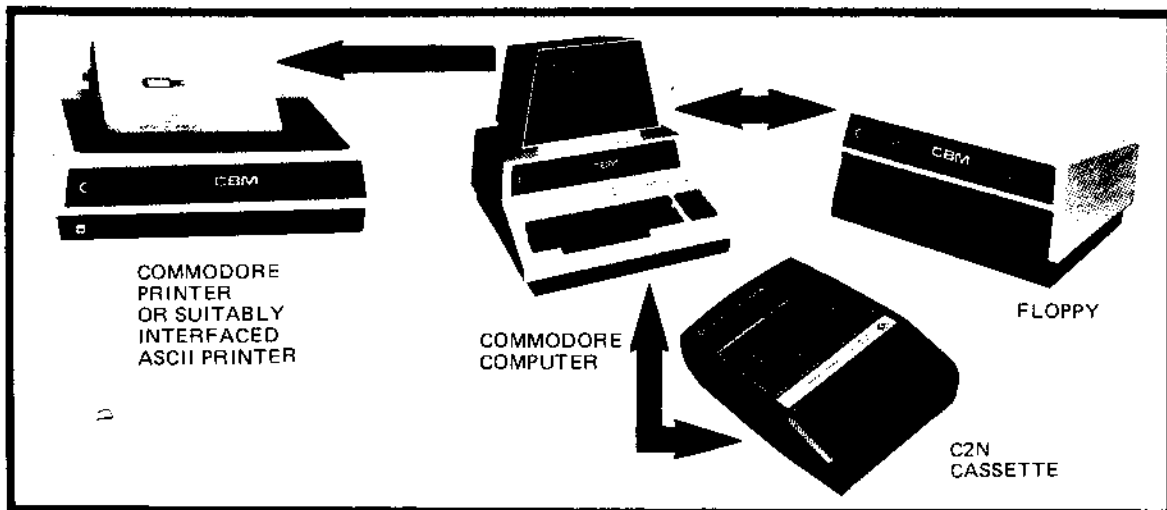


Figure 1 — The Commodore Business System

Let's examine each of these components in more detail.

- Computer** At the heart of the system is the 2001/B computer. It has two functions. First, it controls the other devices in the system. Second, it performs calculations and manipulates information. See Figures 2 and 3.
- Storage Device** There are two types of storage devices available for the system—a cassette tape drive and a floppy disk drive. Both of these devices have the same functions. First, they store information on the storage medium. Second, they can find information that has been stored on the storage medium. More will be said about these devices in the chapter titled "Peripherals".
- Printer** A printer is used to output information on paper. Commodore offers two types of printers for the business system. These will be discussed more in the chapter titled "Peripherals".
- Software** Software is the term used to describe the collection of programs which make the system perform business oriented work. A program is basically a series of instructions which is given to the computer to make it perform a specific task. So, we write a program for each business task we want the system to perform. The collection of all of these business programs is the system's business software.
- Where does this software come from? You can invent your own, but this requires a lot of work and a great deal of knowledge about computers and writing computer programs. Usually, you will purchase pre-prepared software. (Commodore offers a wide selection of software for its business system.) This software usually comes on a storage medium that is compatible with your system's storage device.
- Data Files** Data files are simply stored information. It can be information that a program needs to produce results, or it can be information that a program produces. Data files are stored on storage media, just like software. Unlike programs, data files contain no instructions to be performed by the computer and are not commonly referred to as programs.

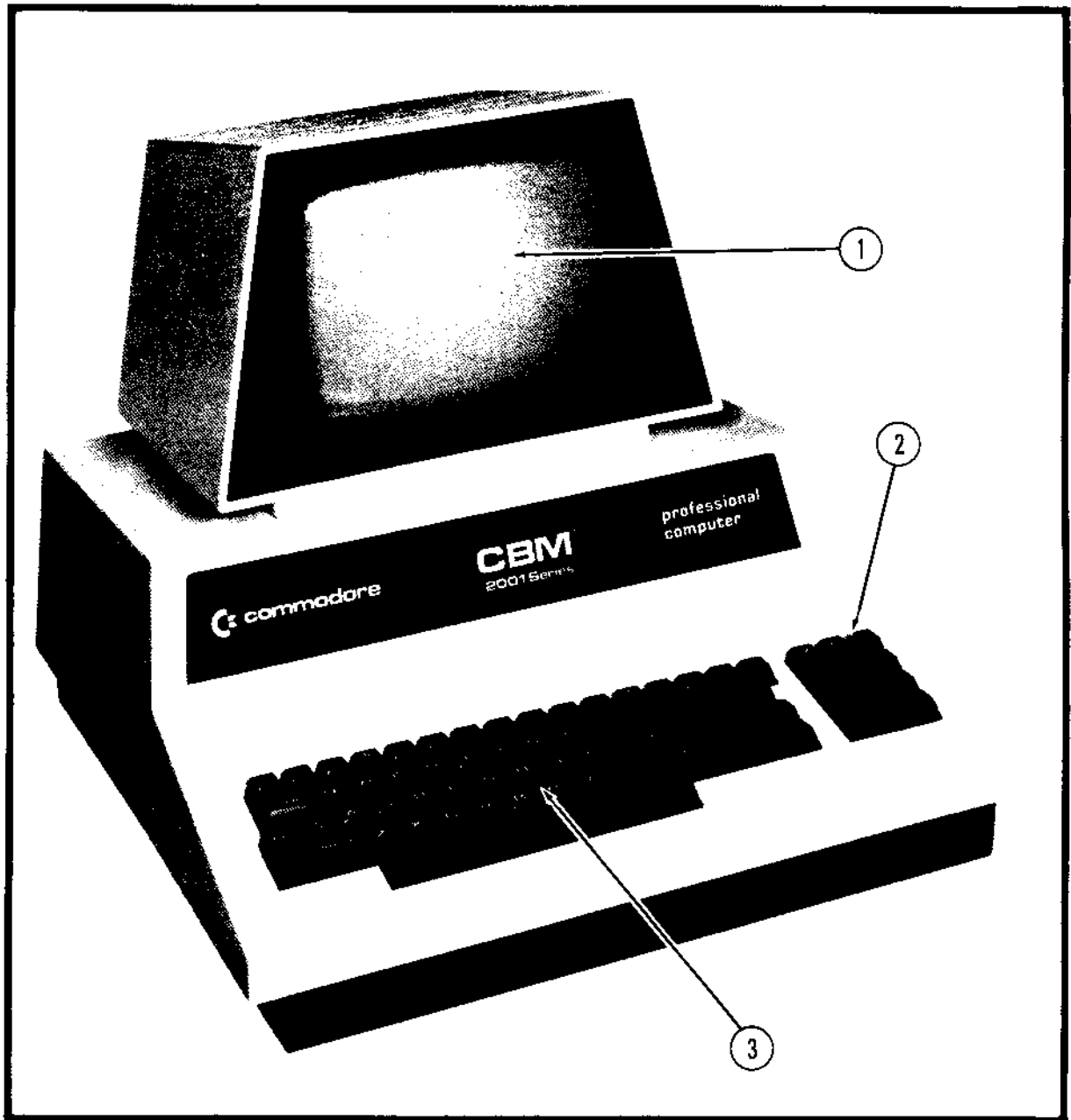


Figure 2 — The Series 2001/B Computer

1. CRT Screen — Nine-inch black-and-green video display presents up to 25 lines of information, each line being 40 characters long.
2. Numeric Keypad — For quick entry of numbers.
3. Typewriter-style Keyboard — Standard typewriter keyboard for easy entry of upper and lower case alphanumeric characters.

