Micro Fiche Scan

Name of device(s) tested:

    XXDP

Test description:

    XXDP FILE STRUCTURE

MAINDEC Number or Package Identifier (after SEP 1977):

    CHQFSB0

Fiche Document Part Number:

    AH-S867B-MC

Fiche preparation date unknown, using copyright year:

    1984

Image resolution:

    8-bit gray levels, max. quality for archiving

IDENTIFICATION

PRODUCT NAME: AC-S866B-MC

PRODUCT NAME: CHQFSB0 XXDP+ FILE STRUCT DOC

PRODUCT DATE: 8 Oct 1984

MAINTAINER: Low End Diagnostic Engineering

DATE: 8 Oct 1984
CHARGE NUMBER: E98-08823

XXDP• FILE STRUCTURE

SPECIFICATION

REVISION 1.0

XXDP Version: 1.3

Maintained by: MSD DIAGNOSTIC ENGINEERING

Revision History:

Revision	Date	By
0.0	17 FEB 1981	Michael Cinnamon
1.0	8 Oct 1984	Larry Prucha

Table of Contents

1.0 INTRODUCTION

The structure that XXDP+ uses for storing files on media is unique
to XXDP+. The structure was originally based on DOS-11 but it has
since been modified to accommodate the needs of XXDP+, although
many similarities still exist.

XXDP+ supports both random access and sequential access type
devices. A directory index structure is used for accessing files
on random access type devices such as disks. For sequential
devices like magtape, a header record containing file information
precedes each file.

2.0 DATA STRUCTURES

2.1 Data Blocks

The basic unit of data transferred in XXDP+ file I/O is a data
block. A data block is defined as a group of 512(10) 8 bit bytes.

2.1.1 Random Access Devices.

On random access devices, data blocks are addressed by their
logical block number. Logical blocks are data blocks that are
addressable in a linear ordered fashion. The order ranges from 0
to n-1, where n is the maximum number of blocks supported on the
device.   The variable n varies depending on the device but is not
greater than 65535 (10). This means that no matter how many data
blocks physically reside on a device only the first n blocks are
accessible.

Logical blocks are not necessarily the same as physical blocks.
A physical block is usually limited to the amount of data a
physical sector contains which may be less than 512 (10) bytes.
Also a physical block houses at most one logical block.

A linked list of logical blocks is set up using linked blocks.
A linked block is a logical block that devotes the first word
of the block to contain a link word. The link word contains the
logical block number of another block. A zero link word indicates
that the block containing it is the last block of the list.

2.1.2 Sequential Access Devices

On sequential access devices such as magtape and cassette, data
blocks are stored as 512 byte records. Because XXDP+ uses
the same read/write routines for both random and sequential
access devices, logical linked blocks are stored on sequential
type devices.

However, the link word is only some non-zero value to indicate
that there are more blocks in the list. A zero link word
indicates the last block of the list.

3.0 FILE STRUCTURES

3.1 Types Of Files

There are three types of files supported by XXDP+. They are
contiguous files, text files and binary files. This does not mean
that other types of files cannot be stored on an XXDP+ medium, but
XXDP+ only has the capability to produce these types.

3.1.1 Contiguous Files

A contiguous file is a set of logical blocks which physically
reside immediately adjacent to one another on the media.
The term 'immediately adjacent' is obvious for sequential devices
but not quite as apparent for random access devices. For these
it means for any logical block n, the next contiguous block is
located at n+1.

Contiguous files are normally used to store core image data such
as the XXDP+ monitor.

3.1.2 Text Files

Text files are made up of a series of linked blocks. Each
block contains 510(10) 8 bit ASCII characters. An ASCII null
character (a byte with a value of zero) is used to indicate the
end of the file.

3.1.3 Binary Files

Binary files are used to store executable programs. They are made
up of a series of linked blocks each of which contain sections
of the program. These sections are in absolute formatted binary
and there is at least one per logical block. The absolute
formatted binary specification is as follows:

BYTE
----   ---

  1   - Contains a value of 1 to indicate starting point.

  2   - Contains a value of 0. This must follow byte 1.

 3,4   - BYTE COUNT = number of bytes (N) in this binary block.
          Includes bytes 1, 2, 3 and 4 & excludes the checksum byte.

               If BYTE COUNT = 6, then this is a TRANSFER BLOCK
               If BYTE COUNT = 5, then this is a BIAS BLOCK

 5,6   - Contains the starting memory address where the following
          data bytes are to be stored.

7 to N - Data bytes. N <= 509. Maximum number of data bytes is 503.

