

An overview of FAT12

The File Allocation Table (FAT) is a table stored on a hard disk or floppy disk that indicates the status and location of all data clusters that are on the disk. The File Allocation Table can be considered to be the "table of contents" of a disk. If the file allocation table is damaged or lost, then a disk is unreadable

In this document, the FAT12 file system is described. The FAT12 is the file system on a floppy disk. The number "12" is derived from the fact that the FAT consists of 12-bit entries.

The storage space on a floppy disk is divided into units called sectors. In larger storage devices, a bunch of sectors form a cluster. However, for the floppy disk, the number of sectors in a cluster is one. Also, the size of a sector (and hence a cluster) is 512 bytes for a floppy disk.

1. Disk organization

A floppy disk layout (FAT-12) consists of four major sections: the boot sector, FAT tables, root directory, and data area:

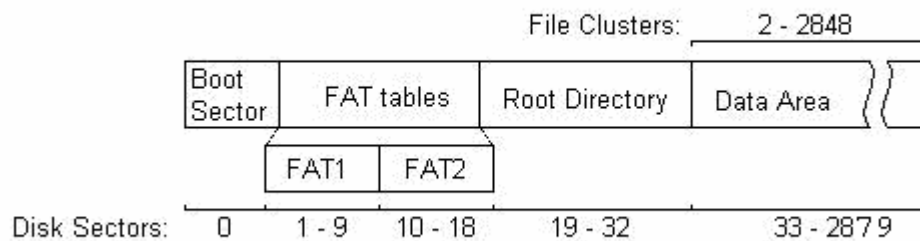


Figure 1 Disk organization of the FAT12 file system¹

- The boot sector consists of the first sector (sector 0) on the volume or disk. The boot sector contains specific information about the rest of organization of the file system, including how many copies of the FAT tables are present, how big a sector is, how many sectors in a cluster, etc.
- FAT tables contain pointers to every cluster on the disk, and indicate the number of the next cluster in the current cluster chain, the end of the cluster chain, whether a cluster is empty, or has errors. The FAT tables are the only method of finding the location of files and directories on the rest of the disk. There are typically two redundant copies of the FAT table on disk for data security and recovery purposes. On a floppy, since a cluster consists of just one sector, there is a FAT entry pointer to every sector on the disk.
- The root directory is the primary directory of the disk. Unlike other directories located in the data area of the disk, the root directory has a finite size (For FAT12, 14 sectors * 16 directory

¹ The figure has been obtained from the CS324 course web-site from Brigham Young University.

entries per sector = 224 possible entries), restricting the total amount of files or directories that can be created therein.

- **Data Area.** - The first sector or cluster of the data area corresponds to cluster 2 of the file system (the first cluster is *always* cluster 2). The data area contains file and directory data and spans the remaining sectors on the disk.

A summary of the disk organization is given below:

Logical Sector	Content
0	Boot Sector
1	First sector in the (first) FAT
10	First sector in the second FAT
19	First sector in the floppy disk's root directory
XX	Last sector in the root directory (see bytes 17 and 18 in the boot sector)
XX + 1	Beginning of data area for the floppy disk

For FAT12, XX = 32 as 14 sectors are reserved for the root directory.

2. The Boot Sector

The boot sector exists at sector 0 on the disk and contains the basic disk geometry, which is the set of information needed by the operating system to use the disk correctly. Whenever the disk is used, the information from the boot sector is read and any needed information is extracted from it. The boot sector on a DOS formatted floppy is a sequence of bytes that looks as follows:

Starting byte	Length (in bytes)	Stored data
0	11	Ignore
11	2	Bytes per sector
13	1	Sectors per cluster
14	2	Number of reserved sectors
16	1	Number of FATs
17	2	Maximum number of root directory entries
19	2	Total sector count ^a
21	1	Ignore

22	2	Sectors per FAT
24	2	Sectors per track
26	2	Number of heads
28	4	Ignore
32	4	Total sector count for FAT32 (0 for FAT12 and FAT16)
36	2	Ignore
38	1	Boot signature ^b
39	4	Volume id ^c
43	11	Volume label ^d
54	8	File system type (e.g. FAT12, FAT16) ^e
62	-	Rest of boot sector (ignore)

- a. Total sector count - This field is the 16-bit total count of sectors on the volume. This count includes the count of all sectors in all four regions of the volume. For FAT12 and FAT16 volumes, this field contains the sector count. For FAT32, see bytes 32-35.
- b. Boot signature - Extended boot signature. This is a signature byte that indicates that the following three fields in the boot sector are present. The value should be 0x29 to indicate that.
- c. Volume id – Also the Volume serial number. This field, together with Volume label, supports volume tracking on removable media. These values allow FAT file system drivers to detect that the wrong disk is inserted in a removable drive. This ID is usually generated by simply combining the current date and time into a 32-bit value.
- d. Volume label - This field matches the 11-byte volume label recorded in the root directory. NOTE: FAT file system drivers should make sure that they update this field when the volume label file in the root directory has its name changed or created. The setting for this field when there is no volume label is the string “NO NAME”.
- e. File System type - One of the strings “FAT12”, “FAT16”, or “FAT”. NOTE: Many people think that the string in this field has something to do with the determination of what type of FAT—FAT12, FAT16, or FAT32—that the volume has. This is not true. This string is informational only and is not used by Microsoft file system drivers to determine FAT type because it is frequently not set correctly or is not present. This string should be set based on the FAT type though, because some non-Microsoft FAT file system drivers do look at it.