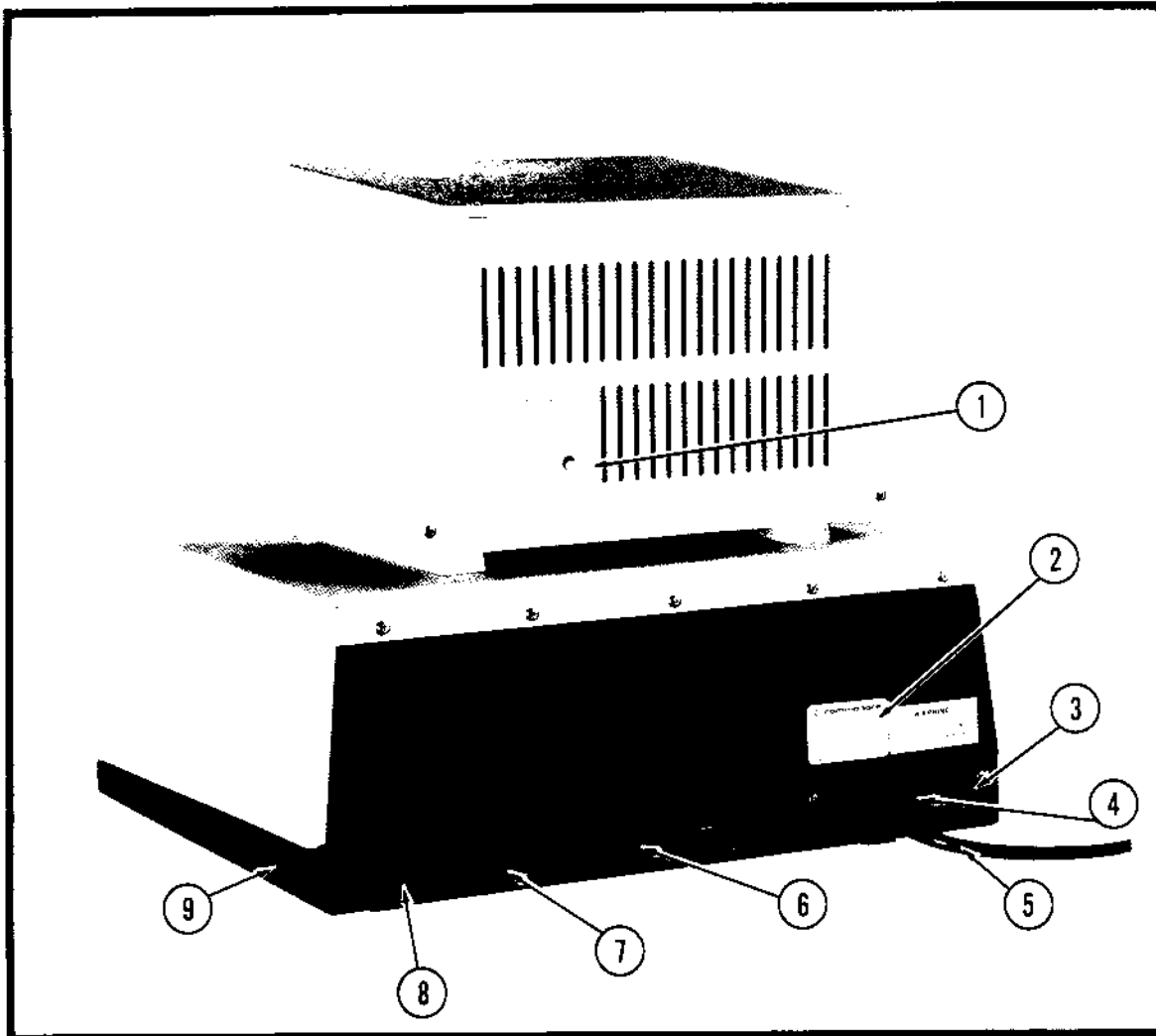


Figure 3 — Rear View of Series 2001/B Computer

1. CRT Brightness Adjustment — Makes the screen brighter or dimmer.
2. Serial Number and Electrical Specifications — Valuable information.
3. Power Switch — Turns the computer off and on.
4. Fuse — Protects the computer.
5. Three-wire AC Power Cord — Provides grounded safe power to the computer.
6. IEEE-488 Interface — For connecting intelligent IEEE-488 peripherals.
7. Parallel User Port — For connecting non-intelligent peripherals and user-built devices.
8. Cassette Interface — For connecting a cassette recorder to be used for saving or loading programs and data.
9. Memory Expansion Connector — For adding additional memory to the computer.

PREPARING THE CBM FOR USE

Unpacking and Installation

- STEP 1: Check the carton for any special unpacking instructions.
- STEP 2: Open the top of the carton and carefully remove as much of the protective styro-foam material as possible.
- STEP 3: Remove the computer from the carton and place it on a sturdy, level surface such as a table or desk.
- STEP 4: Carefully remove any protective plastic covering which may be taped to the computer.
- STEP 5: Examine the computer for any damage. If anything is amiss, report it immediately to both the place of purchase and the shipping agent.
- STEP 6: Locate the power switch. Make sure it is in the "OFF" position. If there is a dot visible on one end of the switch then it is in the "ON" position.
- STEP 7: Ensure that the voltage of your outlet matches the computer's requirement of 115-volts.
- STEP 8: Unwrap the power cord and plug it into a 3-wire, grounded AC outlet.

NOTE

For safety, a 3-wire, grounded outlet must always be used.

TURNING THE COMPUTER ON

When the computer has been properly installed, turn the power switch on the back to the "ON" position. After a few seconds you will see a collection of random letters and symbols on the CRT. This is normal. When the computer is turned on, its electrical circuits have to wake up slowly before they can clear the screen. The screen will soon clear and one of the following two messages will appear on the screen depending on whether you have a 16K or 32K.

```
### commodore basic ###  
31743 bytes free  
ready  
█
```

SERIES 2001/B 32K

```
or  
### commodore basic ###  
15359 bytes free  
ready  
█
```

SERIES 2001/B 16K

If the screen does not clear or any other messages appear, turn the power switch to "OFF", wait 5 seconds, and turn the switch "ON" again. If the appropriate message still does not appear, turn the computer "OFF" and notify the place of purchase immediately.

The three-line message that appears on the screen when power is applied is interpreted as follows:

- Line one indicates that the computer will respond to BASIC language commands.
- Line two indicates the amount of memory space that the computer has to store information.
- Line three means the computer is "ready" to work.

The blinking square at the bottom is called the "cursor" and indicates where the next character will appear on the screen.

CARE OF YOUR CBM

The computer requires almost no care. Only occasional cleaning of the case, keyboard and screen should be necessary. Use a damp, not wet, cloth to wipe off any dirt. Do not use spray cleaners, since the mist from the nozzle may get inside the computer and cause damage.

If anything should ever go wrong with your computer, take it to an authorized Commodore dealer.

Chapter 3

EXPLORING THE KEYBOARD

You can not communicate effectively with the computer until you have explored the keyboard. Actually, the computer has two keyboards. One looks very much like a typewriter keyboard, the other is a calculator-style keyboard used to rapidly enter numbers. See Figure 4.

