The World's Simplest Computer
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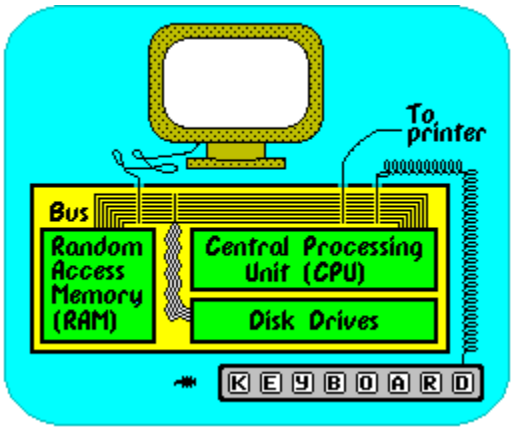
Shrinking the System

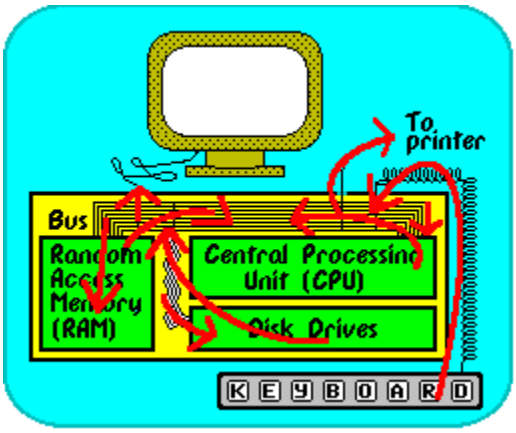


The illustration is being shrunk down to size to make further explanations easier.

Note that the CPU is not to scale even in this smaller illustration. It is actually on a single chip inside the computer cabinet.

Some things have been left out: The power supply, the speaker, and the cooling fan, for example. They do not contribute much towards understanding how a computer works.

What's Going on in There?

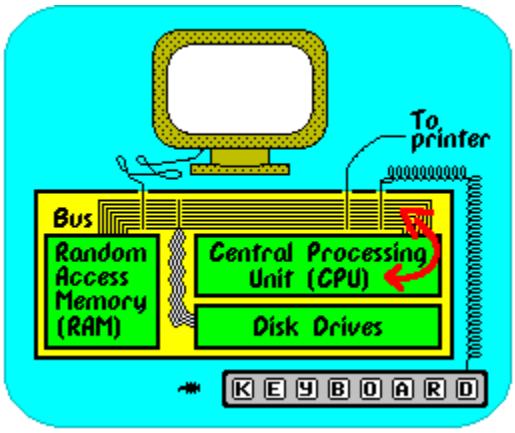


With so much going on inside the computer, many users do not understand where the data is at in there.

Sometimes their data disappears and they do not know why.

Over the next few pages, the illustrations will show what happens inside the computer during popular types of programs.

The CPU Governs Everything

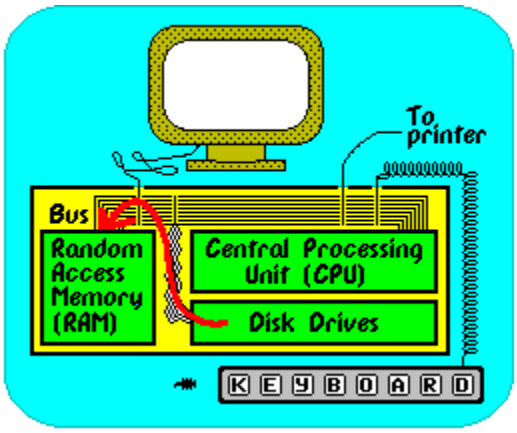


The CPU rules all of the other parts of the computer.

It does this by sending codes, in the form of bytes, through the bus to the other components.

The CPU gets feedback in the same way on such matters as the values as variables, the status of the program, and whether the printer is ready.

