

Computer hardware – memory and storage

Computer hardware is a collective term used to describe the component devices that combine to make up a computer system. It includes devices both inside the system unit and connected externally as peripherals.

The system unit contains the heart of a computer and is the part of a computer system that all other components connect to. The system unit includes a motherboard which houses the central processing unit (CPU) and an array of memory chips.

The Microprocessor (CPU)

The microprocessor is also referred to as the CPU or simply 'the processor'. It is the most important component in a computer system because it controls all the computer's processes. The processor can compute and execute millions and millions of individual instructions every second. The performance of a microprocessor is measured in two ways: the speed of the system clock and the number of instructions it can process in a second.

The system clock speed is measured in hertz, with one hertz equivalent to one cycle per second (one tick of the clock a second). Modern processors are capable of performing many millions of cycles per second. Their clock speed is quoted in gigahertz (GHz) which is 1000 million cycles per second. The greater the speed of the system clock, the faster is the processor.

MIPS or 'millions of instructions per second' is a measure of the number of instructions a microprocessor is capable of performing in a second. Like the system clock speed, the higher the MIPS the faster is the processor. (www.howstuffworks.com)



By the mid 1990s Intel's Pentium® processors were available with MMX chip technology, or **m**ultimedia extension. This technology was designed to provide better performance in audio and video applications. Today, CPU manufacturers have improved the internal structures of their chips (which has led to improved bus speed) and included some memory capacity within the processor. This has led to improved audio and video processing and greatly improved the performance of computers when working with graphics and video applications.

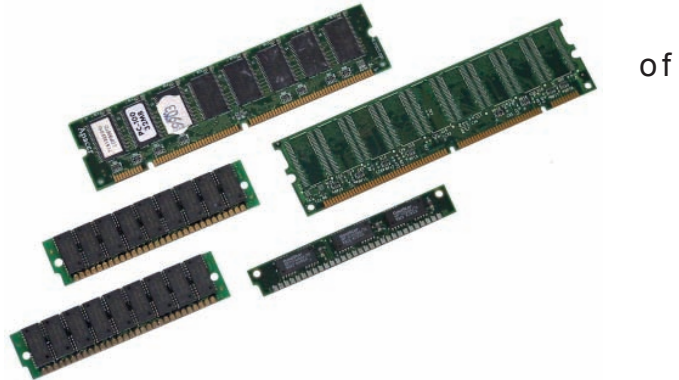
Memory

There are two types of computer memory available in a personal computer system. These are RAM and ROM memory.

RAM or random access memory

RAM or random access memory is available as a set of individual chips that plug into the motherboard. RAM is also found on many hardware devices such as high-performance graphics, sound and video editing cards. Memory used within the microprocessor is termed system RAM. System and cache RAM are temporary storage

areas for the program instructions used by the processor. Any information or instruction stored in RAM is lost when the power is turned off. Because of this, it is dubbed 'volatile' memory. RAM is produced as chips of different capacities, measured in megabytes and gigabytes, for example 256 MB, 512 MB and 1 GB, and can be easily upgradeable. Increasing the amount of RAM can significantly improve the performance of a computer system. There are some different types of RAM available at present.



SDRAM - (Synchronous dynamic RAM) SDRAM is a technology that uses a clock to synchronise all inputs and outputs to the memory chips. The clock is synchronised with the CPU clock so time is saved when executing commands and transmitting data, increasing the overall performance of the computer. SDRAM works on the assumption that most data called on by the central processing unit will be required in a set sequence. SDRAM uses this assumption to advantage by anticipating where the required data is stored in the chip and then moving quickly through the data structure to find the targeted data.

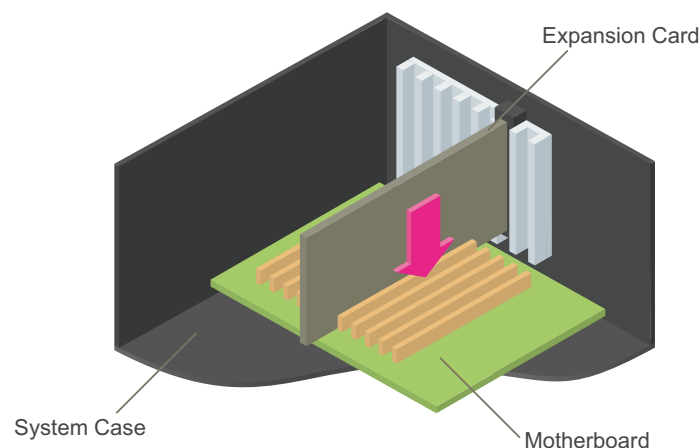
DRAM - (Dynamic RAM) DRAM is a type of memory that stores each bit of data in a separate capacitor on the chip. The number of electrons stored in the capacitor determines whether the bit is considered 'on' or 'off'. The charges of electrons in a chip are refreshed periodically, making it a dynamic memory, as opposed to the older SRAM and other 'static' memories. Accessing DRAM is similar to finding information in a book; first it locates a particular page (module) and then selects information from the page. This is called fast-page mode (FPM) and enables the CPU to access new data in half the normal access time, providing it is on the same page as the previous request. (www.howstuffworks.com)