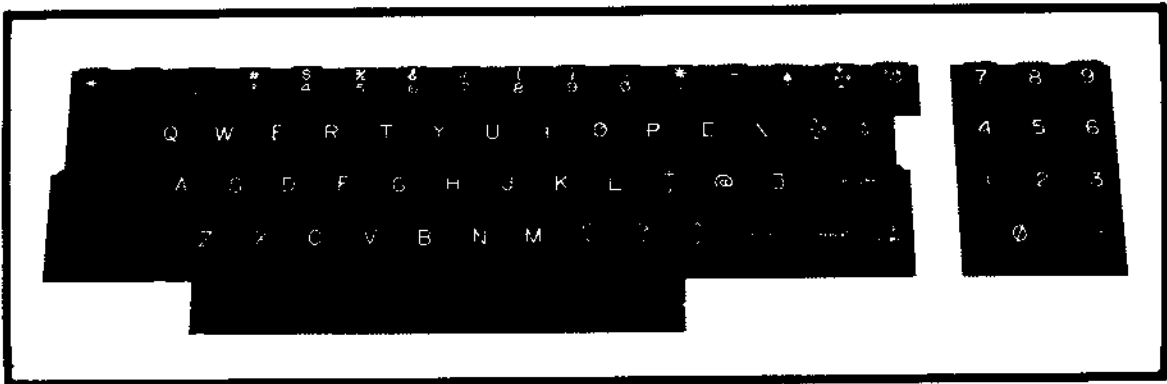


Figure 4 — The CBM Series 2001/B Keyboard

Most of the keys on the typewriter-like keyboard look and function just like their typewriter counterparts except they cause characters to be displayed on the CRT rather than printed on a piece of paper.

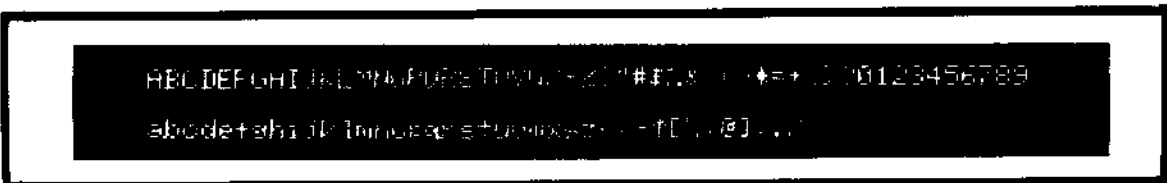


Figure 5 — Series 2001/B Character Display

Figure 5 shows the different characters the keyboard causes to be displayed on the CRT.

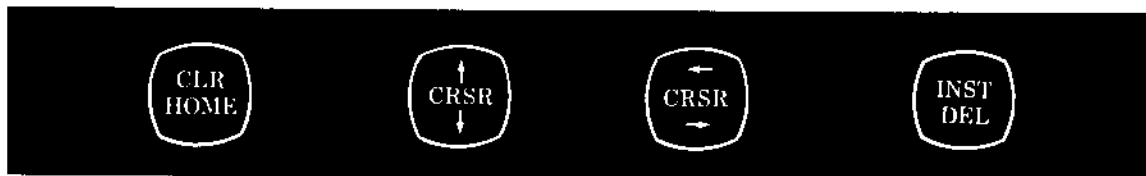
As mentioned earlier, most of the keys function like those on a typewriter. The exceptions to this are the function keys. The function keys are described briefly in Table 2.

Table 2. Function Keys

KEY	NOT SHIFTED	SHIFTED
CLEAR/ HOME	Moves cursor to upper left corner of screen.	Clears display screen and moves cursor to upper left corner of screen.
CURSOR UP/DOWN	Moves cursor down one line. When cursor is at the bottom of the screen, print will move off top of screen. Does not affect characters as cursor passes over them.	Moves the cursor up one line. Will not go off top of the screen. Does not affect characters as the cursor passes over them.
CURSOR LEFT/RIGHT	Moves cursor one space to the right. Will move to beginning of next line when it hits the edge of the screen. Does not affect characters as the cursor passes over them.	Moves cursor one space to the left. Moves to the end of the preceding line when it hits the edge of screen. Does not affect characters as the cursor passes over them.
INST DEL	Deletes the character immediately to the left of cursor. All characters to right of deletion are moved one space to the left.	Inserts a space at cursor position. All characters move one space to the right.
OFF RVS	Prints black characters on green background.	Resets characters to normal green-on-black printing.
RETURN	Sends information on screen preceding cursor to the computer for processing and moves cursor to the beginning of the next line.	Moves the cursor to the beginning of the next line without sending information to the computer.
RUN STOP	Stops the function of the computer, whatever it is doing (i.e., loading, running).	Loads and runs a program from tape #1.
TAB	Not used	Not used
ESC	Not used	Not used
REPEAT	Not used	Not used

SCREEN EDITING KEYS

Commodore Computers have a feature called "screen editing" which allows you to move the cursor to any position on the screen and insert, delete, or retype characters. Characters which are already on the screen will not be affected by the cursor's movement. Four of the function keys are used in screen editing. These are:



All of these keys have two functions. Their action depends on whether or not the SHIFT key is pressed in conjunction with the screen editing key. Let's examine the screen editing keys and their functions through the use of examples.

STEP 1: Turn your computer on.

STEP 2: Press the CLR/HOME key. Notice that the cursor moves to the top left corner of the screen.

STEP 3: Hold the SHIFT key down and press the CLR/HOME key. This action erases all of the characters that were present.

STEP 4: Now type the alphabet followed by the numbers 0 through 9. End the line with four asterisks—*. Notice that after you type the last "*", the cursor moves to the beginning of the next line. This is called "wrap around".

NOTE: If you make a mistake while typing, press INST/DEL to remove the error and retype the correct character.

```
abcdefghijklmnopqrstuvwxyz0123456789****
```

You'll notice that there are 40 characters on the line—26 alphabetic, 10 numeric and 4 operators.

STEP 5: Now hold the SHIFT key down and press the CRSR LEFT/RIGHT key. This moves the cursor to the left. Notice how the cursor "wraps around" back to the end of the first line. Continue moving the cursor left until it rests on the zero. As the cursor moves, it does not affect the characters it passes over.

```
abcdefghijklmnopqrstuvwxyz 123456789****
```

STEP 6: Now hold the SHIFT key down and press the INST/DEL key four times. This will insert four spaces before the zero and move the text four spaces to the right of the cursor. The four *'s wrap around to the second line.

```
abcdefghijklmnopqrstuvwxyz 0123456789  
****
```

STEP 7: Type four asterisks into the space created by the INST/DEL key. We have now inserted the arithmetic operator symbols between the alphabet and the numbers.

```
abcdefghijklmnopqrstuvwxyz**** 123456789  
****
```

However, asterisks still exist on the next line.

To remove them—

STEP 8: Press the CRSR LEFT/RIGHT key until the cursor wraps around to the offending line. Position the cursor just after the last “**”.

```
abcdefghijklmnopqrstuwxz****0123456789
****█
```

STEP 9: Use the INST/DEL key to delete the four asterisks on the second line.

```
abcdefghijklmnopqrstuwxz****0123456789
█
```

STEP 10: Move the cursor down one line by pressing the CRSR UP/DOWN key once.

STEP 11: Type “This is the top.”

STEP 12: Move the cursor to the top line by holding the SHIFT key down and pressing the CRSR UP/DOWN key twice.

STEP 13: We’ve seen that there are 40 characters on each line. Let’s see how many lines there are. Press the CRSR UP/DOWN key counting each keystroke as one. The cursor will move down the screen, reaching the bottom on the 24th keystroke. To prove this, press the CRSR UP/DOWN key a 25th time. You will see that the top line of the screen moves up and off the screen. The line “This is the top.” is now the top line. This action of inserting lines at the bottom and moving old text up is called “scrolling”.

```
This is the top.
```

We started on line one and used 24 key strokes to reach the bottom of the screen. This means the screen will display 25 lines at one time before scrolling.