Loading the Program

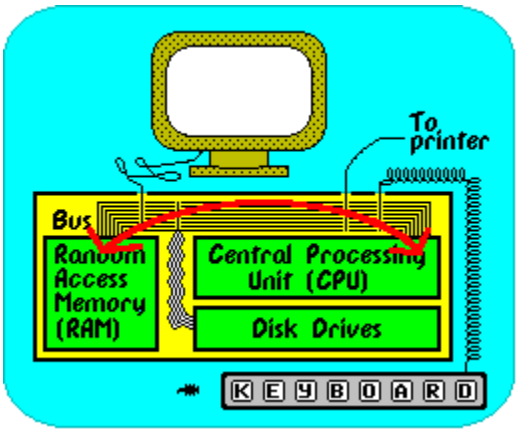


A word processing program is used as the first example.

The program, which has been stored on a disk, is sent through the bus and is put into RAM.

The program is stored on the disk in the form of bytes. It is also sent through the bus and saved in RAM as bytes.

Following the Program Code

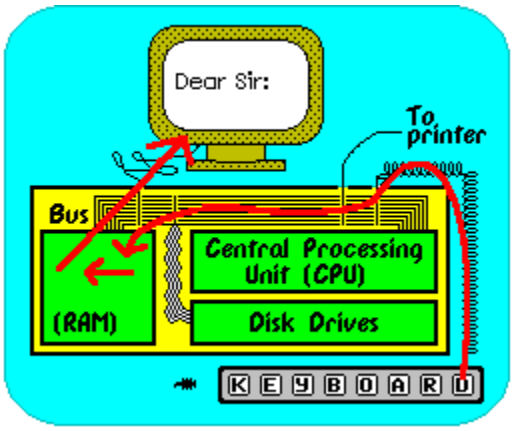


Once the program code is in RAM, it is read by the CPU.

The CPU will obtain an instruction from the program code and then direct the appropriate part of the computer to perform that instruction.

The CPU will then get the next instruction, and the next, going on down the sequence of program code, performing each one in order.

Typing the Document

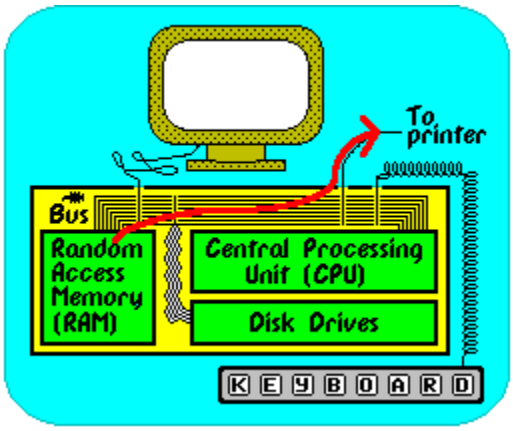


In the word processing program, as the user types the document, it is placed into variables in RAM.

Following the directions of the program, the document is also transferred from the variables to the part of RAM which designates the video display.

It is actually in two locations in RAM. First, in the variables location; and, second, in the video display location. Of course, all of this is in the form of bytes.

Printing the Document

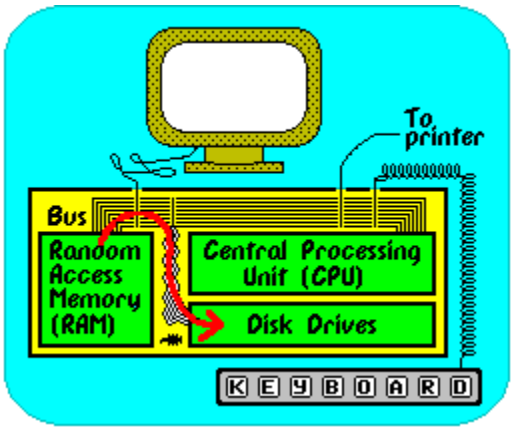


When a copy of the document is printed, it is sent from the variables in RAM to the printer.

This transfer is done through the bus in the form of bytes.

Do not forget that the CPU is directing these activities. Arrows to and from the CPU have been omitted for the sake of simplicity.

Saving the Document



Once the document is finished, it can be saved to the disk for future use.

It is transferred from the variables in RAM through the bus to the disk drive. Of course, all of this is done in the form of bytes and is controlled by the CPU.

Even though the document has been put on the disk, it is still also in RAM until it is cleared, or overwritten by other data, or until the computer is turned off.

Other Types of Programs

Game: 

Planner:

Tutor:

Other types of programs work in a similar way to a word processing program. First, the program, itself, is loaded from the disk drive into RAM. Second, if any data is being used from a previous session, it is loaded into RAM from the disk drive. Third, the data is increased, changed, or decreased by the user. Finally, the data is transferred from RAM back to the disk drive and onto a disk.

