

CompactFlash

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(Redirected from Compact flash)

CompactFlash (CF) is a mass storage device format used in portable electronic devices. For storage, CompactFlash typically uses flash memory in a standardized enclosure.

The format was first specified and produced by SanDisk in 1994.^[1] The physical format is now used for a variety of devices.

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CompactFlash



A 64 MB CompactFlash Type I card

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|----------------------|--|
| Media type | Mass storage device format |
| Encoding | Various file systems |
| Capacity | 2 MB to 64 GB |
| Developed by | SanDisk |
| Dimensions | 43×36×3.3 mm (Type I) 43×36×5 mm (Type II) |
| Weight | 10 grammes (typical) |
| Usage | Digital cameras and other mass storage devices |
| Extended from | PCMCIA / PC Card |

Description

There are two main subdivisions of CF cards, Type I (3.3 mm thick) and the thicker Type II (CF2) cards (5 mm thick). The CF Type II slot is used by Microdrives and some other devices. There are four main speeds of cards including the original CF, CF High Speed (using CF+/CF2.0), a faster CF 3.0 standard and a yet faster CF 4.0 standard that is being adopted as of 2007. The thickness of the CF card type is dictated by the preceding PCMCIA card type standard which was used for data storage in previous years.

CompactFlash was originally built around Intel's NOR-based flash memory, though it switched over to NAND.^[2] CF is among the oldest and most successful formats, and has held on to a niche in the professional camera market especially well. It has benefited from having both a good cost to memory size ratio relative to other formats for much of its life, and generally having larger capacities available than smaller formats.



A 16-GB CompactFlash card installed in a 2.5" IDE port with adaptor

CF cards can be used directly in PC Card slot with a plug adapter, used as an IDE or PCMCIA storage device with a passive adapter or with a reader, to any number of common ports like USB or FireWire. As it has a bigger size relative to the smaller cards that came later, many other formats can be used directly in a CF card slot with an adapter (including SD/MMC, Memory Stick Duo, xD-Picture Card in a Type I slot, and SmartMedia in a Type II slot, as of 2005) (some multi-card readers use CF for I/O as well).

Flash memory, regardless of format, supports only a limited number of erase/write cycles before a particular "sector" can no longer be written. Memory specifications generally allow 10,000 to 1,000,000 write cycles. Typically the controller in a CompactFlash attempts to prevent premature wearout of a sector by mapping the writes to various other sectors in the card - a process referred to as wear levelling.

Technical details

NOR-based flash has lower density than newer **NAND**-based systems, and CompactFlash is therefore the largest of the three memory card formats that came out in the early 1990s, the other two being Miniature Card (MiniCard) and SmartMedia (SSDFC). However, CF did switch to NAND type memory later on. The IBM Microdrive format, which used CF Type II, was not solid-state memory.

CompactFlash defines a physical interface which is smaller than, but electrically identical to, the ATA interface. That is, it appears to the host device as if it were a hard disk of some defined size and has a tiny IDE controller on-board the CF device itself.

CF has managed to be the most successful of the early memory card formats, outliving both Miniature Card, SmartMedia, and PC Card Type I in mainstream popularity. The memory card formats that came out in the late 1990s to the early 2000s (SD/MMC, various Memory Stick formats, xD-Picture Card, etc.) offered stiff competition. The new formats were significantly smaller than CF, in some cases by an even greater fraction than CF had been smaller than PC Card. These new formats would eventually dominate the memory card market for compact consumer electronic devices.

Flash memory devices are non-volatile and solid-state, and thus are more robust than disk drives. Cards consume around 5% of the power required by small disk drives and still have reasonable transfer rates of over 30 MB/s for the more expensive 'high speed' cards.^[3]

Card speed is usually specified in times ratings, i.e. 8x, 20x, 133x..., (the same system as used for CD-ROMs) where the number in front of 'x' when multiplied by 150 kB/s gives the speed of the card (for example, 20x = 3.0 MB/s). They operate at 3.3 volts or 5 volts, and can be swapped from system to system. CF cards with flash memory are able to cope with extremely rapid changes in temperature. Industrial versions of flash memory cards can operate at a range of -45 to +85 °C.

Capacities and compatibility

As of 2008, CompactFlash cards are generally available in capacities from about 512 MB (512 MiB) to about 64 GB (64 GiB), with perhaps the most popular choices in Europe and North America being between 512 MB and 8 GB. Lower capacity cards, below 512 MB, are becoming rare in stores as higher capacity cards are readily available at the same price. The largest CompactFlash cards commonly available currently are the 32 GB models from various manufacturers — SanDisk launched its 16 GB *Extreme III* card at the 2006 Photokina trade fair, Transcend announced its largest-ever 32 GB card on January 15, 2008.^[4] Samsung has launched 16, 32 and 64 GB CF cards and Pretec announced 48 GB cards in January 2008.^{[5][6]} These cards, and almost all cards over 2 GB, require the host device to support the FAT32 file system (if the camera is using a FAT file system). The largest cards, however, are usually not among the fastest ones.