STEP 14: The screen only scrolls from the bottom up. Prove this by pressing CLR/HOME. With the cursor at the top of the screen, try scrolling the screen down by holding the SHIFT key down and pressing the CRSR UP/DOWN key repeatedly. Notice that this does not affect the screen.

```
█his is the top.
```

THE CHARACTER REVERSE KEY

Normally, the screen displays a lighted character (green) on a dark background (black). Using the OFF/RVS key you can highlight information on the screen by printing black-on-green, rather than green-on-black. Try the following example.

STEP 1: Turn the computer on.

STEP 2: Clear the screen. SHIFT, CLR/HOME.

STEP 3: Type: AAA.

STEP 4: Press the OFF/RVS key.

STEP 5: Type: BBB. (Notice that the Bs are printed in reverse:—black-on-green).



```
AAA BBB
```

STEP 6: Hold the SHIFT key down and press the OFF/RVS key. This returns the printing of text to its normal green-on-black. To check this:—

STEP 7: Type: CCC.



```
AAA BBB CCC
```

THE RETURN KEY

Up to now we have simply been typing information on the screen. The computer has been ignoring everything we have typed. In order to make the computer aware of things we've typed we must send it a signal. We do this by pressing the RETURN key. The data which you enter using RETURN can be processed immediately by the computer.

As stated earlier, a program is a series of instructions that the computer performs to produce a specific result. Just as a chef mixes ingredients following a recipe step-by-step to create a meal, the computer performs the instructions contained in a program to produce meaningful results. The order in which the computer performs the instructions is contained in the program itself. Each instruction has a number preceding it. This is called the line number. The line number tells the computer the order in which to "run" a program. The line number also tells the computer to store the information in memory as part of a program. Each new program line is put in numerical order with the program lines already stored in memory. Program lines are stored until the user tells the computer to execute the program. If an instruction is not preceded by a line number, the computer will execute it immediately.

THE RUN/STOP KEY

When shifted, the RUN/STOP key is used to enter programs into the computer's memory from a cassette tape rather than from the keyboard. The use of this key will be more fully discussed in the chapter titled "Peripherals".

Unshifted, this key functions as a break key. It interrupts whatever the computer is doing, such as loading a program, or executing one, and returns it to user control. The screen will display "ready." and the blinking cursor will await your command.

Chapter 4

TAKING COMMAND

Certain BASIC commands are used to manipulate programs in the computer. Normally, a command is used after the computer has printed "ready" on the screen followed by the cursor. The commands are entered into the memory by typing the command and pressing the RETURN key.

The computer is very picky about how the commands are worded. In English and in BASIC, words must be spelled and used correctly or they make no sense. The grammatical rules governing the correct usage of the BASIC language are called syntax.

Syntax dictates the correct spelling and usage of the BASIC instruction set. If an operating system command is entered into the memory which does not obey the BASIC language syntax, the computer will reject it as useless data by printing "? syntax error" on the screen. Try the following:

STEP 1: Clear the screen. SHIFT, CLR/HOME.

STEP 2: Type: CBM.

STEP 3: Press RETURN.

Since CBM is not one of the system operating commands, the computer will respond:

```
CBM
?syntax error
ready.
█
```

In order to correct a syntax error, you must re-enter the command using correct syntax.

Now let's look at the six operating system commands and learn their forms and function. The commands are:

RUN	NEW
LIST	SAVE
VERIFY	LOAD

NOTE: Commands must be entered using lower case (unshifted) characters only on the Business model.

Each command will be defined in terms of its function. An example will be given for each command to clarify its function and syntax. These examples are in the form of a short program that you can enter into the computer via the keyboard. Type each line of the example exactly as it is worded (remember syntax). Use the screen editing functions to correct each line if necessary. After each line has been typed correctly, press RETURN to enter the line into the computer's memory. For example, if you are asked to:

Type: print a

you would type "print a" and press RETURN.

RUN COMMAND

The RUN command begins the execution of a program stored in the computer's memory.

STEP 1: Clear the screen.

STEP 2: Type: 1 print "Hello!"

STEP 3: Type: 2 print "I'm your new CBM."

STEP 4: Type: 3 print "So long for now."

STEP 5: Type: 4 print "*****"

STEP 6: Type: run

At this point the computer will execute the program starting with line 1. The screen will show:

```
1 print "Hello!"
2 print "I'm your new CBM."
3 print "So long for now."
4 print "*****"
```

```
run
```

```
Hello!
I'm your new CBM.
So long for now.
*****
```

```
ready.
```

```
█
```

LIST COMMAND

The LIST command will print the entire program stored in the computer's memory.

STEP 1: Clear the screen.

STEP 2: Type: list

The computer will direct the printing of the program you entered earlier.

```
list
1 print "Hello!"
2 print "I'm your new CBM."
3 print "So long for now."
4 print "*****"

ready.
█
```

NEW COMMAND

The NEW command erases all programs from the computer's memory. Without using the NEW command a program will remain in memory until the power is turned off, or until a new program is loaded in.

STEP 1: Clear the screen.

STEP 2: Type: new

STEP 3: Type: list

The program we have been using up to now has been erased by the NEW command. When we try and list the program we find it is not there:

```
new
ready.

list

ready.
█
```

SAVE COMMAND

The SAVE command is important since the computer forgets everything in its memory when the power is turned off. The SAVE command is used to store information in the computer's memory on a long-term storage medium, i.e., cassette or floppy disk. Without this command, you would have to reenter information using the keyboard every time you wanted to use it. With this command you can recall information at any time.

The computer can save two types of information: programs and data.

- Programs have already been defined as a series of instructions.
- Data is simple information that the computer may need for a program (a series of numbers) or information that the computer has produced as the result of a program.

The computer stores both types of information as an information file:—either a program file or a data file. The SAVE command will be discussed more fully when we talk about peripheral devices.

VERIFY COMMAND

The VERIFY command ensures that information transmitted from the computer to a storage medium has been copied exactly as it was stored in memory. It does this by comparing the information in the computer's memory to the information recorded on the storage medium. Since VERIFY is used in conjunction with peripheral storage devices, it will be more fully described in the next chapter.

LOAD COMMAND

The LOAD command has more or less the opposite effect of the SAVE command. It transfers information from a storage medium into the computer's memory, saving you the time and effort required to enter the information into the computer using the keyboard. The LOAD command is also useful for entering software which someone also has already written.

Since LOAD deals with peripheral devices, it will be discussed in greater detail in the next chapter.

Chapter 5

PERIPHERALS

Peripheral devices, or peripherals, are simply pieces of equipment that are attached to a computer to allow it to perform some specific function. Examples of peripherals are information storage devices, printers, heat sensors, and TV cameras.

In order to make the 2001/B computer as flexible and versatile as possible, it has been designed to connect to many different types of peripherals. Different peripherals require different types of connectors and electrical signals to make them work. A kind of electrical bridge must be provided between the computer and its peripherals. This bridge is called an "interface". CBM has four types of interfaces:

- IEEE-488 Interface
- Parallel User Port
- Tape Cassette Interface
- Memory Expansion Port

IEEE-488 INTERFACE

The computer can be connected to IEEE-488 devices through the IEEE-488 interface. This interface is located on the back of the computer. See Figures 6 and 7. IEEE-488 is the designation given to a particular interface method by the Institute of Electronic and Electrical Engineers (IEEE).

All interface cables connect to the main logic printed circuit board located inside the computer housing. Openings in the rear and righthand side panel of the computer housing expose the press fit connection points. See Figure 6.