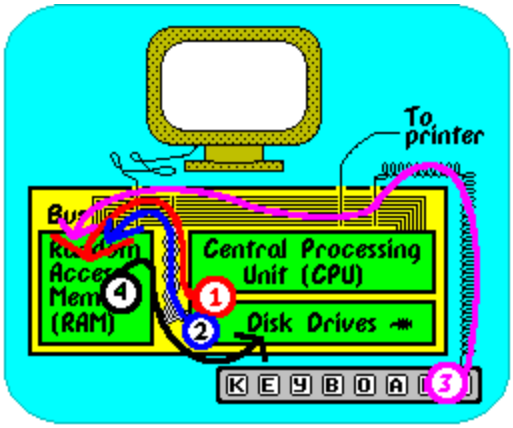
Spreadsheet: 

Database:

Graphics:

Load, Load, Change, and Save

Most programs are similar in this respect: You load the program, then load the data, then change the data, and then save the data.



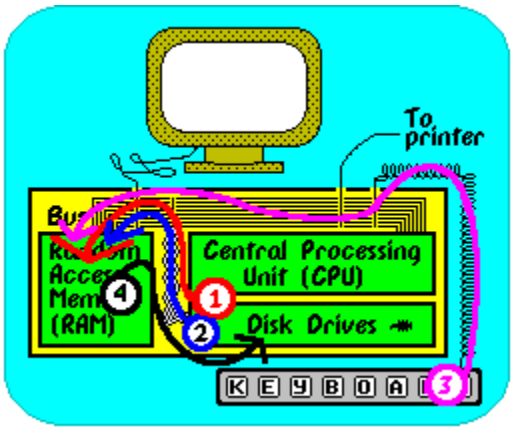
(1) The program is loaded from the disk into RAM.

(2) Previous data, if any, is loaded from the disk into RAM.

(3) The data is changed from the keyboard.

(4) The new or changed data is saved from RAM to the disk.

Test



(1) Load.

(2) Load.

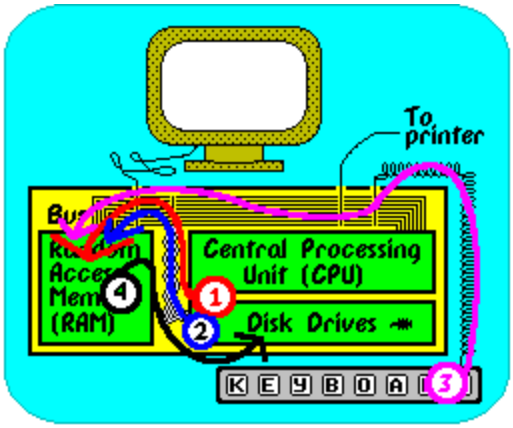
(3) Change.

(4) Save.

A word processing program has been loaded into the computer along with a document for a long-term project. The user accidentally ruins the document. Can the document be salvaged?

Answer: Yes

In the test, only the first three steps had been done. Therefore, the original document is still on the disk. To salvage it, go back to Step 2 and load it, again, from disk into RAM.



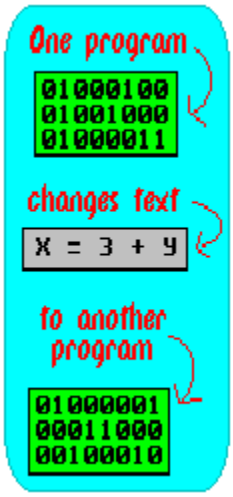
(1) Load.

(2) Load.

(3) Change.

(4) Save.

It Takes a Program to Write a Program



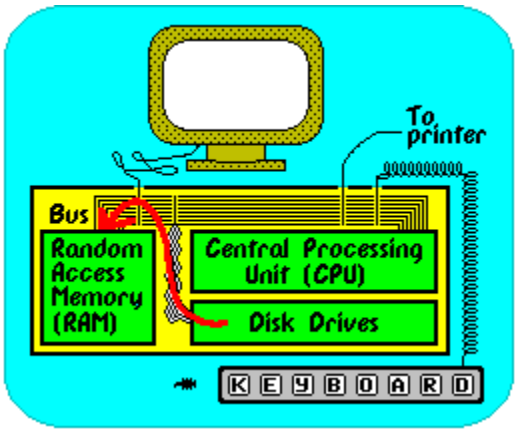
A programming language is needed in order to program a computer, and a programming language is a program, itself.

