

Instant Storage — *In a Flash!*

What is the hottest back-to-school item this year? So red-hot that Mom and Dad will see it and want it too? It's a tiny portable data storage device that plugs into the computer's USB (Universal Serial Bus) port. Just a few of the brand names explain what it is. Here are some examples: TravelDrive™ from Memorex, Mini Cruzer™ from Sandisk, JumpDrive™ from Lexar ([for other common names click here](#)). These small, pocket-sized storage devices are easy to work with, can plug in to any type of computer that is less than 8 years old or that has a USB port. The great thing is that USB flash drives are really affordable now and for less than \$100 you can get a 1GB USB storage device. Although flash drives have many uses, a common one is for transferring files from your work computer to your home computer, eliminating the need for lugging a laptop back and forth. (Although these devices go by many names, for purposes of this article, we will use the term flash drive.)

This article will take a look at this micro-technology, its history and future; you'll be surprised to find out how prevalent this technology is and how long it has been around. As always, we will take a look at recovery options for these devices.

Are Flash Drives a New Technology?

In order to better understand the flash devices we have now, let's take a moment and look at their history. Rudimentary flash memory began as integrated circuit chips that would come to be a standard in all electronic devices. These were known as CMOS (Complementary Metal-Oxide-Semiconductor, pronounced 'see-moss') circuits. These small, low power, high-density circuits could be designed to perform a variety of functions and operations. Initially designed in 1963 and first produced in 1968, these little chips were the beginning of the digital integrated circuit. Perhaps you had a computer 17 years ago and remember the importance of the CMOS chip; the CMOS chip controlled the basic system settings and is similar to the BIOS (Basic Input/Output System) on today's computers.

CMOS integrated chips were a fantastic innovation; however, they were vulnerable to electro-static discharge, had to be handled carefully, and these chips always needed a constant power source to maintain the data. Did you ever have to replace the CMOS battery on your 8088 or 8086 computer? Then you remember that once the power was gone, you had to re-enter all of your computer's settings.

A new style of chip called EEPROM (Electrically Erasable Programmable ROM or Read Only Memory) was the successor to the CMOS chip and had significant improvements. The major innovation was that the chips were designed to be written to and then to hold data without power. The on-board memory usually held 64k (65,536 bytes). However, the materials inside the chip would wear out over time due to the number of write operations, so the lifetime of these chips were 10,000 to 100,000 write cycles.

Flash memory was an improvement over the EEPROM circuits in that they provided faster access to the data. Originally designed by Intel in 1988 and followed up by Samsung and Toshiba in 1989, these chips started popping up everywhere as embedded memory on electronic devices. Most of the applications for this non-volatile memory storage were for devices where the chip was part of the internal electronics, for example mobile phones, VCRs, automotive electronics, and handheld devices. In fact, flash memory storage (NAND-type flash memory as it is known) could be used for any electronic application that required the storage of data without electrical current; even hard drives use flash memory chips!

After flash technology had proven its reliability, retail products were the next step. M-Systems (NasdaqNM:FLSH) lead the industry with the flash disk concept in 1989 and in 1995 started to offer retail products that were designed for cameras, PDAs, and removable memory sticks or cards. Quite a long history, wouldn't you agree? As you read this, flash storage is replacing the floppy diskette for portable, temporary data storage. The beauty of the USB flash drive is that it is universal. Remember the Great Floppy Diskette Debate? Do we install 5¼" drives? 3½" drives? Both? The manufacturers have wisely stuck to a standard this time.

What Are the Risks of Using Portable Storage?

As far as reliability goes, USB flash drives are very durable. They are "hot-swappable" (that is, removable without shutting down the computer) and "solid-state" (that is, no moving parts). They're great for transferring data between computers. A British television program ("The Gadget Show") decided to put flash drives to the test. They ran over them with a car, blasted them out of a cannon, and baked them in a soufflé at 400° F! What was the result? The flash drives shot out the cannon suffered because they were broken into little pieces; the rest worked just fine and retained their data.

For the majority of USB flash drive users, their drives will never go through that type of punishment. It seems that the biggest risk in using these devices is simply losing them! They are so small and compact that it would be easy to misplace a USB flash drive. Most of them come with neck strap or keychain clip that allow them to be with you constantly.

Most industry sites define flash drives as a compact storage and transporting device whereas most dictionaries define flash memory as a computer chip with a read-only memory that can be electronically erased and reprogrammed without being



removed from the circuit board. By definition, using a flash drive as an active storage area could pose a risk. For instance, one user used a flash drive like a second document folder. The user was creating and editing documents on the device with their word processor re-saving active documents every five minutes. This constant writing wore out the flash memory. Just like EEPROM chips, flash devices have a lifespan (this depends on the number of write cycles, check with the manufacturer find out the expectancy rates of your particular model), however, there is no limit to the number of times data can be read.