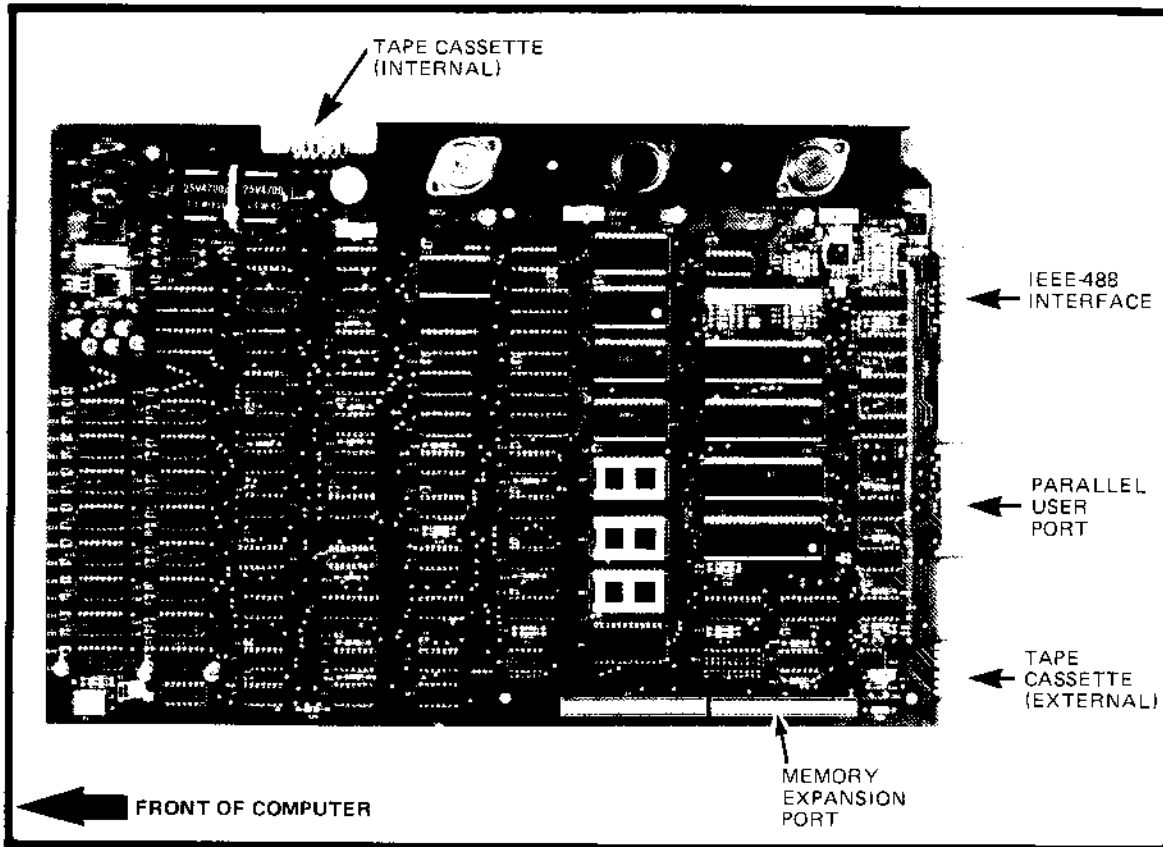


Figure 6 — IEEE Peripheral Device Contact Points

The IEEE-488 interface can be used to attach up to 15 IEEE-488 devices at a time to the computer. Each IEEE-488 peripheral has a unique device number assigned to it. The computer “talks” or “listens” to devices connected to the IEEE-488 interface by addressing them with their device number. For example, suppose two devices are connected to the computer’s IEEE-488 interface. One has device number 4 and the other has device number 8. If the computer sends a signal to device 4, both peripherals receive the signal, but only device 4 would respond.

To connect several peripherals to one plug, a special PET-to-IEEE-488 cable is used. It is pictured in Figure 7(B). This cable can be plugged into the computer and have an IEEE-to-IEEE cable plugged into it piggy-back fashion. In this way, up to 15 IEEE-488 peripherals may be attached to the computer at the same time.

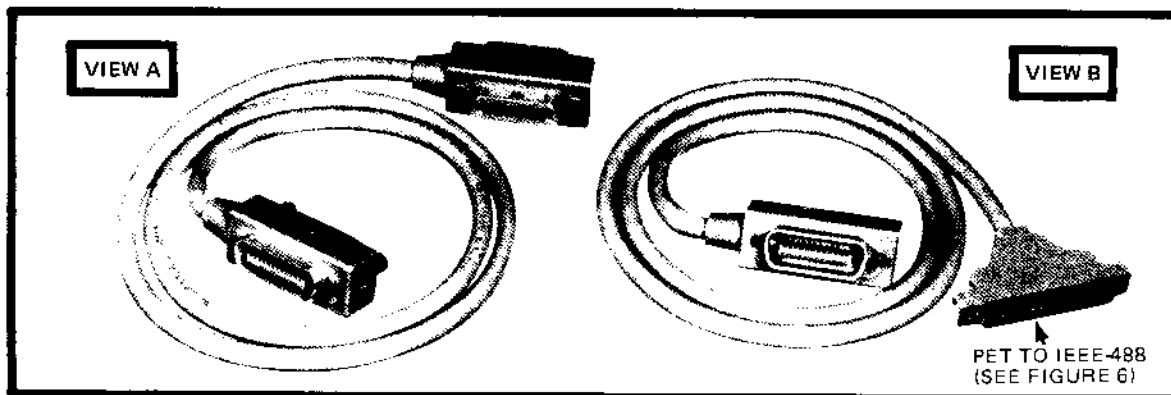


Figure 7 — IEEE Interface Cables

A PET-to-IEEE cable (P/N 320202), Figure 7(B), must be used to connect a peripheral to the computer. This interface cable is available through Commodore or your dealer. NOTE: The IEEE-IEEE (Figure 7(A)) cable can not be used to connect the computer to a peripheral. It is used only to connect peripherals to each other.

PARALLEL USER PORT

User built devices and many non-IEEE-488 devices can be connected to the parallel user port. See Figure 6. Normally, the port will accept only one peripheral at a time.

MEMORY EXPANSION PORT

The memory expansion port can be used to interface additional memory to the computer. See Figure 6.

CASSETTE TAPE INTERFACE

The connector on the extreme left on the back of the computer (see Figure 6) is the connector for attaching a cassette tape drive to the computer. Another cassette interface is available for a second cassette drive, and is located inside the computer's housing. Commodore supplies cassette drives with a cassette-interface compatible connector.

The Commodore Tape Cassette (Model C2N) is used as a storage device. It can record information from the computer's memory onto a cassette tape and can play information already recorded back into memory. See Figure 8.

