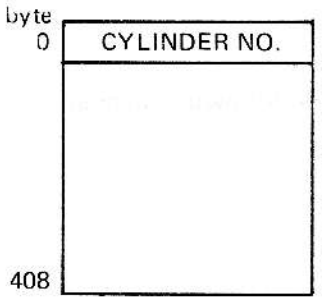
5. DISK STRUCTURE

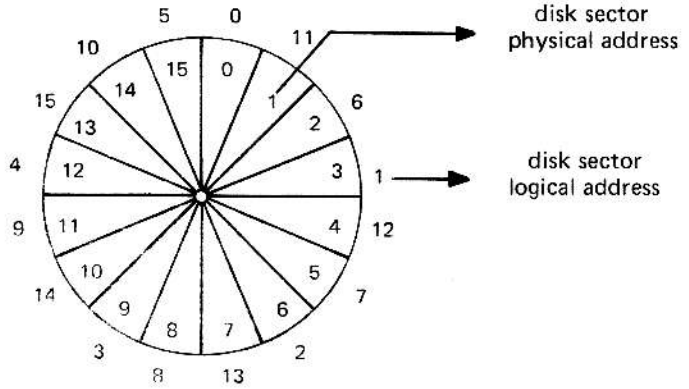
5.1 Sectors

Each disk track is divided by the hardware into 16 sectors of 205 words each. The basic unit in the structure of a disk is the sector. All I/O operations are performed on whole sectors. All sectors on the disk are numbered relative to the start of the disk (sector 0). A sector has the following format:



A cylinder number is written in the first word of every sector when the disk is initially formatted by the utility PM6800. It contains the number of the cylinder in which the sector is located. It is used by the Monitor to check if a seek operation has been successful or not.

There are two sector addressing systems used by the Monitor : physical addressing and logical addressing. Using physical addresses, sectors are numbered according to their physical sequence on the disk. Using logical addresses, sector numbers are interlaced on a "factor minus three" basis. This is done to give programs enough time to process the current sector before reading or writing the next sector. The following diagram illustrates this point:



16 sectors

Physical addresses are used by the Monitor when reporting disk errors on the console typewriter. In all other cases the logical address is used. For example, all data management functions refer to logical addresses and when a disk dump is made the sectors are printed in their logical sequence.