Security is the final risk. A common use for a flash drive is to transfer files from work to home. If the flash drive was lost or stolen during the transport, proprietary company information would be compromised. In fact, most small to large companies have strict policies of what types of information can leave the premises. This highlights the importance of data encryption. ([See May's Technical Article](#))

There are a number of software encryption products that will maintain data security even if the flash device falls into the wrong hands. In fact, most USB flash drives come with some sort of free encryption software; however the free software may not meet your data protection requirements. If you use your flash drive for your company's information or for your own personal information, be sure to purchase quality encryption software. The manufacturer of the flash device should have a recommendation of software on their Web site.

What About Data Recovery? What if the Flash Device Is Damaged?

Data Recovery is always an option for these types of devices. The quality of the recovery depends on how much usable data there is. In the British television program mentioned earlier, after the flash drive was shot out of the cannon and damaged, the producers sent the damaged flash device it to Ontrack Data Recovery's London office. After working with the device and its pieces, Ontrack's engineers were able to recover the data on the device and found the data the producers were expecting.

Never assume that the data is gone when physical damage has occurred. Ontrack's experienced data recovery engineers are capable of repairing complex electronics on USB flash drives.

What about deleted or reformatted USB flash drives? Similar to hard disks, when a USB flash drive is reformatted or data is deleted, the file system addresses to the data are erased—not the data itself. Even if some files are re-saved back to the device, there may be a chance that the information is recoverable. In simple deleted recovery situations, do-it-yourself solutions such as Ontrack EasyRecovery™ software would be able to find the data and bring it back. In more complex situations where data has been restored back to the device, a trained data recovery engineer would be able to tell the difference between the newly written data and the original data. After an evaluation, the user would know exactly which files sustained damaged and which ones did not.

As long as the flash media is not physically damaged, a quick recovery choice for USB flash drives is Ontrack's Remote Data Recovery service. Ontrack's remote engineers can work on your flash drive while it's still plugged into your computer and has access to the internet or to a modem.

A few years ago, a professional photographer in Ireland had just completed a photo shoot of a wedding using digital media. The wedding organizers went to great lengths to provide a truly unique wedding experience and family members were flown in from areas of Europe and the U.S. to a historic castle, the wedding site—a definite once-in-a-lifetime, storybook event. The photographer had been in the business for a number of years and had just started moving from traditional film to digital photography.

After the wedding was over, to the photographer's horror, the digital pictures were gone. There was no time to ship the storage device for a recovery so the photographer engaged Ontrack's London Remote Data Recovery service. An analysis was started and pictures were recovered. Many individuals—business as well as private—have used Ontrack's Remote Data Recovery Service in an effort to save time. In addition, Ontrack's Remote Data Recovery pricing is the same as in-lab service.

Ontrack Data Recovery (www.ontrack.com) is the largest, most experienced and technologically advanced provider of data recovery products and services worldwide. Ontrack is able to recover lost or corrupted data from virtually all operating systems and types of storage devices through its do-it-yourself, remote and in-lab capabilities, using its hundreds of proprietary tools and techniques. Ontrack operates 18 worldwide locations featuring customer support in 11 languages. With more than 150 engineers worldwide, Ontrack invests in technology and techniques to speed recovery times and enhance recovery capabilities.

References

Alternate Names:

USB flash drives



USB keys

USB memory stick

USB sticks

Flash Drives

Jump Drives

Key Drives

Pen Drives

Thumb drives

Examples of Flash Drives

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Universal Serial Bus (USB) – An Overview

http://www.crutchfieldadvisor.com/ISEO-rgbtcspd/reviews/20030923/usb_formats.html?print=1&page=all

Flash Frequently Asked Questions

http://www.usbflashdrive.org/usbfd_faq.html

Compact Flash Association

<http://www.compactflash.org/index.htm>

Interview with M-Systems CEO about the history of company

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Flash Devices – An Overview from About.com

<http://www.answers.com/topic/flash-memory>

System Engineering Document about EEPROM Memory

<http://ece-www.colorado.edu/~mcclurel/man537.pdf>

Technical Overview of Flash Memory – IEEE document

http://www.elettronica.ingre.unimore.it/memorie/IEEE_Proc_97.pdf

Technical Article about EEPROM Degradation – IEEE document

<http://www.eas.asu.edu/~schroder/Published%20Papers/ED%20June%2098-Park.pdf>

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