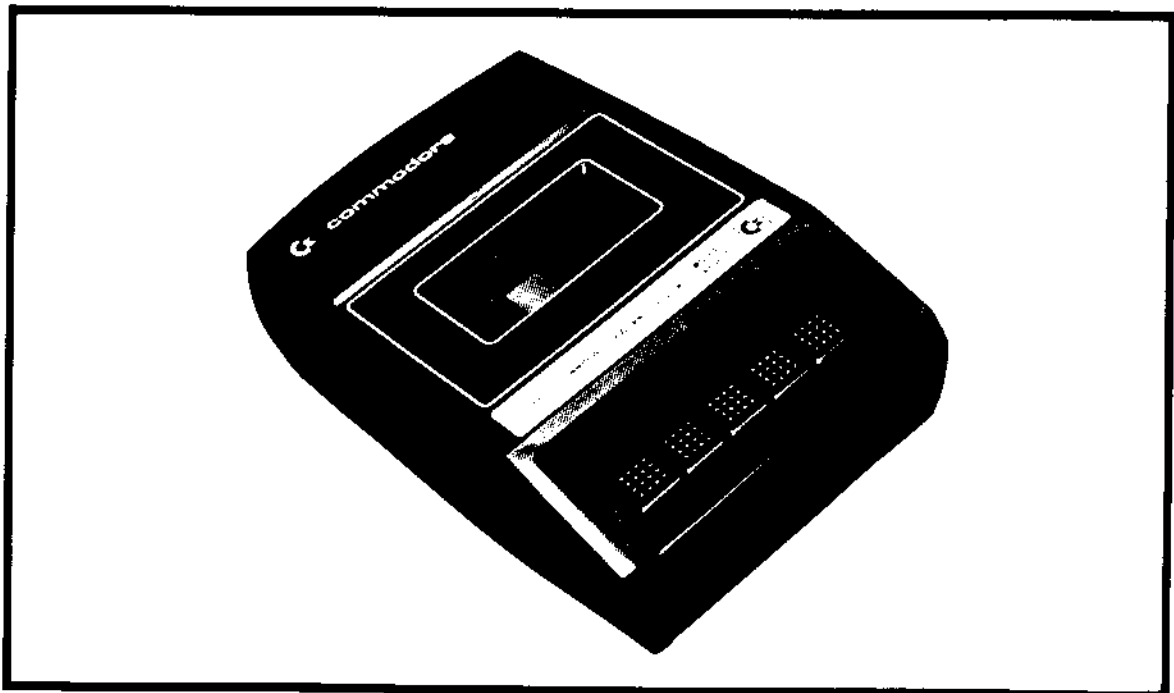


Figure 8 — Model C2N Tape Cassette

To attach a single cassette drive, simply plug its connector into the primary cassette interface on the back of the computer (Figure 6). If you require a second cassette for more advanced data handling capability, you should consult your dealer as the second cassette interface is inside the computer housing. Reference Figure 6.

There are five commands that are used to write information onto or read information from a cassette tape. They are:

```
save "filename"      load "filename"
save "filename",2    load "filename",2
verify "filename"
```

Each of these commands will be defined along with a brief example to illustrate their use. If your computer has a cassette attached, please try the examples.

Save 'filename'

The SAVE "filename" command is used to write a file named "filename" onto a tape in the primary cassette unit. The file name does not need to be specified.

STEP 1: Insert a blank cassette into the primary cassette drive and rewind it. Use only low-noise music quality cassette tape for the best results.

STEP 2: Type: new

STEP 3: Clear the screen.

STEP 4: Type: 15 print "This is a test"

STEP 5: Type: save "test"

We have now asked the computer to save the one line program we wrote and to call it test. We could have named it anything we wanted as long as the name was not more than 16 characters long. At this point the screen displays:

```
15 print "This is a test"
save "test"

press play & record on tape #1
```

STEP 6: Press the lock the RECORD and PLAY buttons on the cassette.

The computer will save the program on the cassette tape.

```
15 print "This is a test"
save "test"

press play & record on tape #1

ok

writing "test"

ready.
█
```


STEP 7: Press the STOP button and REWIND the tape. Leave the tape in the drive for now.

DO NOT TURN THE COMPUTER OFF OR USE THE "NEW" COMMAND AT THIS TIME

Save "filename",2

This command is exactly the same as the SAVE "filename" command except that it writes the file on the secondary cassette.

Verify "filename"

This command verifies that a file named "filename" on the primary cassette drive contains the same information stored in the computer's memory. It does this by reading the file off the cassette tape and comparing it to the information in memory. This command ensures that your tape copy of the information is accurate.

NOTE: If the file name is not specified the computer will use the first file it comes to on the cassette tape in the verification process.

STEP 1: Make sure that the tape with "test" on it is in the primary cassette drive and that the tape is rewound.

STEP 2: Clear the screen.

STEP 3: Type: verify "test"

The computer will request:

```
verify "test"  
press play on tape #1
```

STEP 4: Press PLAY. The computer will search the tape for "test".

```
verify "test"  
press play on tape #1  
ok  
searching for test
```

Once the computer finds "test" it will begin verification.

```
verify "test"  
press play on tape #1  
ok  
searching for test  
found test  
verifying
```

Once the file has been verified, the screen will display:

```
verify "test"

press play on tape #1
ok

searching for test
found test
verifying
ok

ready.
█
```

If the computer finds that the recorded file is not the same as the information in memory, it will display:

```
verify "test"

press play on tape #1
ok

searching for test
found test
verifying
?verify error
ready.
█
```

If this occurs, go back to Step 1 and try again. If you still get "verify error", reSAVE your information and verify it again.

Load "filename"

The LOAD "filename" command is used to enter a file named "filename" into the computer from the primary cassette player. If "filename" is not specified, the computer will load the first file it finds on the tape.

STEP 1: Press STOP. Rewind the tape with "test" on it.

STEP 2: Clear the screen.

STEP 3: Type: new. Now "test" is no longer in the computer's memory.

STEP 4: Type: load "test"

The computer will display:

```
new
ready.
load "test"

press play on tape #1
```

STEP 5: Press PLAY. The computer will search for "test".

```
new
ready.
load "test"

press play on tape #1
ok

searching for test
```

When it finds the file it will load it.

```
new
ready.
load "test"

press play on tape #1
ok

searching for test
found test
loading
ready.
█
```

Sometimes the computer will fail to load a file correctly. When this occurs it displays:

```
new
ready.
load "test"

press play on tape #1
ok

searching for test
found test
loading
?load error
ready.
█
```

If this occurs go back to Step 1 and try again.

STEP 6: Type: list.

The program "test" will now be displayed. Note that it is identical to the program you originally typed in.

```
new
ready.
load "test"

press play on tape #1
ok

searching for test
found test
loading
ready.
list
15 print "This is a test"

ready.
█
```

Load "filename",2

This command has the same function as the LOAD "filename" command, only it loads the named file from the secondary cassette.

Quick Load For Program Files

In order to load the next program file on the tape quickly, try this:

STEP 1: Press SHIFT. While holding this key down,

STEP 2: Press and release the RUN/STOP key.

STEP 3: Release SHIFT.

The screen displays:

```
load
press play on tape #1
```

Once the program file is loaded with this method, the computer will automatically RUN it for you. Pressing the RUN/STOP key a second time will "break" or stop the quick load procedure.

COMMODORE'S DUAL DRIVE FLOPPY DISK

The Commodore dual drive floppy disk unit (Model 2040) is IEEE-488 device number 8. It is used for storing information from and entering information into the computer's memory. Its purpose, then, is much like the cassette drive. In function, however, it is vastly different. Instead of using a cassette tape as the storage medium, it uses floppy disks.

Floppy disk drives have several advantages over tape cassettes. First, they are very fast. Where it may take up to five minutes or more to find and load a file from a cassette, the floppy disk drive can accomplish the same thing in seconds. Another advantage is that a floppy disk can store more information than a cassette tape. The floppy disk drive is pictured in Figures 9 and 10.

