

Why we use bit-by-bit duplication

For a device to function optimally using the data on flash memory, that data must be perfect in every respect. The 100,000th flash memory card duplicated must be identical to the first one that came off the production line. To achieve this level of precision, specialist duplication facilities are required.

File copies are not exact duplicates

When anyone does a normal file copy on their computer some data is changed. It might not look like it, because the parts of the file we see remain constant. If a copy is made of a document, its file name might have the word "copy" appended to it, but the content of the document looks just like the original.

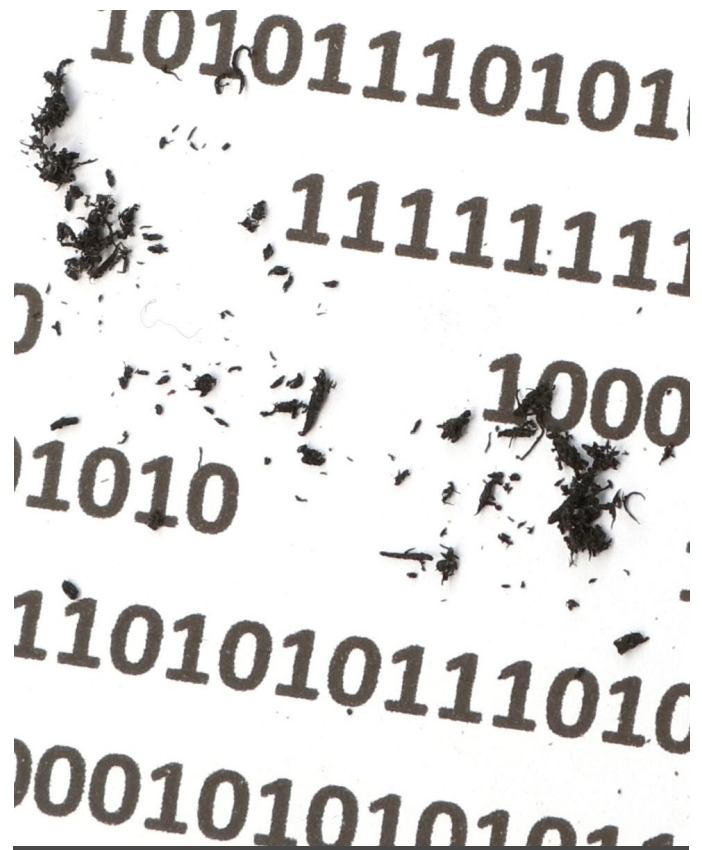
We might think it's an exact copy. But it isn't. The document file is comprised of much more than just its title and the words we read on screen. We can see some of the other elements easily by looking at a file's properties. We can see the date a document was created and last edited and by whom. A copy's creation date will be the date the copy was made, not the date the original document was started. That's just one example of the many ways a copy is not an exact duplicate.

File copies are stored randomly

When a file is copied it is broken up into bits which are stored wherever a space is found. A storage device has a file system, which is a bit like the contents, index and page numbers of a book. When new data gets added, the file system is updated so that it can be found again and fragmented files can be pieced back together. The file system also identifies gaps where new data can be stored.

This is a fast, efficient way for computers to manage files, but it is not appropriate for flash memory used in

devices which need to perform optimally. If you make six copies of a file onto six flash devices, your file may well go in six different places. This is an inefficient use of what might be quite limited storage, and piecing together entire files from constituent parts can result in slower access times. When every single device has to function to the same standard, that's not acceptable.



Above: Bit-by-bit duplication ensures each copy of a flash memory card is exactly the same as every other copy.

Bit-by-bit duplication is precise

All files are made up of 1s and 0s - binary data. This is the case regardless of the nature of the file itself. Documents, videos, executable programs and more are all stored as binary data. Bit-by-bit duplication is the only way to ensure exact duplicates are made. Bit-by-bit duplication copies the binary data that makes up files, and saves it in exactly the same place on flash memory every time.

A bit-by-bit binary copy is 100% identical to the source. This can be checked easily using a data checksum. This is a number (usually hexadecimal) that is generated using the data on a flash memory card. If the checksum for a particular card does not match what's expected, then that card is not an identical duplicate. Perhaps this is caused by errors on the card itself which make it imperfect. The checksum makes it easy to identify cards that are not up to standard, and these can be discarded.

State of the art facilities at Cardwave



Cardwave is the leading expert in flash memory storage products for specialist applications including automotive, industrial and IoT. We work out of state of the art service centres in the UK and the US. Our UK facility is Europe's most advanced and capable high-volume production facility for pre-loading and duplicating content. We can duplicate tens of thousands of copies of a flash product, each one faultless.

We have a world-leading reputation for reliability and high quality of service. Our customers include global companies and brands like the BBC, Raspberry Pi, HERE Technologies, Avaya, Harman International, OneOcean, Scania and many leading automotive brands. Customers return to us time after time: relationships of ten years or more are not unusual for us.



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