5.2 Granules

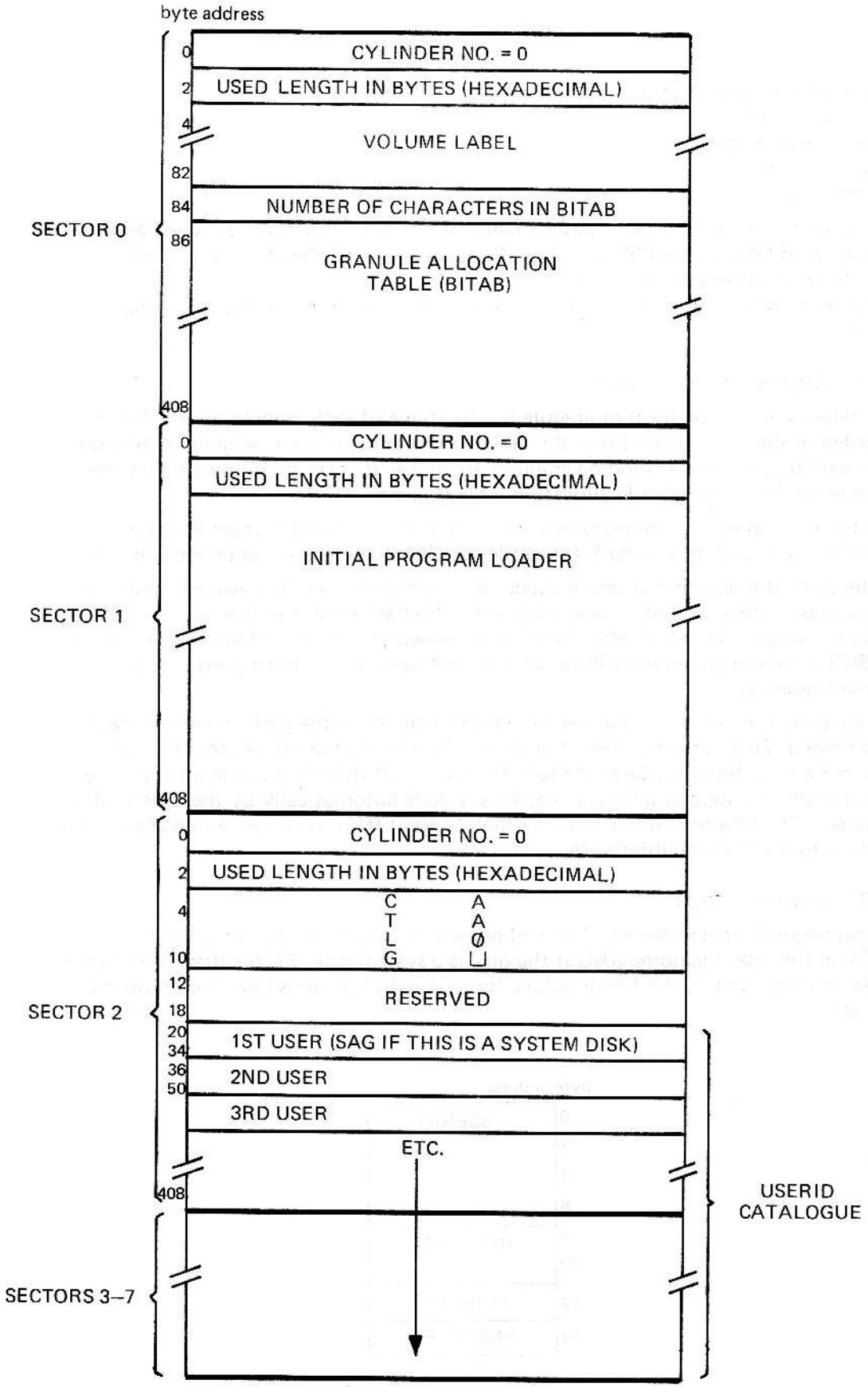
Disk space is allocated in discrete granules. Each granule comprises eight logically consecutive sectors. There are two granules per track.

The first three granules on every disk are reserved by the Monitor. The use of these granules is described in the following sections.

5.3 Granule Zero

5.3.1 *General*

The layout of this granule is shown in the following diagram:


byte address
SECTOR 0
0
CYLINDER NO. = 0
2
USED LENGTH IN BYTES (HEXADECIMAL)
4
VOLUME LABEL
82
84
NUMBER OF CHARACTERS IN BITAB
86
GRANULE ALLOCATION TABLE (BITAB)
408
SECTOR 1
0
CYLINDER NO. = 0
USED LENGTH IN BYTES (HEXADECIMAL)
INITIAL PROGRAM LOADER
408
SECTOR 2
0
CYLINDER NO. = 0
2
USED LENGTH IN BYTES (HEXADECIMAL)
4
CTLG AAØ␣
10
12
RESERVED
18
20
1ST USER (SAG IF THIS IS A SYSTEM DISK)
34
36
2ND USER
50
3RD USER
ETC.
408
USERID CATALOGUE
SECTORS 3–7

The significant entries in this granule are:

- Volume label
- Granule allocation table
- Initial program loader
- Userid catalogue

The volume label and initial program loader (IPL) are written on the disk when it is premarked by the utility PM6800. The IPL is used to load the Monitor into memory from the disk during system start.
The granule allocation table and userid catalogue are described in the following sections.

5.3.2 *Granule allocation table*

This table is held in sector 0 of granule 0. The status of each granule on the disk is recorded in this table. Each bit in the table corresponds to one disk granule. Bits set to 0 indicate that the corresponding granules are in use. Bits set to 1 indicate that the granules are free. The granule allocation table is named BITAB.

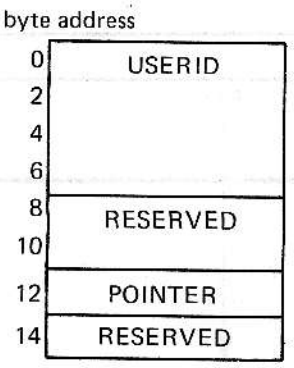
This table is copied into memory at system start. It is updated in memory. It is written back to disk after a KPF (keep file) or DEL (delete file) command is issued.