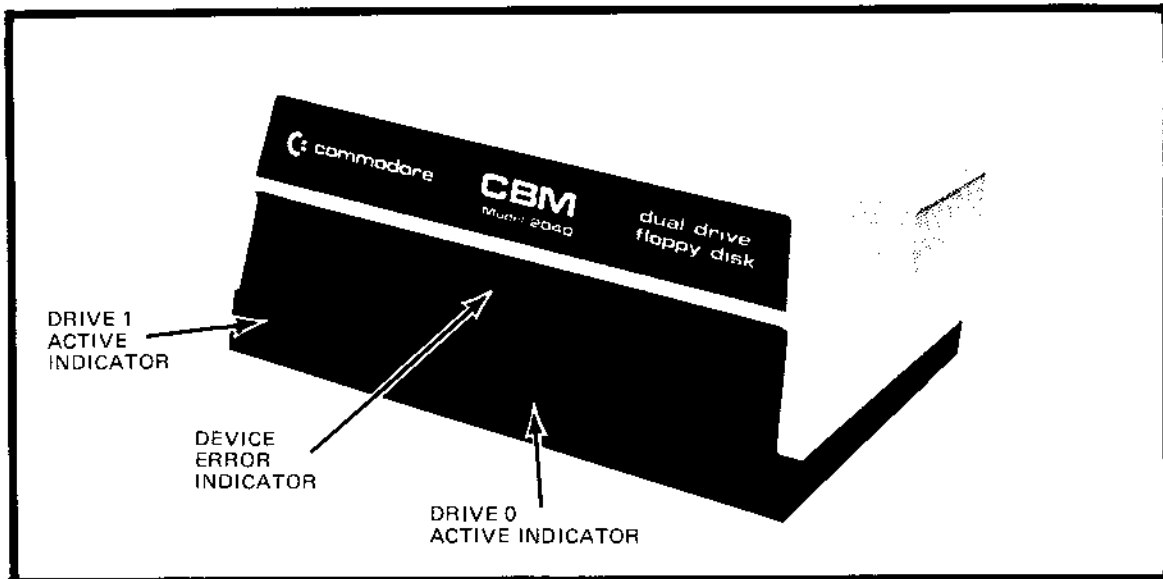


Figure 9 — Model 2040 Dual Drive Floppy Disk

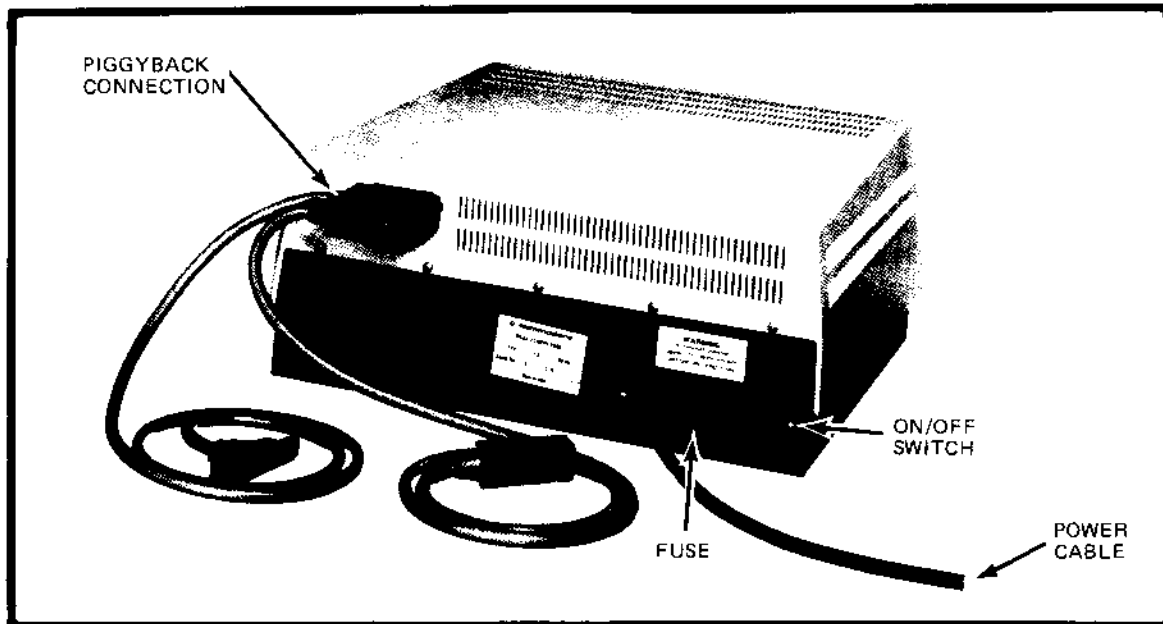


Figure 10 — Model 2040 Dual Drive Floppy Disk, Rear View

For more details on how the drive works and how to attach it to your computer, please refer to the "Commodore CBM Dual Drive Floppy Disk Model 2040 User's Manual".

Now let's look at some of the simple commands you'll need to use the disk drive. For more information on disk commands read the floppy disk drive user's manual. There are five commands used to write data onto or read data from a floppy disk. They are:

```
SAVE "dr:filename",8    VERIFY "*" ,8    LOAD "*" ,8
VERIFY "dr:filename",8  LOAD "dr:filename",8
```

Each of these commands will be defined along with a brief example to illustrate their use. If your computer has a dual drive floppy disk attached, please try the examples. Before we can use a new floppy disk, we must prepare (format) it in a certain fashion. Let's take time now to prepare a disk to use in the examples that follow.

STEP 1: Insert an unused disk into the left-hand drive and close the door. Insert the disk as shown in the User's Manual.

STEP 2: Clear the screen.

STEP 3: Type: open 1,8,15

STEP 4: Type: print#1,"nl:new disk,99"

The screen will display:

```
open 1,8,15
ready.
print#1,"nl:new disk,99"
ready.
■
```

Always use a unique disk ID. It can be any two characters. The formatting will take about 80-seconds.

A new disk should be formatted (or "newed") only once. Whenever a formatted, or previously used disk is inserted into the drive, it must be INITIALIZED for use. To initialize a disk, type: open 1,8,15,"i1" <RETURN>. If the disk is in drive 0, use "i0". You cannot initialize a brand-new (unformatted) disk, but all other disks must be initialized EACH TIME they are inserted into the drive.

Save "dr:filename",8

This command will save a file named filename on the floppy disk in drive number 0 or 1. The file name, "filename", can be any name of 16 characters or less.

There are two drives on the dual disk drive, the one on the right is drive number 0. The drive on the left is drive number 1.

STEP 1: Your formatted floppy disk should still be in drive 1. If you have removed it, initialize it as follows:

```
open 1,8,15
print#1,"i1"
```

STEP 2: Clear the screen.

STEP 3: Type: new

STEP 4: Type: 15 print "Floppy Test"

STEP 5: Type: save "1:test",8

The screen will now display:

```
new
ready.
15 print "Floppy Test"
save "1:test",8
ready.
█
```

If the light between the two drives lights and stays lit, an error has occurred. When this happens, press the RUN/STOP key, go to Step 5 and try again.

DO NOT TURN OFF THE MACHINE OR USE THE "NEW" COMMAND AT THIS POINT.

Verify "dr:filename", 8

This command verifies that a file named filename stored on a floppy disk contains the same information which is stored in the computer's memory. This command is similar to the VERIFY command used with the cassette. Once again dr refers to the drive number, either zero or one.

STEP 1: Make sure the disk with "test" on it is in drive 1 and that the door on the drive is closed.

STEP 2: Clear the screen.

STEP 3: Type: verify "1:test",8

Once verified, the screen displays:

```
verify "1:test",8
searching for 1:test
verifying
ok
ready.
█
```

If a verify error occurs, go to Step 1 and try again. If the error persists, reSAVE the program and verify it again.

Verify "*",8

This form of VERIFY simply verifies the last file saved.

STEP 1: Make sure that the disk having "test" on it is in drive 1 and that the door on the drive is closed.

STEP 2: Clear the screen.

STEP 3: Type: verify "*",8

STEP 4: Proceed as with VERIFY "dr:filename".

Load "dr,filename",8

This command is used to load a file named filename from drive number dr into the computer's memory.

