Master Boot Record

Block zero on the disk

Block 0

0000h

Boot Code

01BEh
Partition 1

01CEh
Partition 2

01DEh
Partition 3

01EEh
Partition 4

01FEh
AA55h

Signature

0. BIOS transfers to location 0000h
1. Locate "active" partition
2. Load 1st sector of partition into memory
3. Transfer execution to that code
DOS Partition

Disk Partition

0
Boot Block

1
First Block in first FAT

... ...

1
Last Block in first FAT

Blocks in any duplicate FATs

... ...

1
First block in root directory

... ...

1
Last block in root directory

Beginning of data area on disk

Binary Boot Block Contents
0x00 0x02 <jump to bootstrap>
0x03 0x0a Computer mfg name
0x0b 0x0c Bytes per block (bpb)
0x0d Blocks/cluster (bpc)
0x0e 0x0f Reserved blocks (for boot record) (rb)
0x10 0x10 # of FATs (nFAT)
0x11 0x12 # of root directory entries (nrd)
0x13 0x14 # of logical blocks
0x15 0x15 Medium Descriptor
0x16 0x17 # of blocks/FAT (bpf)
0x18 0x19 Sectors/track
0x1a 0x1b # of heads (surfaces)
0x1c 0x1d # of hidden blocks (hb)
0x1e .... Bootstrap program
## DOS Directory Entry

Each entry is 8 bytes long and consists of the following fields:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name of the file or directory</td>
<td>3</td>
</tr>
<tr>
<td>Ext</td>
<td>Extension name</td>
<td>1</td>
</tr>
<tr>
<td>Reserved</td>
<td>Reserved bits</td>
<td>10</td>
</tr>
<tr>
<td>T</td>
<td>Type of entry:</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>Date of last access</td>
<td>2</td>
</tr>
<tr>
<td>CN</td>
<td>Cluster number</td>
<td>2</td>
</tr>
<tr>
<td>Size</td>
<td>Size of the file or directory in bytes</td>
<td>4</td>
</tr>
</tbody>
</table>

### Attribute Bits

- 0x00: Unused
- 0xE5: Deleted

### Date and Time

- **Y-1980**: Year 1980 to 2020
- **M**: Month (0-11)
- **D**: Day (0-31)
- **H**: Hour (0-23)
- **M**: Minute (0-59)
- **S**: Second (0-59)

### 8 Entries per Block

The diagram illustrates the layout of the DOS directory entry, with detailed explanations of each field and attribute bit. The diagram uses binary representations to show the bit allocation for each field.

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**Source:** University of Idaho
FAT Values

0x000 - Unused block
0xFF0 - 0xFFFF - Reserved
0xFF7 - Bad Cluster
0xFF8 - 0xFFF - Last cluster in file
Anything else - next cluster in file
12 Bit FAT Example

The following is the FAT table for a 1200 byte file, 1 block/cluster, 512 bytes/block, starting at cluster number 2. DOS values are stored "little endian."

```
00 00 00 0F FF 00 40 03 FF FF FF FO
```

Cluster number 2

Not Used
Boot Sector Example

rb  bpc  bpb  Mfgr Name  jmp <bootcode>

hb  heads  bpt  bpf  MD  nblks  nerd  nFAT
Some Equations

Location of first FAT
\[ \text{FATstrt} = \text{hb} + \text{rb} \]

Location of i-th FAT
\[ \text{FATstrt}[i] = \text{hb} + \text{rb} + i \times \text{bpf} \]

Number of blocks in root directory
\[ \text{nRoot} = \frac{(\text{nrd} \times 32 + \text{bpb} - 1)}{\text{bpb}} \]

Logical block number of first block in a cluster
\[ \text{lb} = \text{hb} + \text{rb} + \text{nFAT} \times \text{bfp} + \text{nRoot} + (\text{cln} - 2) \times \text{bpc} \]
VFAT Long File Names

8 bytes

5 Unicode Chars

Ordinal field

Entry No
Set if Last entry
Set if deleted

6 Unicode Chars

Checksum

7 6 5 4 3 2 1 0

Attribute

Read-only (0x01)
Hidden (0x02)
System (0x04)
Volume label (0x08)
Subdirectory (0x10)
Archive (0x20)
Unused
Unused

00 2 Chars

2 2 2 4
Example Long File Name

<table>
<thead>
<tr>
<th>Directory Entry No</th>
<th>File 1</th>
<th>File 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Ext</td>
<td>Reserved</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>5 Unicode Chars</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
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<td>Name</td>
<td>Ext</td>
</tr>
<tr>
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