At the start of a session disk space allocation begins from the first available granule. New granules are allocated in ascending order. No backward search is done to take into account any granules which may have been released as a result of file deletion. However, the SCR (scratch) command will result in granule allocation starting again at the first available granule.

A library file (i.e. a file that has been made permanent via the KPF command) cannot be extended. That is the number of granules allocated to the file cannot be increased. Only temporary files may be extended. The user must therefore create a temporary file each time he updates a library file. This is done automatically by the Line Editor processor. The new temporary file may then be kept (KPF command) in place of or in addition to the original library file.

5.3.3 *Userid catalogue*

The catalogue is held in sectors 2 to 7 of granule 0. It contains an entry for each userid on the disk, including SAG if the disk is a system disk. Each entry contains the userid and a pointer to the file directory for that userid. Entries have the following format:



The pointer contains the sector number of the granule containing the file directory. If the userid is SAG the pointer will point to sector 8 (the first sector of granule 1). This is because the file directory for the SAG library is always held in granule 1.

Whenever a new user is declared via the DCU command an entry is made in the catalogue. It remains in the catalogue until the userid is deleted via the DLU command.

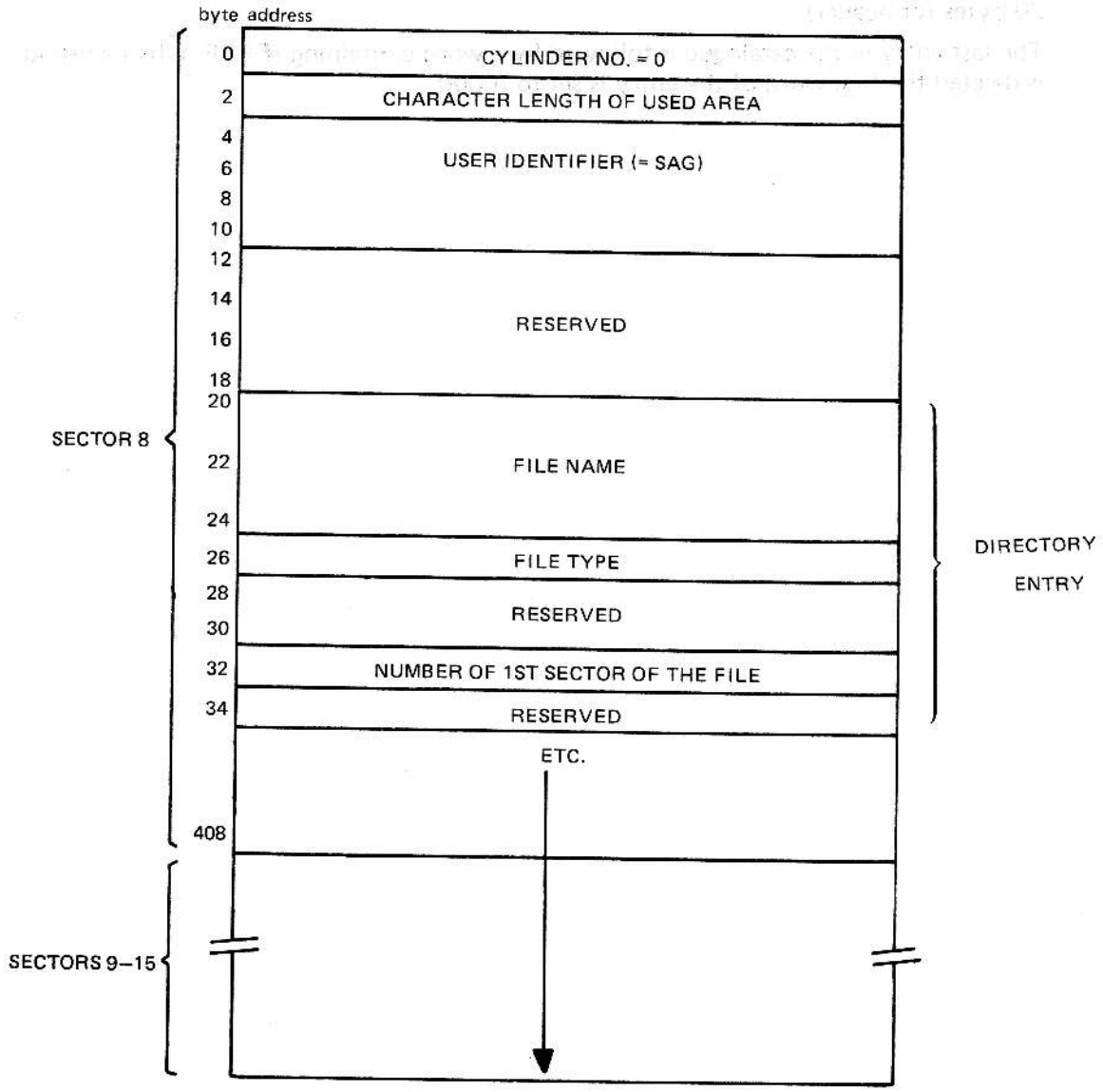
Entries are placed in the sequence in which DCU commands are keyed-in, starting at byte 20 of sector 2.
A catalogue may contain a maximum of 149 entries (i.e. the capacity of 6 sectors less 20 bytes for header).