Filesystems



1 GB CF card into a Nikon D200 DSLR camera

There are different levels of compatibility amongst FAT32-compatible cameras. While any camera that claims to be FAT32-capable is expected to read and write to a FAT32-formatted card without problems, some cameras are tripped up by cards larger than 2 GB that are completely unformatted, while others may take longer time to apply a FAT32 format. For example, the FAT32-compatible Canon EOS-1Ds will format any unformatted card with FAT16, even ones larger than 2 GB.

Indeed, there is a FAT32 bottleneck because of the manner in which many digital cameras update the file system as they write photos to the card. Writing to a FAT32-formatted card generally takes a little longer than writing to a FAT16-formatted card with similar performance capabilities. For instance, the Canon EOS 10D will write the same photo to a FAT16-formatted 2 GB CompactFlash card somewhat faster than to a same speed 4 GB FAT32-formatted CompactFlash card, although the memory chips in both cards have the same write speed specification.^[7]

The cards themselves can of course be formatted with any type of file system such as JFS and can be divided into partitions as long as the host device can read them. CompactFlash cards are often used instead of hard drives in embedded systems, dumb terminals and various small form-factor PCs that are built for low noise output or power consumption. CompactFlash cards are often more readily available and smaller than purpose-built solid-state drives and can be used to obtain faster seek times than hard drives. However, this is only true for CompactFlash cards supporting direct memory access.

CF+ specification revisions

When CompactFlash was first being standardized, even full-sized hard disks were rarely larger than 4 GB in size, and so the limitations of the ATA standard were considered acceptable. However, CF cards since the original Revision 1.0 have been able to support capacities up to 137 GB. While the current revision 4.1 from 2004 supports only IDE mode future revisions are expected to have SATA support

- Revision 2.0 added an increase in speed to 16 MB/s data-transfer, according to the CompactFlash Association (CFA).
- Revision 3.0 supports up to a 66 MB/s data transfer rate, along with a number of other features.
- Revision 4.0 supports IDE Ultra DMA 133 for a maximum data transfer rate of 133 MB/s.

Type I and Type II

The only difference between the two types is that the Type II devices are 5 mm thick while Type I devices are 3.3 mm thick.^[8] The vast majority of all Type II devices are Microdrives and other miniature hard drives. Flash based Type II devices are rare but a few examples do exist.^{[9][10]} Even the largest capacity cards commonly available are Type I cards and most card readers will read both formats with the exception of some early CF based cameras where the slot is too small and some of the poorer quality USB card readers with the same problem.

Microdrives

Microdrives are tiny hard disks—about 25 mm (1 inch) wide—packaged with a CompactFlash Type II form factor and interface. They were developed and released in 1999 by IBM in a 170 megabyte capacity. The division was then sold to Hitachi in December 2002 along with the Microdrive trademark. There are now other brands that sell Microdrives (such as Seagate, Sony, etc), and, over the years, these have become available in increasingly larger capacities (up to 8 GB as of late 2001).

While these drives fit into any CF II slot, they draw more current on average (500 mA maximum) than flash memory (100 mA maximum) and so may not work in some low-power devices (for example, NEC HPCs). Being a mechanical device they



IBM 1 GB Microdrive

are more sensitive to physical shock and temperature changes than flash memory.

The popular iPod mini, Nokia N91 and the Rio Carbon are devices which use a compact Microdrive to store music.

Compared to other portable storage

Strengths

CompactFlash cards are considered the main form of flash storage for almost all professional photographic needs. All major camera brands such as Canon, Fuji, Nikon, Olympus and Sony use this form of flash storage in almost all their 'Pro Cameras'. In comparison to other card formats, CompactFlash has remained the longest and most consistent performer (in terms of industry standards). CF cards are also considered far more rugged and durable to many "in the field" photographic shocks, impacts and accidents. CompactFlash cards are capable of withstanding more physical damage in comparison to other, flimsier designs. Recently a CompactFlash card was found to be still working after spending two years inside a camera that was submerged in shallow water.^[11]

Due to their compatibility with IDE/ATA they are used in many embedded systems as solid-state drives. In early 2008 the CFA demonstrated CompactFlash cards with a built in SATA interface.^[12]

CompactFlash does not have any built in DRM or cryptographic features like on some USB flash drives and other formats such as Secure Digital. The lack of such features contributes to the openness of the standard since other memory card standards with such features are subject to restrictive licensing agreements.

