Double-Density Versus High-Density Disks

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TOPIC ---

This article gives the specifications for the 800K floppy disks and the
1.4MB floppy disks. It also describes why you should not drill a hole in a
double-density disk and format it as a high-density disk.

DISCUSSION --

The table below compares the formatted capacity of the different media:

	800K Disk 1600 sectors	1.4MB Disk 2880 sectors
Bytes/Sector	512	512
Sectors/Track	8-12	18
Tracks/Side	80	80
Bytes/Side	409,600	737,280
Bytes/Disk	819,200	1,474,560

The Apple SuperDrive (formerly Apple FDHD) can read and write to any of the
major 3.5-inch disk formats, including Macintosh (GCR 400K, 800K, and MFM
1.44MB), Apple II (800K), and MS-DOS and OS/2 (MFM 720 and 1.44MB). GCR
stands for "Group Code Recording" and MFM stands for "Modified Frequency
Modulation".

When the SuperDrive writes 400K/800K disks in GCR mode, the motor
speed is variable, and the disk surface is divided into five zones to allow
a constant recording density as the head moves from the outer edge to the
center. When using high-density media, data is written in MFM mode, and
the drive speed is constant for each track.

The table that follows compares the speed of the different disk structures:

Tracks	800K Disk	1.4MB Disk
00-15	394/12	300/18
16-31	429/11	300/18

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32-47              472/10          300/18
48-63              525/9           300/18
64-79              590/8           300/18
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        Revolutions Per Minute/Sectors Per Track

GCR and MFM only affect how the data is written to the disk. GCR and MFM
do not care how the tracks and sectors are laid out on the disk. They also
have no effect on the directory structure. GCR and MFM deal with how the
bits are recorded on the surface of the media.

The MFM Method

MFM was originally recommended by Shugart Associates for double-density,
floppy drives and was used in a small number of systems. IBM was the first
major vendor to use MFM, and now Apple also provides MFM support for the
Apple SuperDrive. MFM uses a transition pulse to write data to drive
media. There are two locations for the transition pulse: the data boundary
or the cell boundary. A transition occurs at a cell boundary only when two
zero bits occur next to each other. This encoding method guarantees that no
more than two-bit cells can occur without a transition and is, thus,
self-clocking.

The GCR Method

GCR is a method that Apple has used to record information since the Apple
II Disk Controller. Each group of four bits is translated into a 5-bit
code (the Run-Length code). A translation table is used to find this 5-bit
code. This 5-bit code seems to increase data bits by 20%. However, the
5-bit codes never contain more than two consecutive zeros, and GCR writes
the data in NRZI format. When a 1 occurs in the data stream, a transition
occurs on the data boundary. Thus, GCR is guaranteed to be self-clocking.
You also save the cell boundary transitions required for MFM. Thus, GCR is
more efficient than MFM and is widely used in high-density disks and tape
recordings. The disadvantage of GCR is the relatively high complexity of
the encoding and decoding logic.

High-Density vs Double-Density Disks

High-density disks are physically different and tested to a different
specification than double-density disks. In this case, high-density disks
are of higher quality than double-density disks. The high-density disks
have a special, thin, recording surface that allows the higher data rates
used in MFM. The 800K or 400K disk may not be sensitive enough to properly
pick up and align the magnetic particles when the SuperDrive writes in MFM.
This could cause corruption of the stored data and may result in errors.
Thus, it is unreliable, unsupported, and not suggested.

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