Many new computer users try the BASIC programming language. This stands for Beginner's All-purpose Symbolic Instruction Code.

Many other types of programming languages are available, such as C, Pascal, Fortran, Cobol, and others.

Sometimes a computer is distributed with a programming language, such as BASIC, included. More often, a programming language has to be purchased separately.

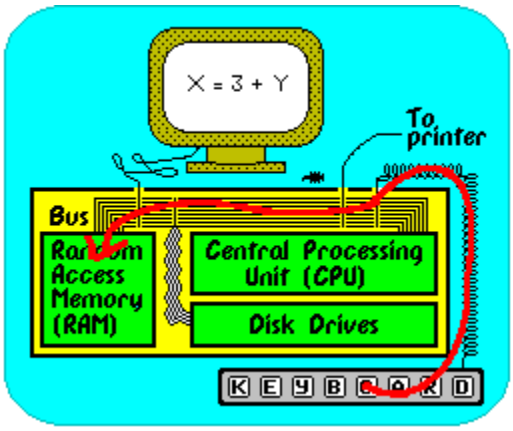
Loading the Language



In order to begin programming, the language must first be loaded into RAM.

It is probably loaded from a disk. However, with BASIC, it is possible that it may be loaded from a read-only memory (ROM) chip.

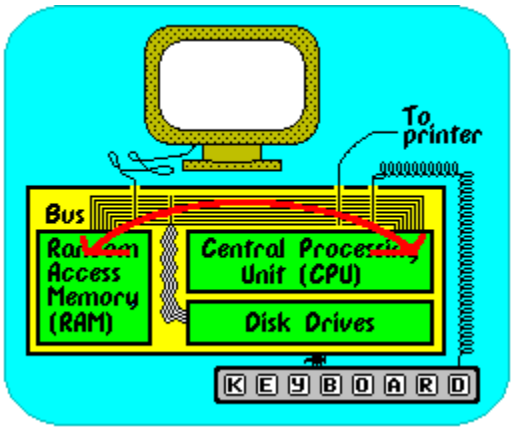
Typing the New Program



As the program is typed, in BASIC or whatever other programming language is being used, it is saved as ASCII text in variables in RAM.

The newly written program can be saved to a disk in this text format, to be recalled and worked on, again, later.