Also, at the moment, CF cards are available at higher storage capacities than memory cards from any other standard.

Weaknesses

- CompactFlash lacks the mechanical write protection switch that some other devices have, as seen in a comparison of memory cards.
- In the case of improper insertion, a card can potentially cause damage to a receptor device. The consequence of which may result in an expensive repair. However this rarely happens and slots are usually designed to prevent this from happening.
- CompactFlash's large dimensions in comparison to other cards limits its feasibility in very slim devices. The large card slot consumes devices' valuable internal space, especially in point and shoot digital cameras.

Counterfeiting

There is extensive marketplace competition for sales of all brands of flash memory. As a result counterfeiting is quite widespread. Under their own brand, or while imitating another, unscrupulous flash memory card manufacturers may sell low-capacity cards formatted to indicate a higher capacity, or else use types of memory which are not intended for extensive rewriting.^{[13][14]}

Other devices conforming to the CF standard

The CompactFlash format is also used for a variety of Input/Output and interface devices. Since it is electrically identical to the PC card, many PC cards have CF counterparts. Some examples include:

- Ethernet
- Bluetooth
- Modem
- Wi-Fi
- Digital Camera
- GPS
- Barcode scanner
- RFID
- Magnetic stripe reader
- Super VGA display adapter
- Serial port and USB 1.1 host adapters
- readers for various other Flash media

CompactFlash card manufacturers

- Apacer
- A-DATA
- Canon
- FujiFilm
- Kingston Technology
- Kodak
- Lexar
- Olympus
- Panasonic
- Sandisk
- Samsung
- Sony
- Toshiba
- Transcend
- Verbatim Corporation
- UMAX

See also

- Comparison of memory cards
- Microdrive
- PC card
- Random access memory

References

- ↑ Digiprint Uk (http://www.digiprintuk.com/information.php?info_id=11)
- ↑ http://www.karlfoster.com/text/DP_flashmemory.doc
- ↑ SanDisk Extreme IV review (<http://www.photokina-show.com/0365/sandisk/flashmemorycard/sandiskextreme4/>)
- ↑ Transcend Releases Largest-Ever 32GB 133X CompactFlash® Card (<http://www.transcendusa.com/Press/index.asp?LangNo=0&axn=Detail&PrsNo=902&NewsKeyWd=>)
- ↑ 64 GB compact flash from Samsung (<http://gadgets.fosfor.se/64-gb-compact-flash-from-samsung/>)
- ↑ Pretec intros 16GB / 24GB / 48GB CompactFlash cards - Engadget (<http://www.engadget.com/2008/01/07/pretec-intros-16gb-24gb-48gb-compactflash-cards>)

7. ^ Rob Galbraith DPI: CompactFlash Performance Database updated (http://www.robgalbraith.com/bins/content_page.asp?cid=7-6453-6837)
8. ^ CompactFlash Frequently Asked Questions (http://www.compactflash.org/faqs/faq.htm#What_is)
9. ^ Delkin Devices ship 224MB CF type II: Digital Photography Review (<http://www.dpreview.com/news/9911/99112302delkin224.asp>)
10. ^ Lexar Media announces 8GB CompactFlash type II (http://www.letsgodigital.org/en/news/articles/story_934.html)
11. ^ Nova Scotia News - TheChronicleHerald.ca (<http://thechronicleherald.ca/NovaScotia/978423.html>)
12. ^ Submerged camera holds functional memory card two years after accident - Engadget (<http://www.engadget.com/2007/11/17/submerged-camera-holds-functional-memory-card-two-years-after-ac/>)
13. ^ eBay.ie Guides - FAKE SanDisk Extreme Compact Flash Cards Exposed (http://reviews.ebay.ie/FAKE-SanDisk-Extreme-Compact-Flash-Cards-Exposed_W0QQugidZ1000000001456526)
14. ^ July 2007 - Counterfeit SanDisk Cards (<http://www.pictureline.com/newsletter/article.php?id=401>)

External links

- CompactFlash Association (<http://www.compactflash.org/>)
- CompactFlash Association, CompactFlash Frequently Asked Questions (<http://www.compactflash.org/faqs/faq.htm>)
- Rob Galbraith DPI: CF Performance Database (http://www.robgalbraith.com/bins/multi_page.asp?cid=6007)
- CompactFlash connector description and pin layout (http://pinouts.ru/Memory/CompactFlash_pinout.shtml)
- CompactFlash pinout (<http://pinouts.ws/compact-flash-pinout.html>)
- Compact Flash cards Explained (http://www.memoryking.co.uk/acatalog/Compact_Flash_Explained.html)

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Categories: Computer memory | Solid-state computer storage media

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