The last entry in the catalogue is followed by a word containing /FFFF. When a userid is deleted the first word of the entry is set to /0000.

5.4 Granule One

If the disk is a system disk granule 1 contains the file directory for the SAG library.
If the disk is not a system disk granule 1 is not used.

The format of this granule (when used) is as follows:



There is one eight word entry in the directory for each file in the library of userid SAG.

Each entry contains the file name, the file type and the number of the first sector of the file. The format of the entry is shown in the above diagram (bytes 20 to 35).

The file type can have the following values:

- SC meaning source file
- ØB meaning object file
- LM meaning load file
- UF meaning undefined file type.

There is also a file directory for each non system userid declared on a disk. These user directories may be located anywhere on disk. Their locations are indicated by the pointers in the userid catalogue. The directories for user libraries have exactly the same format as the system file directory, except for cylinder no. , sector no. and userid. Each directory occupies one complete granule.

Whenever a disk file is made permanent via the KPF command an entry is made in the directory. It remains in the directory until the file is deleted via the DEL command.

Entries are placed in the sequence in which KPF commands are keyed-in, starting at byte 20 of the granule. A directory may contain a maximum of 199 entries (i.e. the capacity of eight sectors less 20 bytes for the header).

The last entry in a directory is followed by a word containing /FFFF. When an entry is deleted the first word of the entry is set to /0000.

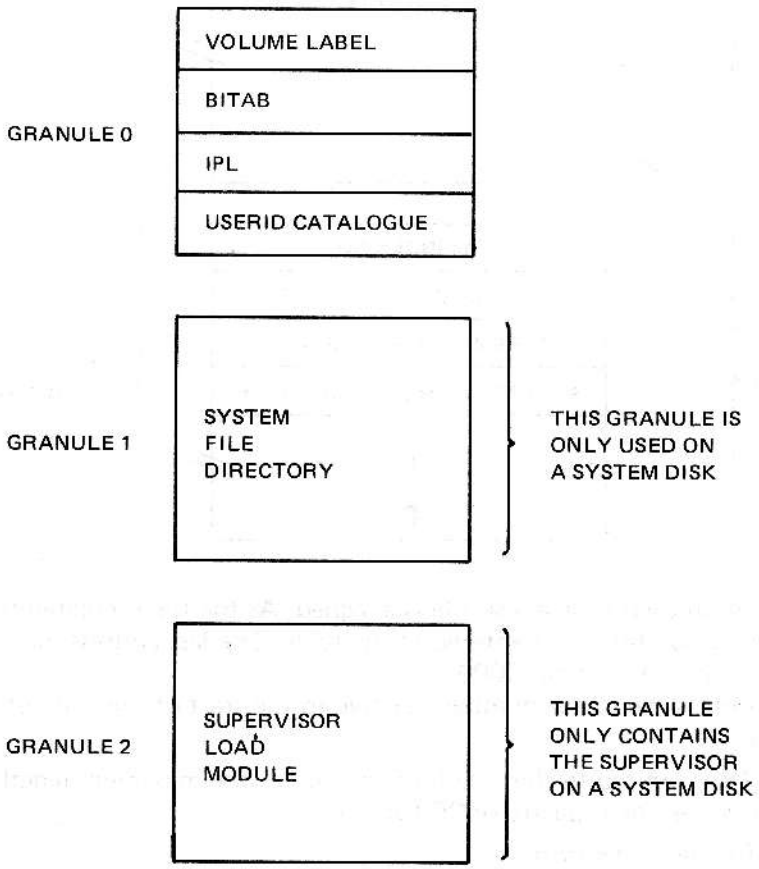
The granule for a directory is allocated at the time a new userid is declared.