Translating to Program Code

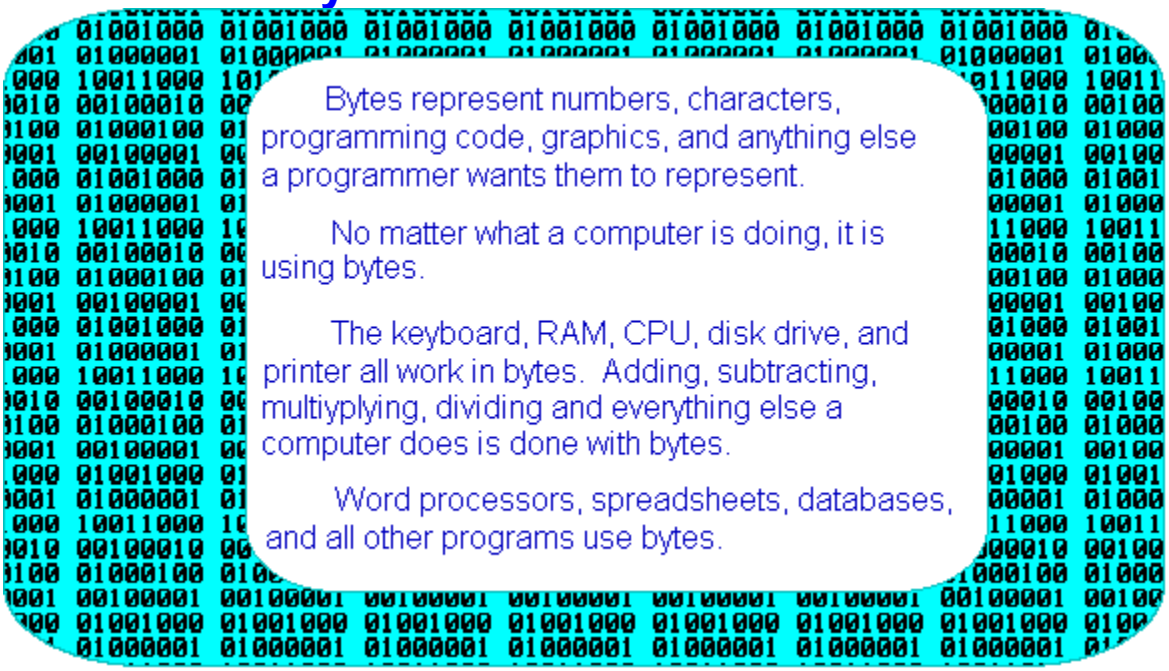


Before the newly written program can be performed by the computer, it has to be translated to machine language.

This translation is done internally by the CPU, using RAM and following the directions of the programming language.

Once the newly written program has been changed to machine language, most programming languages allow it to be saved to a disk as a program.

Back to Bytes



Bytes represent numbers, characters, programming code, graphics, and anything else a programmer wants them to represent.

No matter what a computer is doing, it is using bytes.

The keyboard, RAM, CPU, disk drive, and printer all work in bytes. Adding, subtracting, multiyplying, dividing and everything else a computer does is done with bytes.

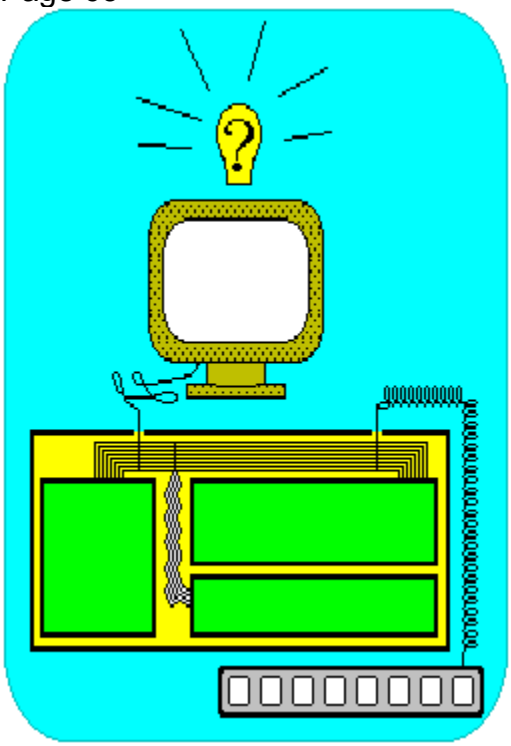
Word processors, spreadsheets, databases, and all other programs use bytes.

The Lowly Bit

A bit is nothing but 1/8 of a byte. It is the smallest unit of information which a computer can handle.

A bit is similar to a light bulb in that it can be either on or off.

However, everything that a computer does, it does with bytes. Since bytes are made of bits, this means that all that a computer can do is done with little pieces of information that can be either on or off. **Bits!**



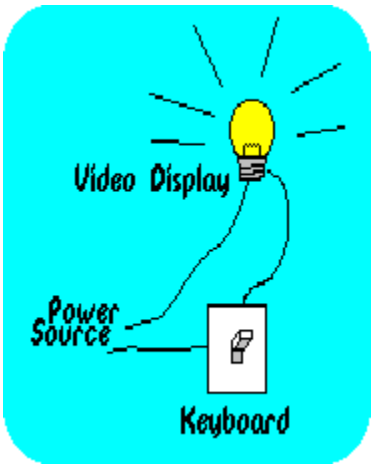
Are Computers Intelligent?

Humans have developed a revolutionary machine where millions of tiny switches can represent numbers, characters, and, even, complex ideas. The switches, themselves, are no smarter than light bulbs which can be turned on and off. But, humans have devised ways to combine these switches to represent ideas.

It is not the switches which are intelligent.

It is the humans.

The World's Simplest Computer (Revisited)



Just as humans use switches to turn room lights on and off, they can use millions of switches in computers to represent complex ideas.

Reduced to its simplest form, all a computer is...

...is a switch.