MBR	BOOT	FAT1	FAT2	Root Directory	Data area

FAT 32 Root Directory (short file name :SFN)

The root directory contains an entry for each file and folder in the root. root directory is on a **specified location** on the disk and has a **fixed size** (512 entries for a hard disk, number of entries on a other disk depends on its size).

Byte Offset	Length in Bytes	Description
0x00	8	DOS file name (padded with spaces) The first byte can have the following special values:<table><tr><th>Value</th><th>Description</th></tr><tr><td>0x00</td><td>Entry is available, and no subsequent entry is in use</td></tr><tr><td>0x05</td><td>Initial character is actually 0xE5</td></tr><tr><td>0x2E</td><td>'Dot' entry; either '.' or '..'</td></tr><tr><td>0xE5</td><td>Entry has been previously erased and is not available</td></tr></table>
0x08	3	DOS file extension (padded with spaces)
0x0B	1	File attributes The first byte can have the following special values:<table><tr><th>Bit</th><th>Mask</th><th>Description</th></tr><tr><td>0</td><td>0x01</td><td>Read only</td></tr><tr><td>1</td><td>0x02</td><td>Hidden</td></tr><tr><td>2</td><td>0x04</td><td>System</td></tr><tr><td>3</td><td>0x08</td><td>Volume label</td></tr><tr><td>4</td><td>0x10</td><td>Sub-directory</td></tr><tr><td>5</td><td>0x20</td><td>Archive</td></tr><tr><td>6</td><td>0x40</td><td>Device (internal use only, never found on disk)</td></tr><tr><td>7</td><td>0x80</td><td>Unused</td></tr></table>An attribute value of 0x0F is used to designate a long file name entry.
0x0C	1	Reserved
0x0D	1	Creation time, fine resolution: 10 ms units, values from 0 to 199.
0x0E	2	Creation time. The hour, minute, and second are encoded according to the following bitmap:<table><tr><th>Bits</th><th>Description</th></tr><tr><td>15-11</td><td>Hours (0-23)</td></tr><tr><td>10-5</td><td>Minutes (0-59)</td></tr><tr><td>4-0</td><td>Seconds/2 (0-29)</td></tr></table>Note: Seconds are recorded only to a 2-second resolution. Finer resolution for file creation is found at offset 0x0D.
0x10	2	Creation date. The year, month, and day are encoded according to the following bitmap:<table><tr><th>Bits</th><th>Description</th></tr><tr><td>15-9</td><td>Year (0 = 1980, 127 = 2107)</td></tr><tr><td>8-5</td><td>Month (1 = January, 12 = December)</td></tr><tr><td>4-0</td><td>Day (1 - 31)</td></tr></table>
0x12	2	Last access date; see offset 0x10 for description.
0x14	2	EA-index (used by OS/2 and NT)
0x16	2	Last modified time; see offset 0x0E for description.
0x18	2	Last modified date; see offset 0x10 for description.
0x1A	2	First cluster
0x1C	4	File size

Table 5. Various fields of a 32-byte entry in the directory table

Offset	Length of Field	Typical Value	Meaning
0x00	8B	49 4F 20 20 20 20 20 20	File name, padded with spaces
0x08	3B	53 59 53	3B file extension
0x0b	1B	04	File Attribute
0x0c	1B	00	Reserved
0x0d	1B	23	Millisecond stamp at file creation time.
0x0e	2B	65 59	Time file was created
0x10	2B	18 21	Date file was created
0x12	2B	18 21	Date file was last accessed
0x14	2B		High word of the file's first cluster
0x16	2B		Time of last write.
0x18	2B		Date of last write.
0x1a	2B		Low word of the file's first Cluster
0x1c	4B		File Size in by

One of the user experience goals for the designers of Windows 95 was the ability to use **long filenames** (LFNs, up to 255 UTF-16 code points long), in addition to classic 8.3 filenames (Short File Name, SFNs). For backward compatibility, LFNs were implemented as **an optional extension on top of the existing** FAT file system structures using a workaround in the way directory entries are laid out. This transparent method to store long file names in the existing FAT file systems without altering their data structures is usually known as **VFAT** (for "Virtual FAT"), after the Windows 95 virtual device driver. In **Windows NT**, support for VFAT long filenames started **from version 3.5**. Non VFAT-enabled operating systems can still access the files under their short file name alias without restrictions; however, the associated long file names may get lost, when files with long file names are copied under non VFAT-aware operating systems.

Root directory entry for Long File Name :LFN

Byte Offset	Length	Description
0x00	1	Sequence number (if masked with 0x40, indicates that the entry is the last long directory entry in a set of long directory entries. All valid sets of long directory entries must begin with an entry with this mask.
0x01	10	Name characters (five UTF-16 characters)
0x0B	1	Attributes (always 0x0F)
0x0C	1	Reserved (always 0x00)
0x0D	1	Checksum of DOS file name
0x0E	12	Name characters (six UTF-16 characters)
0x1A	2	First cluster (always 0x0000)
0x1C	4	Name characters (two UTF-16 characters)

Long Filenames (example) : الجدول للاطلاع

Offset	Length of Field	Typical Value	Meaning
0x00	1B	0x 41	Entry order number in sequence of long directory entries
0x01	10B	65 00 74 00 68 00 65 00 72 00	Long Directory Entry Name Characters 1-5 (in Unicode and small endian).
0x0b	1B	0F	File Attribute, must be 0x 0f.
0x0c	1B	00	Type: If zero, this is a subcomponent of a long name.
0x0d	1B	DE	Checksum of short file name
0x0e	12B	00 00 FF FF FF FF FF FF FF FF FF FF	Long Directory Entry Name Characters 6-11 (in Unicode and small endian).
0x1a	2B	00 00	Must be zero to be compatible with the first cluster entry of small directory entries
0x1c	4B	02 00	Long Directory Entry Name Characters 12, 13(in Unicode and small endian).

A directory other than the root directory is a file that has exactly the same structure as the root directory. Each directory has two entries ".." and ".". The first one refers to itself, the second one to the parent directory.

	Normal entry			LFN entry
Bytes	**Description**		**Bytes**	**Description**
0-0	1st character of the filename (0x00 or 0xe5 means unallocated)		0-0	Sequence Number
1-10	7+3 characters of filename + extension.		1-10	File name characters (5 characters in Unicode)
11-11	File attributes (e.g., read only, hidden)		11-11	File attributes - always 0x0F
12-12	Reserved.		12-12	Reserved.
13-19	Creation and access time information.		13-13	Checksum
20-21	High 2 bytes of the first cluster address (0 for FAT16 and FAT12).		14-25	File name characters (6 characters in Unicode)
22-25	Written time information.		26-27	Reserved
26-27	Low 2 bytes of first cluster address.		28-31	File name characters (2 characters in Unicode)
28-31	File size.			

مقارنة بين حقل معلومات الملف في حالة اسم الملف اقل من ٨ حروف وحالة LFN   : للاطلاع