5.5 Granule Two

On a system disk, granule 2 and subsequent contiguous granules hold the Supervisor load module which is read into memory by the IPL at system start.

5.6 Summary of Granules Zero, One and Two

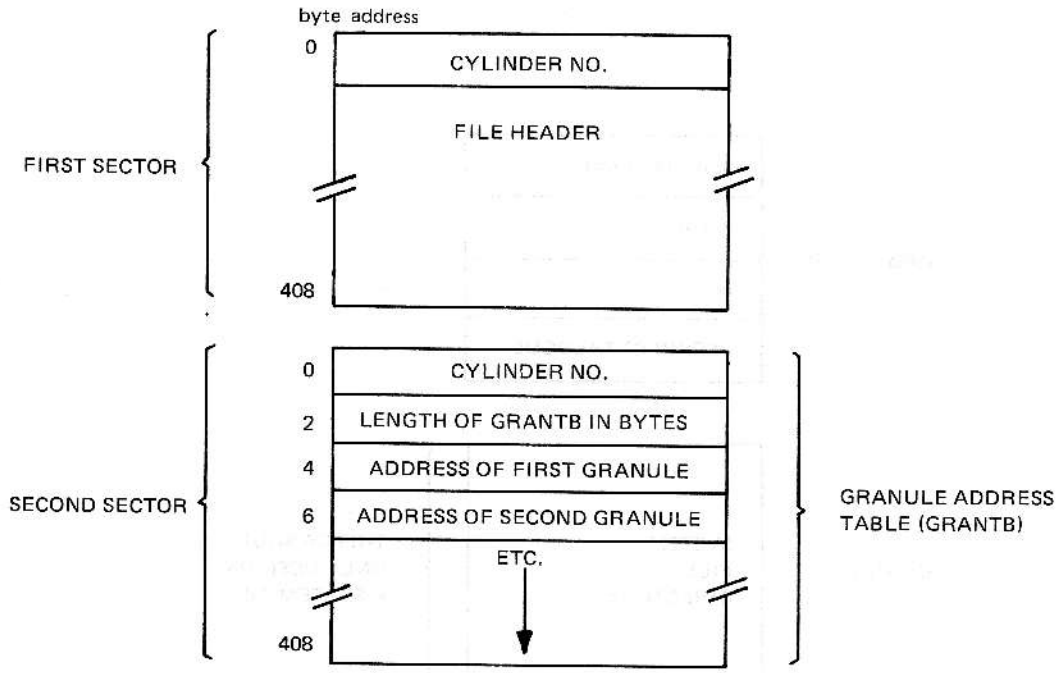
In summary, the contents of granules 0, 1 and 2 of a disk can be depicted thus:



5.7 Files

A file is held in an integral number of granules, so one granule cannot be shared by two or more files. The Monitor allocates as many granules as are needed during the creation of a temporary file. These granules need not be contiguous. They are chained and the address of each granule is entered in a granule address table called GRANTB.

