

Types of Main Memory

1- Read-write or random access memory(RAM)

It has a variable content , also it is generally used to store the variable data. RAM can also be used to store frequently changed programs and other information. The term “**random**” means that any memory location can be accessed in the same amount of time, regardless of its position in the memory.

RAM allows the computer to store information quickly for later reference:

- 1- The active part of the operating system, the fundamental program that control the operation of the computer.
- 2- The application program being executed (for example a letter being written with the word processing program).
- 3- A representation of the data being presented on the video display

In RAM, the stored information will be lost when computer power supply is removed (even a short interruption). That is RAM, is **volatile memory**. Some form of RAM, called **flash memory**, retain their electrical charges when a computer is turned off. When program instruction, reads the data in memory address, it gets a copy of the data. This is called a nondestructive read, because the contents of the memory address are not changed. Sending data to a RAM memory address is called a destructive write, because the new data erases whatever was there before.

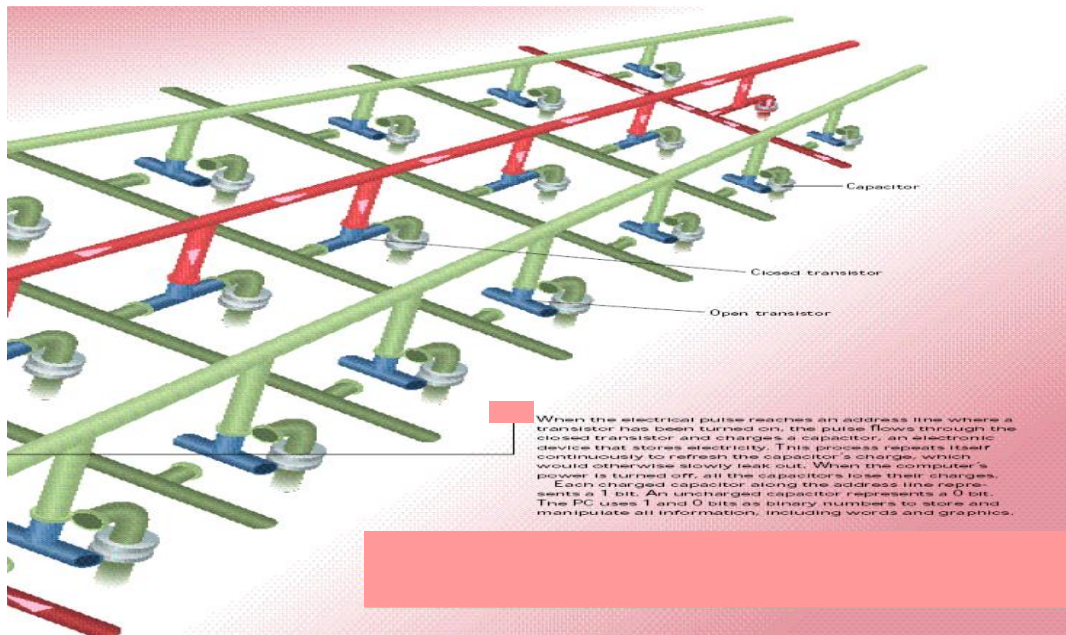


Figure 9: internal organization of RAM

2- Read only memory (ROM): The real difference between RAM and ROM is this: information that is stored in RAM can be changed. It is a nonvolatile memory, when the computer turns off, the contents of ROM do not change, that is another difference between RAM and ROM. Sending data to a ROM memory address is ineffective, because the contents of ROM are permanent.

Types of RAM

Various RAM **chips** have been developed to move data in and out of memory quicker, to avoid errors and to make collections of RAM chips smaller. Here are the most common types of RAM:

1- DRAM (Dynamic RAM): For years, the most common type of main memory. “Dynamic” refers to the memory’s method of storage, basically storing the charge on a capacitor, which leaks the charge over time and must be refreshed every **10-100 ms**.

- 2- **SRAM** (Static RAM): Unlike DRAM doesn't need to have its electrical charges constantly refreshed because the contents of each location persist as long as power is applied to the chips. SRAM is usually faster than DRAM but more expensive, so it is used for most speed-critical parts of a computer, such as the cache memory.
- 3- **VRAM** (Video): RAM optimized for video adapters. VRAM chips have two ports so that video data can be written to chips at the same time the video adapter continuously reads the memory to refresh the monitor's current display.
- 4- **EDO RAM** (Extended Data Out RAM): Faster than DRAM. EDO memory can send data even while receiving instructions about what data to access next.
- 5- **SDRAM** (Synchronous DRAM): RAM designed to keep up with the bus speed of fast processors. SDRAMs are designed with two internal banks of transistors for storing data. This allows one bank to get ready for access while the other bank is being accessed. This is most often the RAM of choice for Pentium-class PCs.
- 6- **DDR SDRAM** (Double data-rate synchronous DRAM) : Enhancement of SDRAM that uses both edges as control signals.
- 7- **SIMM** (Single In-line Memory Modules): memory chips are put onto a small circuit board with pins along the bottom , which plugs into a connector on the motherboard.
- 8- **DIMM** (Dual In-line Memory Module): Similar to SIMMs, DIMM use memory chips and separate connector pins on both sides of the circuit board to increase the amount of memory that can be plugged into a single connector and to increase the size of the data path for faster data transfer.
- 9- **ECC** (Error Correcting Code): RAM that uses extra bits to detect errors. Types of memory such as DRAM, SDRAM and DIMM may also be ECC chips.

ROM can be divided as:

- 1- ROMS:** The first type of ROM the contents are determined by a masking operation that is performed while the chip is being manufactured such chip cannot be altered by the user.
- 2- PROM (Programmable ROM):** The contents of this type allow the data to be loaded by the user if the proper equipment is available. Once a memory is programmed, its contents can never be changed.

EPROM (erasable Programmable ROM) and EAPROM (electrically alterable PROM): this type of ROM can be erased, reprogrammable by using special equipment (ultraviolet light) and can be reprogrammed as often as required .