STEP 1: Make sure the disk having "test" on it is in drive 1 and that the door on the drive is closed.

STEP 2: Clear the screen.

STEP 3: Type: new

STEP 4: Type: load "1:test",8

The computer will now search for "test" and load it.

```
new
ready.
load "1:test",8

searching for 1:test
loading
ready.
█
```

If a load error occurs, press RUN/STOP and go back to Step 4.

Load "*",8

This command initializes a disk in drive 0 and loads the first file on the disk into memory. To utilize this command, it must be the first disk command given after a cold start.

STEP 1: Reset the computer by turning it OFF, then ON.

STEP 2: Make sure the disk having "test" on it is in drive 0 and that the door on the drive is closed.

STEP 3: Type: load "*",8

The computer will initialize the disk in drive 0, search for the first program and load it.


```
### commodore basic ###  
  
31743 bytes free  
  
ready.  
load "*",8  
  
searching for *  
loading  
ready.  
█
```

COMMODORE PRINTER

The Commodore printers, either Model 2022 or 2023, are IEEE-488 device number 4. See Figures 11 and 12. They are used to print information stored in the computer's memory onto paper for permanent reference. The printer may also be used to print results generated by a program.



Figure 11 – Commodore Model 2022 Printer

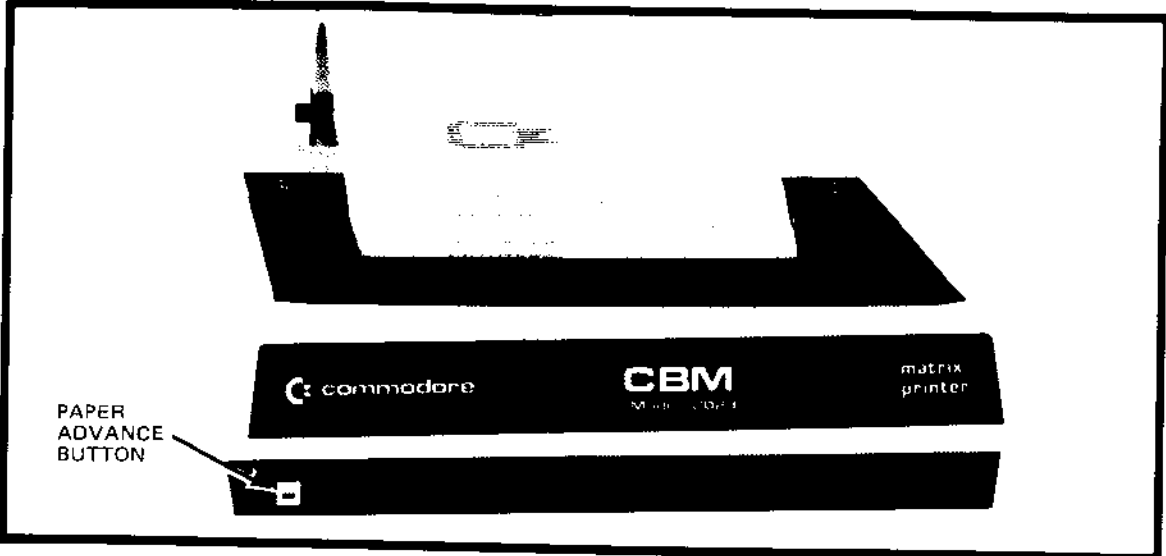


Figure 12 – Commodore Model 2023 Printer

Since most programs that you will use that output data to the printer already have the necessary printer commands incorporated into them, we will concentrate on the sequence of commands that list programs from the computer's memory to the printer. For more information on printer commands, and attaching the printers to the computer, see the user's manuals for the Commodore Model 2022 and 2023 printers.

The sequence of commands for listing programs on the printer will now be presented in the form of an example. If you have a printer attached to your computer, try the following example:

STEP 1: Type: new

STEP 2: Clear the screen.

STEP 3: Type: 15 print "This is a printer test."

STEP 4: Type: open 4,4

This opens a file on the printer.

STEP 5: Type: cmd 4

This opens the printer up to receive data. The printer will print:

ready.

STEP 6: Type: list

The listing of the program is routed to the printer rather than the screen:

ready.

15 print "This is a printer test."

ready.

STEP 7: Type: print#4:close 4

This closes the printer file and reroutes future listings to the computer's display screen.

Chapter 6

ERROR MESSAGES

Whenever the computer can not understand what it was told to do, it prints an error message on the screen and waits for you to do something about it. The advantage of having this immediate response is that you can use the screen editing function to fix the problem when it occurs. In many cases the problem will be obvious to you.

When an error occurs, the computer will usually stop any program that is running, print an error message, put the cursor on the screen, and wait for the error to be fixed. The most common error messages you will encounter are:

- DEVICE NOT PRESENT
- INPUT
- SYNTAX
- LOAD
- REDO FROM START
- VERIFY

We will now examine these errors—their causes and cures. The computer has a great deal more error and diagnostic messages which we will ignore for now, since they assume that the user has a good understanding of BASIC programming.

DEVICE NOT PRESENT

This error message means that the computer has tried to communicate with an IEEE-488 device that either is not attached to the computer or that is not turned on. To correct the error, attach the appropriate device to the computer IEEE-488 port and turn it on. Make sure that the device number the computer is using to call the device matches the device number of the device being used.

INPUT

When this error occurs the CRT will display "??". This error does not stop the program that is being executed. It simply means that the computer has asked you for two or more inputs and you have given it less than requested. The computer will continue to request the missing data with a double "?" until it has all of the data it asked for originally.

```
What is your name and age? CBM
??
```

Now the computer is happy

```
What is your name and age? CBM
?? 3
ready.
█
```

SYNTAX

When you type something that the computer does not recognize, it prints:

```
?Syntax error
```

This is usually caused by incorrect punctuation or misspelling. To correct the error, retype the offending command or line correctly. The computer will help you find a syntax error in a program by printing the line number in which the error occurs.

line 25 has print misspelled →

```
15 print "hello"
25 pint "goodbye"
run
hello
```

the computer tells you about it →

```
?syntax error in 25
ready.
```

list is also misspelled and
the computer catches it →

```
15 print "hello"
25 pint "goodbye"
run
hello

?syntax error in 25
ready.
list 25

?syntax error
ready.
```

The offending line is retyped. (Screen editing could also have been used to make the corrections.)

```
15 print "hello"
25 print "goodbye"
run
hello

?syntax error in 25

ready.
list 25

?syntax error
ready.
list 25

25 print "goodbye"
ready.
25 print "goodbye"
run
hello
goodbye

ready.
```

LOAD

This error takes the form:

```
?load error
```

This means that the computer could not load a program from the tape cassette. Try rewinding the tape and reloading the program. Make sure you are searching for a program that actually is on the tape you are using.

REDO FROM START

This error prints:

```
?redo from start.
```

This means that the computer has asked for a number and you gave it an alphabetic character. The CRT will display the error message followed by a "?" and wait for the correct information.

"r" is not a number

That is better

```
What is your age? r
?redo from start
?

What is your age? r
?redo from start
? 25

ready.
```

VERIFY

This error occurs when the computer can not verify a file stored on a cassette or a floppy disk with the information in the computer's memory. The CRT displays:

?verify error

If you are USING A CASSETTE:

1. rewind the tape
2. list the program stored in memory to be sure it is the correct program
3. make sure that you are using the correct cassette
4. re-VERIFY

If you are USING A FLOPPY DISK:

1. list the program stored in memory to make sure it is the correct program
2. make sure you are using the correct disk
3. re-INITIALIZE the diskette
4. re-VERIFY

If the error persists, re-SAVE the program.

NOTES



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