Tech Info Library

3.5 Disks: Unformatted and Formatted Capacity (2/95)

```
Revised:        2/8/95
Security:       Everyone


3.5" Disks: Unformatted and Formatted Capacity (2/95)


======================================================================


Article Created: 2 March 1994
Article Reviewed/Updated: 8 February 1995


TOPIC -------------------------------------------------------------


Some 3.5' floppy disks are marked as 1MB and 2MB. Why are the disks marked
as such when the formatted capacity is 800K and 1.44MB respectively?


DISCUSSION --------------------------------------------------------


The 1MB and 2MB ratings are unformatted capacities. Regardless of what computer
you initialize these disks with, you do not get a data capacity of the full 1MB
or 2MB. This is due to the way information is stored on floppy disks. Depending
on what operating system is used, more information than 800K or 1.44MB can be
placed on a floppy disk. This is because they use additional sectors per disk.



Macintosh Disk Capacities
=========================


|                         Double Density      High Density
|                         1 MB Unformatted    2 MB Unformatted
|                         800K Formatted      1.44MB Formatted
|                         ---------------      ----------------
|   Bytes/Sector          512                  512
|   Sectors/Tracks        8-12 (variable)      18
|   Track Density tpi     135                  135
|   Tracks/Side           80                   80
|   Sectors/Disk          1600                 2880
|   Bytes/Side            409,600              737,280
|   Bytes/Disk            819,200              1,474,560



Typical Disk Sector
===================
```
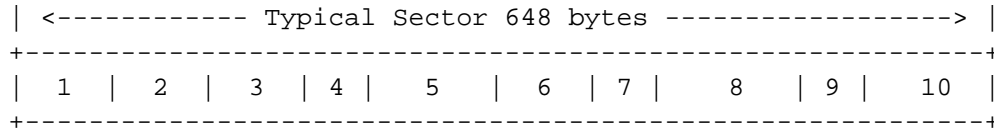
A typical disk sector consists of 648 bytes of information. Here is how this information is encoded on the disk:

```
| <------------ Typical Sector 648 bytes -----------------> |
+-------------------------------------------------------------+
| 1 |  2  | 3  | 4 |   5   | 6  | 7 |   8    | 9 |   10   |
+-------------------------------------------------------------+
```

```
 1 - Sector Gap                  12 bytes
 2 - ID Mark                      4 bytes
 3 - Track and Sector Address     4 bytes
 4 - CRC                          2 bytes
 5 - ID Gap                      22 bytes
 6 - Date Block Gap              12 bytes
 7 - Data Mark                    4 bytes
 8 - Data Field                 512 bytes
 9 - CRC                          2 bytes
10 - Data Block Gap              84 bytes
```

How Disk Space is Calculated
============================

When formatted disk space is calculated, most of the sector information is not included. The only information used is the data field. Here is the formula used to determine the amount of information on a floppy disk.

Sides x Tracks x Sectors x Bytes/Sector = amount of information a disk can store

For a High Density disk this would be:

2 x 80 x 18 x 512 = 1,474,560 bytes

The Macintosh double density disk gets a bit more difficult because it uses 5 different speeds. When the speed changes, so does the sectors in per track. Here is a table with the track information and our formula:

```
Tracks          Sectors
-------          -------
00 - 15            12
16 - 31            11
32 - 47            10
48 - 63            09
64 - 79            08
```

Formula

Sides x Tracks x Sectors x Bytes/Sector = Information

Double Density Disk
----
2 x 16 x 12 x 512 = 196,608

```
2 x 16 x 11 x 512 = 180,224
2 x 16 x 10 x 512 = 163,840
2 x 16 x 09 x 512 = 147,456
2 x 16 x 08 x 512 = 131,072
.                   -------
.Total disk space = 819,200 bytes
```

Article Change History:
08 Feb 1995 - Added keyword; made several technical updates.

Support Information Services

Copyright 1994-95, Apple Computer, Inc.

Tech Info Library Article Number:14779