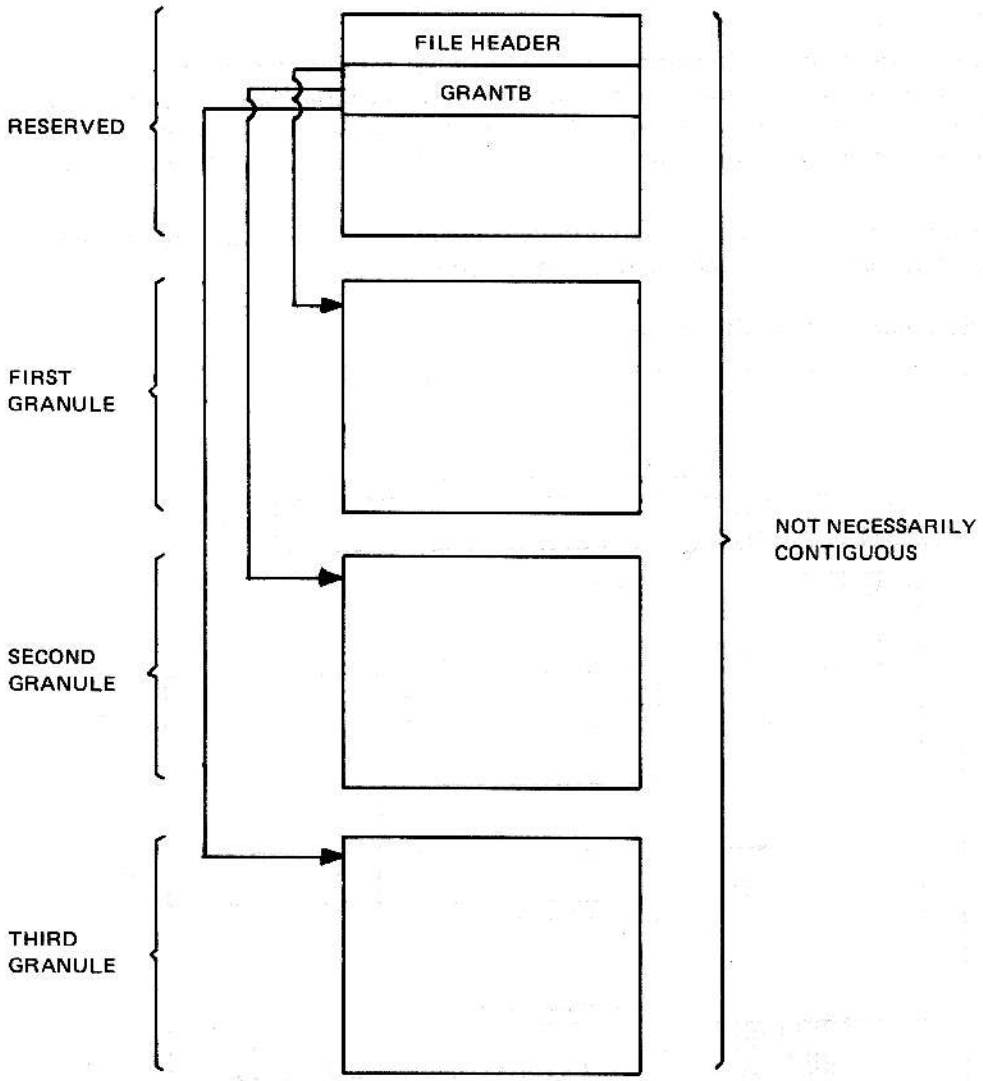
The first two sectors of the first granule of each file are reserved by the Monitor. The first sector contains a file header. The second sector contains the table GRANTB.



A GRANTB is set up each time a disk file is assigned. As the file is created the address of each granule used by the file is entered in the table. The last address in GRANTB is followed by a word containing /0000.
The granule address is the sector number, relative to the start of the disk, of the first sector in the granule.

Because GRANTB is limited to the length of one sector the maximum length of any file is 320K words (i.e. the capacity of 200 granules).

