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## Write once read many

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**Write once read many (WORM)** descrbes a [data storage devce](#) n whch nformat on, once wrtten, cannot be mod fied. Ths [wr te protect on](#) affords the assurance that the [data](#) cannot be tampered wth once t s wrtten to the devce.

On ordnary (non-WORM) data storage devces, the number of tmes data can be mod fied s mted on y by the fespan of the devce, as mod fcat on nvo ves phys ca changes that may cause wear to the devce. The "read many" aspect s unremarkab e, as modern storage devces perm t un mted read ng of data once wrtten.<sup>[[Note 1](#)]</sup>

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### History [ed t]

WORM dr ves preceded the nvent on of the [CD-R](#) and [DVD-R](#). An examp e was the IBM 3363.<sup>[1]</sup> These dr ves typ ca y used a 12 n (30 cm) dsk n a cartr dge, wth an [ab at ve](#) opt ca ayer that cou d be wrtten to on y once, and were often used n paces ke brar es that needed to store arge amounts of data. Interfaces to connect these to PCs a so exsted.

[Punched cards](#) and [paper tape](#) are obso ete WORM med a. A though any unpunched area of the med um cou d be punched after the frst wr te of the med um, do ng so was virtua y never usefu . [Read-on y memory \(ROM\)](#) s a so a WORM med um. Such memory may conta n the nstruct ons to a computer to read the [operat ng system](#) from another storage devce such as a [hard dsk](#). The non-techn ca end-user, however, cannot wr te the ROM even once, but cons ders t part of the unchangeab e [comput ng p atform](#).

### Current WORM drives [ed t]

The CD-R and DVD-R opt ca dsk s for [computers](#) are common WORM devces. On these dsk s, no reg on of the dsk can be recorded a second tme. owever, these dsk s often use a [fe system](#) based on [ISO 9660](#) that perm ts add t on a [fes](#), and even revsd vers ons of a [fe](#) by the same name, to be recorded n a dfferent reg on of the dsk. To the user of the dsk, the dsk appears to a ow add t ons and revs ons un t a the dsk space s used.

A vers on of the [Secure D g ta](#) fash memory card ex sts n whch the nterna [m croprocessor](#) does not a ow rew tes of any b ock of the memory.

The Memory Vault product of [SanDsk](#) s a [thumbdr ve](#)- ke consumer devce that funct ons as a WORM devce, by not provd ng the capab ty of de et ng any [fe](#) previous y wrtten to t.<sup>[2]</sup>

Snce 2005 WORM s a so an opt on for h gh dens ty [magnet tape storage devces](#), deveped by the LTO Consort um.

### Research [ed t]

In recent years there has been a renewed nterest n WORM based on organ c components, such as [PEDOT:PSS](#)<sup>[3][4][5]</sup> or other polymers such as [PVK](#)<sup>[6]</sup> or [PCz](#).<sup>[7]</sup> Organ c WORM devces, consdered organ c memory, cou d be used as memory e ements for ow-power [RFID](#) tags.<sup>[8]</sup>

### Notes [ed t]

- 1 ^ H stor cal except ons ndude tme l m ted d scs such as [Flexplay](#) des gned for short term rental of moves and early [non volat le memory](#) technolog es such as [magnet c core memory](#) and [bubble memory](#) from whch read ng data also erased t

### References [ed t]

- 1 ^ [BM3363 Opt cal WORM dr ve](#)
- 2 ^ ["SanDsk Memory Vault Technology"](#) SanDsk 2011 09 14 Retreved 2012 04 16
- 3 ^ [Organ c norgan c heterojunct on WORM memory](#)
- 4 ^ [Miller et al "Apolymer/sem conductor wr te once read many tmes memory"](#)
- 5 ^ [Sm th and Forrest "Alow sw tch ng voltage organ c on norgan c heterojunct on memory element ut l z ng a conduct ve polymer fuse on a doped s l con substrate"](#)
- 6 ^ [L n and Ma "Real zat on of wr te once read many tmes memory devces based on poly\(N vnylcarbazole\) by thermally anneal ng"](#)
- 7 ^ [Teo et al "An Organ c Based D ode Memory Devce Wth Rect fy ng Property for Crossbar Memory Array Appl cat ons"](#)
- 8 ^ ["Holst Centre reports major step towards organ c RFID"](#)

Categories: [Opt ca](#) [computer storage](#)

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