Storage and storage media

Storage refers to any device into which data can be entered, then stored, and retrieved. Storage can be categorised as either primary or secondary storage, with devices rated according to their type, storage capacity, cost per megabyte and speed of data transfer.

Primary storage

Often referred to as main memory, primary storage is the internal memory within a computer system. Random access memory (RAM) is an example of this type of memory. A user needs to be aware that, if the computer is switched off or the supply of power is removed, information stored in this type of memory will be lost. This loss of data with loss of power is why primary storage is described as *volatile* memory.

Secondary storage

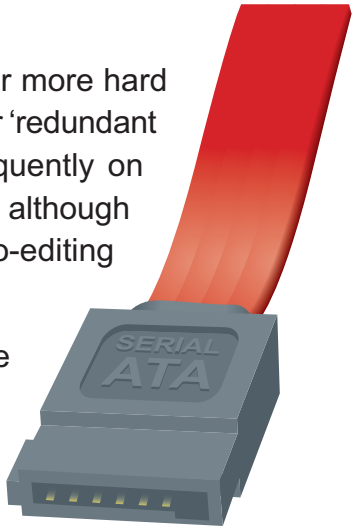
There are many examples of secondary storage, including hard disk drives, compact discs and floppy disks. These types of storage are permanent, because the data contained on the device will remain until the user erases it.

Hard disk drives

Hard disks are a form of enclosed disk drive containing one or more metallic disks used for data storage. Typically, they have very large storage capacities. Portable hard drives are very popular because they are compact, rugged and have *plug-and-play* capabilities. They deliver high capacity, flexibility and performance for data-intensive applications, such as digital video/audio editing. Hard drives are a fast and easy way to add storage space to a computer system.

Large-capacity hard drives are suitable for the storage of images captured by digital cameras. When an image is shot by a high–megapixel camera, the raw file size can be quite large, so a large hard drive is needed to store these files.

RAID



RAID is a technique in which a computer system turns two or more hard disks into a single, high-performance hard disk. RAID stands for 'redundant array of inexpensive disks'. RAID disk drives are used frequently on servers but aren't generally necessary for personal computers, although they are gathering popularity for home and professional video-editing systems.

Serial ATA or SATA is a specification for consumer hard-drive connections that boosts data transfer rates for hard drives.

Network-attached storage (NAS)

NAS is a term used for RAID, tape and other mass storage systems which have an integral network connection, such as Ethernet or fibre-channel. NAS is a number of hard disk drives or tape drives connected to a network, rather than to just a single computer, and are used for large storage demands. NAS is designed for sharing and storing information over networks. Many NAS devices include automatic backup software to back up data, saving files to designated local or network locations.

Storage area network (SAN)

A SAN is another form of networked disk storage. In large companies and office networks, a SAN connects many servers to a centralised pool of disk storage instead of each server handling its own storage on separate disks. A SAN makes backing up and managing data easy because all stored data is located in a single resource. This makes disk maintenance and routine backups simple to administer.

Digital audio tape (DAT)

Digital audio tape (DAT) storage uses a magnetic tape format originally developed for audio recording to back up and store computer data. The latest DAT storage format is DDS (digital data storage). Mini DV is a type of DAT and is commonly used in consumer-level video cameras. Professional video cameras use a range of high-capacity DAT tapes suitable for broadcast quality recording, for example DVCPRO®.

Compact disc (CD-R, CD-RW)

The CD-ROM (an abbreviation for 'compact disc read-only memory') is a non-volatile, optical, data storage medium using the same physical format as audio compact discs. These disks are readable by a computer using a CD-ROM drive. CD-ROMs are flat, plastic discs onto which digital information is recorded, or 'burnt' – using a laser in a spiral form, starting from the centre. Writable compact discs (CD-R) can be 'written to' once; however, it is possible to have multi-sessions. This means it is possible to add data to the disc gradually over a number of sessions before it is closed to further writing.

Rewritable discs (CD-RW) are those that can be 'written to' more than once. These are often more expensive than CD-R type discs, but the option of writing and re-writing the disc is an advantage.

