QUAD DENSITY DISKS

(Written for the Swedish user group PROGRAMBITEN 90-1)

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A disk stores data as sectors each with 256 bytes. Such a sector is the smallest amount of data that you can write to a disk, so the computer writes always a whole sector at a time. You sometimes write to a data file with PRINT #1:A,B,C which is less than 256 bytes. The computer will store it in a buffer in RAM until it can write the whole sector. Don't forget to close the file with CLOSE #1 because there may still be data in the buffer.

DISK HEADER

There are two special sectors number 0 and 1 on a disk for management of all files on the disk. Sector one has pointers, sorted by filename in alphabetic order, which points to the sector with the file header. This file header shows file name, file structure (DIS/VAR 80, INT/FIX 128, PROGRAM etc.) and which sectors that contain data belonging to the file. Sector zero has general information about the disk as number of sides, tracks/side, sectors/track and a table of which sectors are occupied so the computer can know which sectors it can use for a new file. TI made the table in a way that it can only hold 1600 sectors. A SS/SD 90 kbytes disk uses 360 sectors and a 360 kbytes DS/DD disk uses 1440 sectors.

If you have a disk with more than 400 kbytes (1600 sectors) then there is no space for all sectors. This is the reason why a 512 kbytes Myarc RAM disk cannot use more than 400 kbytes. The remaining 112 kbytes is used as expansion RAM 32 kbytes, printer buffer and working memory for Myarc Extended Basic II. Horizon RAM disk has solved the problem by using two disk numbers each with 360 kbytes (1440 sectors) on each card. Corcomp 512 kbytes RAM disk has 32 kbytes expansion memory but the remaining 480 kbytes is used as a RAM disk. This can be managed by the use of an additional sector for marking of used sectors. An empty RAM disk will then have 3 used sectors (0-2).

QUAD DENSITY (5.25 inch)

There is a Myarc disk controller (with DS/QD EPROM) and a Myarc hard disk controller HFDC. HFDC EPROM H6 isn't OK because SAVE of a file from Basic or TI-Writer will destroy the disk (DM V works despite of this). You must have EPROM H10 or H11 for quad density. Both types of disk controller can use disks with 720 kbytes DS/QD (double sided/quad density). This mean that there are 2880 sectors. Myarc has solved the problem with sector zero by letting each bit mark two sectors at the same time (1 allocation unit is 2 sectors) which means that you cannot use less than two sectors for file header and two sectors for data. The shortest possible file is then four sectors. A program will despite of this write and read single sectors of 256 bytes. A

disk drive for quad density can read single density and double density but only write quad density.

The file headers are mainly stored on sectors 2-33 to speed up the search of files. This means that a normal SS/SD or DS/DD can have 32 file header for fast access. Higher numbers is used if there are more than 32 files. The computer will also store data sectors on sectors 2-33 if there are less than 32 files but not until all other sectors are used.

A DS/QD disk with a 2 sector file header can only have 16 file headers on sector 2-33 with fast access. My Myarc HFDC card cannot store any data sectors on sector 2-33 when I have a few long files. This often happens when you have archived files.

DISK MANAGER FOR 720 KBYTES DS/QD

There are some disk manager suitable for 720 kbytes:

- Funnelweb 4.30 Quick Directory
- Funnelweb 4.30 Show Directory 40 or 80 columns
- Funnelweb 4.30 Disk Review 40 or 80 columns
- Myarc CALL DIR
- Myarc DM III
- Myarc DM V for HFDC
- Disk Utilities

You cannot use DM1000 for quad density because it will missunderstand sector 0 and that one allocation unit is two sectors. Hard Master will show the total number sectors in a wrong way for QD-disks.

The well working disk managers all show the same number of free and used sectors. This corresponds to the marked allocation units in sector zero. The file length is shown in different ways:

DS/QD	Header	Data sectors	Minimum
FW QD	1	used	2
FW SD	1	used	2
FW DR	2	even number	4
CALL DIR	2	used	3
DM III	2	even number	4
DM V	2	even number	4
DSKU	2	even number	4

Older versions of Funnelweb may differ from this. Funnelweb QD and SD shows how much space is needed for copying to a smaller disk. CALL DIR shows the number of sectors that cannot be used to increase the file. If you have an odd number of data sectors then there is one free sector which only can be used by that particular file. DM V, DSKU and FW DR show the number of sectors that cannot be used by other files. None of the disk managers has any knowledge of that sector 2-33 cannot be used for data but only for file header.

TI-Writer behaves strange because the shortest possible file has

two data sectors when you save it to a DS/QD disk. If this file is copied to a smaller disk then it will have a total length of 3 sectors. Three data sectors can despite this be used with TI-Writer on a QD disk.

You can also use 3.5 inch DS/DD 720 kbytes in the same way as 5.25 inch DS/QD.

HIGH DENSITY (3.5 inch)

Myarc HFDC is prepared for DS/HD 1.44 Mbytes 3.5 inch drives but the software is not ready. I haven't seen any information about how the allocation units will be organized. I suspect that it will have an allocation unit of 4 sectors. This would mean that the shortest file is 8 sectors long.

HARD DISK

My 20 Mbytes hard disk has an allocation unit of 2 sectors so the files will have two sectors for file header and an even number of data sectors. The shortest file will be 4 sectors. Both CALL DIR and DM V will show 3 sectors for the shortest file in this case. This is rather strange because a 20 Mbytes hard disk is similar to a DS/QD 720 kbytes disk. A hard disk can have maximum >FFFF allocation units and a 20 Mbytes hard disk uses >99C0.

A 40 Mbytes hard disk has 4 sectors per allocation so the smallest file will be 8 sectors. Myarc DM V will only show 4 sectors file header and used data sectors. The unused but occupied data sectors will not be shown so the disk manager will show 5 sectors for the smallest file that occupies 8 sectors.

I haven't seen any information about an 80 Mbytes hard disk but I think that it will have 8 sectors per allocation unit. The smallest file will be 16 sectors which will be shown as 9 sectors by the disk manager.

A hard disk with more than 7 heads will not work with Myarc HFDC according to Richard Twyning, EAR july 90. There are only 3 address lines for head select. Small hard disks will use pin 2 for write precompensation, medium size will not use it and large size will use it as the most significant bit for head select. Most HFDCs cannot use the third address contact for WDS3 according to Asgard Reflections vol 2, no 3.

REFERENCES

MG Advanced Diagnostics
Asgard Hard Master
Jan Alexandersson: HFDC review
Jan Alexandersson: Sector Editor review