# CP/M 2.2 disc formats

CP/M 2.2 works with a much larger range of discs than CP/M 1.4. The disc statistics are stored in a parameter block (the DPB), which contains the following information:

 DEFW spt ;Number of 128-byte records per track

 DEFB bsh ;Block shift. 3 => 1k, 4 => 2k, 5 => 4k....

 DEFB blm ;Block mask. 7 => 1k, 0Fh => 2k, 1Fh => 4k...

 DEFB exm ;Extent mask, see later

 DEFW dsm ;(no. of blocks on the disc)-1

 DEFW drm ;(no. of directory entries)-1

 DEFB al0 ;Directory allocation bitmap, first byte

 DEFB al1 ;Directory allocation bitmap, second byte

 DEFW cks ;Checksum vector size, 0 for a fixed disc

 ;No. directory entries/4, rounded up.

 DEFW off ;Offset, number of reserved tracks

The directory allocation bitmap is interpreted as:

 al0 al1

b7b6b5b4b3b2b1b0 b7b6b5b4b3b2b1b0

 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0

 - ie, in this example, the first 4 blocks of the disc contain the directory.

The DPB is not stored on disc. It is either hardwired into the BIOS or generated on the fly when a disc is logged in.

The reserved tracks will contain an image of CP/M 2.2, used when the system is rebooted. Discs can be formatted as data only discs, in which case they have no system tracks and cannot be used to reboot the system.

## CP/M 2.2 directory

The CP/M 2.2 directory has only one type of entry:

UU F1 F2 F3 F4 F5 F6 F7 F8 T1 T2 T3 EX S1 S2 RC .FILENAMETYP....

AL AL AL AL AL AL AL AL AL AL AL AL AL AL AL AL ................

UU = User number. 0-15 (on some systems, 0-31). The user number allows multiple files of the same name to coexist on the disc.

 User number = 0E5h => File deleted

Fn - filename

Tn - filetype. The characters used for these are 7-bit ASCII.

 The top bit of T1 (often referred to as T1') is set if the file is read-only.

 T2' is set if the file is a system file (this corresponds to "hidden" on other systems).

EX = Extent counter, low byte - takes values from 0-31

S2 = Extent counter, high byte.

 An extent is the portion of a file controlled by one directory entry. If a file takes up more blocks than can be listed in one directory entry, it is given multiple entries, distinguished by their EX and S2 bytes. The formula is: Entry number = ((32\*S2)+EX) / (exm+1) where exm is the extent mask value from the Disc Parameter Block.

S1 - reserved, set to 0.

RC - Number of records (1 record=128 bytes) used in this extent, low byte.

 The total number of records used in this extent is

 (EX & exm) \* 128 + RC

 If RC is 80h, this extent is full and there may be another one on the disc.

 File lengths are only saved to the nearest 128 bytes.

AL - Allocation. Each AL is the number of a block on the disc. If an AL number is zero, that section of the file has no storage allocated to it (ie it does not exist). For example, a 3k file might have allocation 5,6,8,0,0.... - the first 1k is in block 5, the second in block 6, the third in block 8. AL numbers can either be 8-bit (if there are fewer than 256 blocks on the disc) or 16-bit (stored low byte first).