ROM or read-only memory

ROM memory is a type of pre-encoded instruction, manufactured inside a chip. Apart from the flash ROM used in some computers, BIOS information in ROM memory cannot be changed by the user. A ROM chip contains the instructions that the microprocessor uses when the computer system is turned on or 'booted'. It contains all of the instructions needed by the processor to establish the presence of hardware devices and the status of these devices.

Expansion slots

Expansion slots are located on the motherboard and allow the addition of devices or cards (sound and video cards) to a computer system. Expansion cards, also called interface cards, add performance or functions to the computer system. The slots provide a high-speed link to the microprocessor, with each card performing specialised processes, both independently and cooperatively, with the CPU. The standard for communication of expansion cards has progressed from ISA through VESA to PCI. The type of slot available depends on the age of the motherboard and its design.



Power supply unit

The power supply unit is an electrical component that supplies power to a computer. Most personal computers can be plugged into standard electrical outlets. The power supply unit pulls the required amount of electricity and converts the alternating current (AC) to direct current (DC). The power supply unit also regulates the voltage, eliminating 'spikes' and surges which are common in most domestic electrical supplies.

The power supplied to the motherboard is commonly 5 volts but some computer systems use 3.3 and 2.8 volts. Other devices, like the motors in CD-ROM and DVD-ROM drives, use 12 volts.

Much heat is generated by the power supply unit and most modern system units have large, often noisy, cooling fans built into them.



Disk drives and storage media

Disk drives and their assorted storage media are used to store information. There are many types of disk drive: they can be classified as portable, non-portable, permanent and semi-permanent.

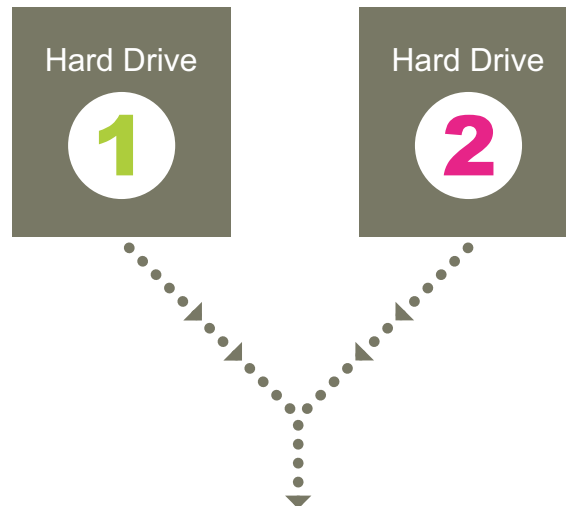
Hard disk

Hard disks were originally called 'fixed disks' and were invented in the 1950s. Early hard disks could be as large as 20 inches (50 centimetres) in diameter but could store only a few megabytes of data. They later became known as 'hard disks' to distinguish them from 'floppy disks'. Hard disks have hard platters coated with a magnetic surface, as opposed to the flexible plastic film found in tapes and floppy disks. For many years hard drives were available only as non-portable devices. Today, portable hard drives are very popular. They connect to a computer via FireWire or USB ports and include their own power supplies.



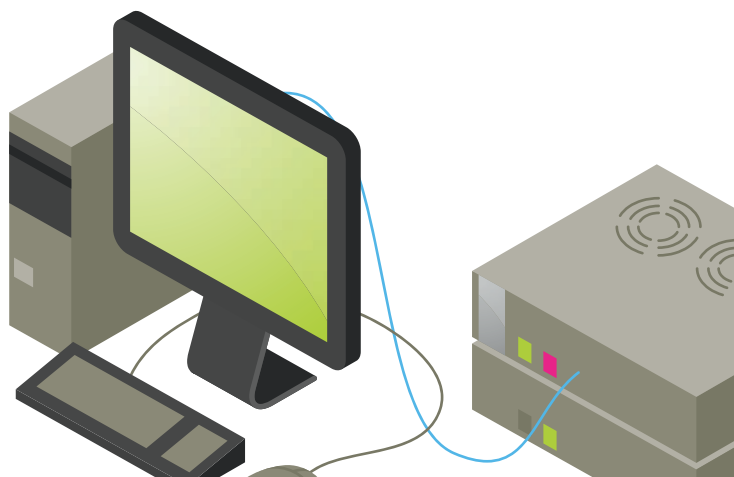
RAID

Multiple hard disk assemblies can be created and are called RAIDs. RAID stands for 'Redundant **A**rray of Independent (or Inexpensive) **D**isks'. RAID use two or more drives in combination to improve performance. RAID disk drives are frequently used in servers and are not generally necessary for personal computers. However, they are gathering popularity for home and professional multimedia-editing systems.