The structure of a file is therefore:


FILE HEADER
GRANTB
RESERVED
FIRST GRANULE
SECOND GRANULE
THIRD GRANULE
NOT NECESSARILY CONTIGUOUS

5.8 System Files

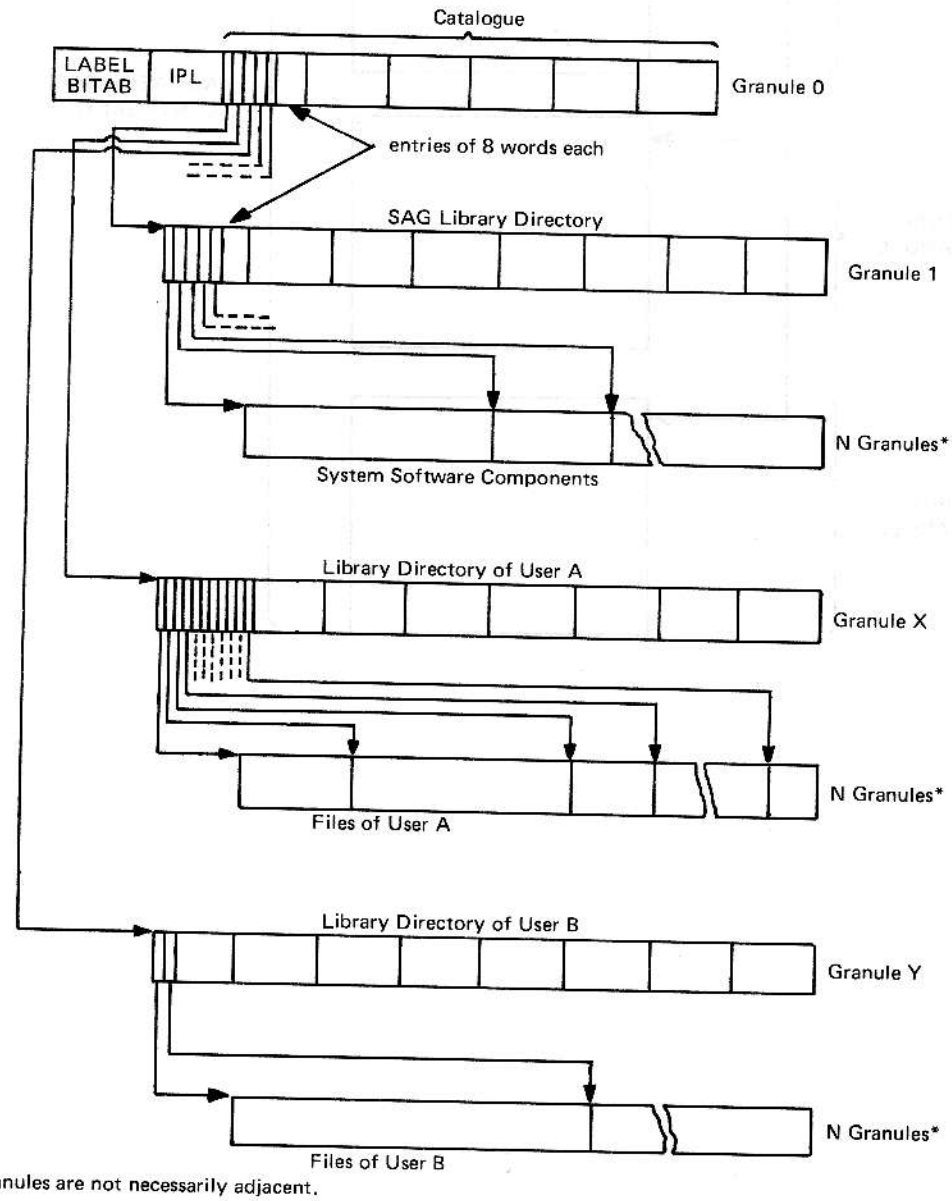
DOS6800 System Software components are held in disk files in the same manner as user programs and data.

There is one constraint on the storage of system files: the first file in the library of user SAG must start in granule 2 of the disk and must occupy contiguous granules. This file is the Supervisor load module. However, the format of the Supervisor is that of a normal load module and apart from the above restriction it is held in a normal file.

Other DOS6800 System Software components are also held in the library of the user SAG but the granules they occupy need not be contiguous.

5.9 Summary of Disk Structure

The structure of the disk is summarized in the following diagram.



*These granules are not necessarily adjacent.