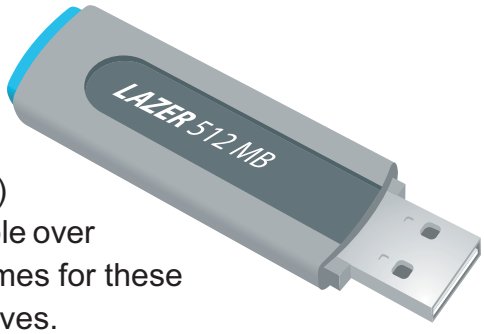
Digital versatile disc (DVD)

Similar to the compact discs, the digital versatile disc (DVD) is an excellent medium for the storage of data and digital images. Single-layer DVDs have a capacity of 4.7 GB but multi-layer DVDs are also available. DVD is seen as the successor to CD-ROM technology, with the discs being the same size as a CD-ROM disc. Early DVD drives and discs were read-only devices but newer versions, including DVD-R/+R/-RW/+RW/-RAM are available, and variously offer writing and rewriting options.

ZIP disks

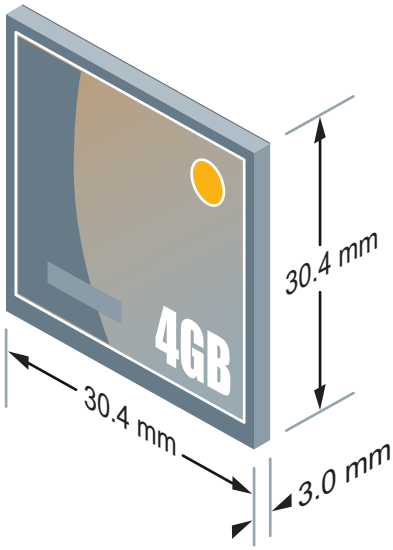
Similar to a floppy disk, ZIP disks feature a disc of magnetic media inside a protective outer case. Floppy disks have a capacity of 1.44 MB, while ZIP disks have two different capacities, 100 MB and 250 MB. Zip drives can be connected to a computer via USB, FireWire® or ATAPI connections.

USB flash drives



These are small, portable storage devices with capacities up to and exceeding 2 GB. They are very small and lightweight. Data is transferred to and from the device via a universal serial bus (USB) interface. This ensures that the devices are compatible over a number of different computer platforms. Other names for these devices are thumb drives, key drives and pocket drives.

Flash cards



Like flash drives, flash cards are storage devices that retain their contents even without a power supply. Flash memory cards are used in many applications, including PDAs, MP3 players and some digital cameras.

There are four main types of flash cards:

- CompactFlash® (CF)
- Secure Digital™ (SD)
- Memory Stick® (MS)
- MultiMediaCard™ (MMC).

CompactFlash® (CF)

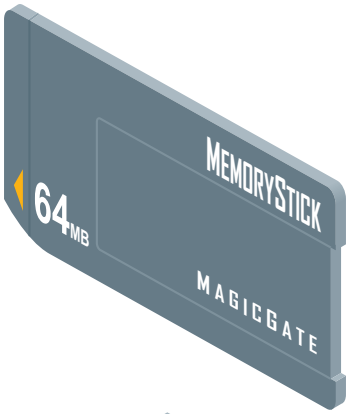
CompactFlash® (CF) cards are a common data storage device used for mobile computers, PDAs, digital cameras and some MP3 players. They are 30 x 40mm in size and 3 mm thick. CompactFlash® cards are highly portable and can be inserted directly into many computers' drive bays or USB ports. The cards do not require a power supply and have a read speed fast enough for most applications.

Professional cards are available for high-end digital cameras and offer very fast data transfer rates. These cards use a technology called *write-assist*, which can improve write performance in enabled cameras and achieve read speeds of between 40x and 80x.

Secure Digital™ (SD)

Secure Digital™, or SD, is a flash memory data storage device measuring 32 mm by 24 mm by 2.1 mm, SD is slightly thicker than MMC but thinner than CF, and includes features that allow the secure exchange of data, enabling usage restrictions such as copyright protection. The erasure-prevention switch means that data can't be accidentally deleted or copied over.

Memory Stick® (MS)



Introduced by the Sony Corporation, this type of digital data storage card is about the size of a stick of chewing gum.

Memory Stick® is a durable, easy-to-use format. It works in an array of different applications, including MP3 audio recorders, video cameras and computers with a Memory Stick® slot.

MultiMediaCard™ (MMC)

A thin memory card that was jointly developed by SanDisk and Siemens AG/Infineon Technologies AG. About the size of a postage stamp, it is much smaller than older memory card formats, such as CompactFlash®.

Microdrive

Similar to CompactFlash®, the Micro drive is a small removable mass storage device that has a spinning disk drive, similar to that of a traditional hard disk drive. Traditionally these devices have been used in portable music players but are becoming more commonly used for digital cameras. Not all digital cameras are compatible with Microdrives.