Storage area networks

Storage area networks, or SANs, are devices that contain only hard disk drives and provide a shared, multi-host storage solution for large amounts of data. SANs are popular for many data-intensive computer operations such as video editing.

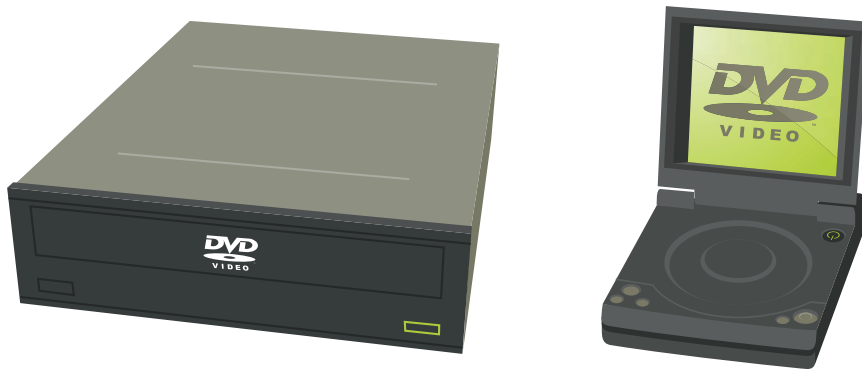


Compact disc

The audio compact disc has been altered and adapted to become the CD-ROM disc used by computers to store data. Many types of CD-ROM are available and some allow a user to burn, and some also to re-burn, data to a disc. These disc types are called CD-recordable (CD-R) and CD-rewritable (CD-RW) respectively.

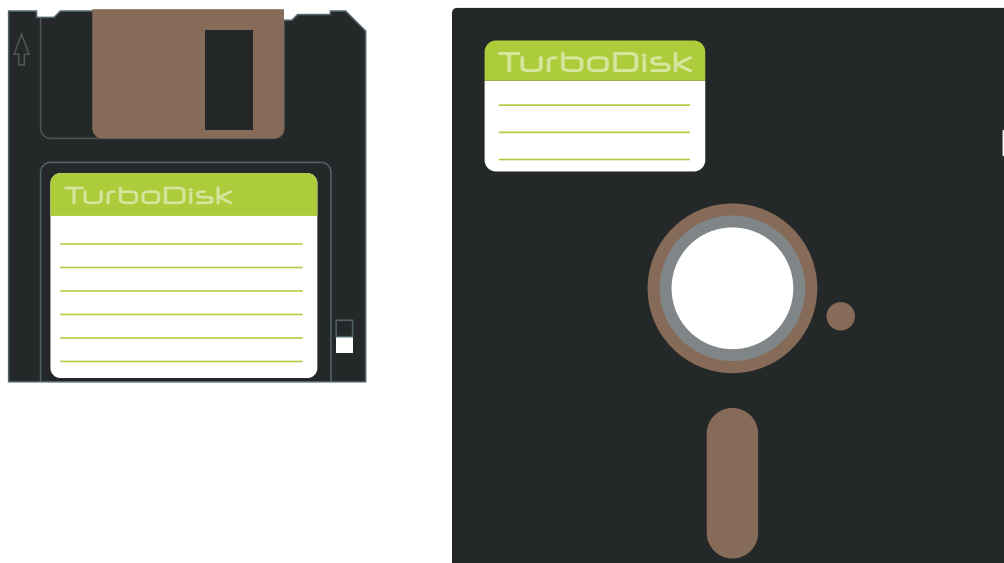
Digital versatile disc (DVD)

Another variation from the CD standard, DVD employs the same technologies as CD-R and CD-RW discs. A DVD is very similar to a CD-ROM but has a much larger data capacity. A standard DVD holds about seven times more data than a CD-ROM. This increased capacity means a DVD has sufficient room to store a full-length movie. Both CD and DVD drives are available as portable and non-portable devices.



Floppy disk

This is a storage medium made from flexible plastic covered with a magnetic material and laid out in a single, spiral track. The standard floppy disk can hold 1.44 MB of uncompressed data. The floppy disk is now considered 'old', with the original disk being developed by Sony in the early 1980s. The first disks were thin, flexible and 5¼ inches in diameter. Later versions have a non-flexible case and are 3½ inches in diameter. (www.howstuffworks.com)



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