N + 1   - CHECKSUM byte. The checksum is the 2's complement of the
          sum of the data in all n bytes. It is generated
          ignoring overflow and carry conditions.

TRANSFER BLOCK is at the end of a binary file and is indicated by
a binary block that has a byte count of 6. Bytes 5 and 6 contain
the program's transfer address.

BIAS BLOCK is indiacted by a binary block with a byte count of 5.
Bits 0 and 1 of byte 5 represent bits 16 and 17, respectively, of
the load address for the next binary block.

4.0 MEDIA STRUCTURE

4.1 Random Access Structure

All XXDP+ random access devices are set up to contain the
following pieces of information: bootstrap, monitor core
image, master file directories (MFD), user file directories (UFD),
and bit maps.

The bootstrap is a program that always occupies logical block 0 on
the device. It is a core image that is placed there by the utility
command 'SAVM'. The bootstrap knows where on the disk the monitor
core image resides.

The monitor core image is a contiguous file that is 16 blocks
long. It is placed on the disk by the utility command 'SAVM'. It
position depends on the type of disk. The MFD is a table of
information which contains pointers to the UFDs and the bit maps.

4.1.1 Master File Directory

The MFD is placed on the disk by the utility 'ZERO' command. The
type of disk determines which of two varieties of MFD is used and
where it is on the device.

MFD VARIETY #1   WORD OFFSET
MFD1:   INTO BLOCK

```
+------------------------------------+
!    LINK TO MFD2                    !   0
!------------------------------------!
!    INTERLEAVE FACTOR               !   1
!------------------------------------!
!    BIT MAP START BLOCK #           !   2
!------------------------------------!
!    POINTER TO BIT MAP #1           !   3
!------------------------------------!
!    POINTER TO BIT MAP #2           !   4
!                                    !
!                .                   !
!                .                   !
!                                    !
!    POINTER TO BIT MAP #N           !   N+2
!------------------------------------!
!                0                   !   N+3
!------------------------------------!
!              UNUSED                !   N+4 to 255
+------------------------------------+
```

The interleave factor is used as part of the block allocation
algorithm. Normally blocks are allocated contiguously if possible
but on certain devices, the amount of time it takes to access a
linked list of blocks is reduced by placing each block of the list
a constant number of blocks apart. This constant number is the
interleave factor. The pointers in the table are the logical block
numbers of the respective bit maps.

                                        WORD OFFSET
MFD2:   INTO BLOCK

```
+------------------------------------+
!                                    !   0       - Link of zero
!                0                   !             indicates no more
!                                    !             MFDs.
!------------------------------------!
!               401                  !   1       - DOS-11 UIC [1,1].
!------------------------------------!
!   POINTER TO FIRST UFD BLOCK       !   2       - logical block number
!                                    !             of first UFD block.
!------------------------------------!
!      9 (10)        ALWAYS          !   3       - number of words in
!                                    !             each UFD entry;
!------------------------------------!
!                0                   !   4
!------------------------------------!
!              UNUSED                !   5-255
+------------------------------------+
```

MFD VARIETY #2

MFD 1/2:

```
                                WORD OFFSET
                                INTO BLOCK
+----------------------------------+
!                0                 !     0
!----------------------------------!
! POINTER TO FIRST UFD BLOCK       !     1
!----------------------------------!
! # OF UFD BLOCKS                  !     2
!----------------------------------!
! POINTER TO FIRST BIT MAP BLOCK!  !     3
!----------------------------------!
! # OF BIT MAP BLOCKS              !     4
!----------------------------------!
! POINTER TO MFD 1/2               !     5
!----------------------------------!
!                0                 !     6
!----------------------------------!
! NUMBER OF SUPPORTED BLOCKS       !     7
!----------------------------------!
! # OF BLOCKS PREALLOCATED         !     8   <- number of blocks on
!                                  !             device reserved for
!                                  !             device structure
!                                  !             information.
!----------------------------------!
! INTERLEAVE FACTOR                !     9
!----------------------------------!
!                0                 !    10
!----------------------------------!
! POINTER TO FIRST BLOCK OF        !    11
! MONITOR CORE IMAGE               !
!----------------------------------!
!                0                 !    12
!----------------------------------!
! TRACK + SECTOR ADDRESS FOR BAD!  !    13     )   )
! SECTOR FILE (SINGLE DENSITY)  !  !           )   )  refers to the
!----------------------------------!           )   )
! CYLINDER ADDRESS FOR BAD         !    14     )   )  location on
! SECTOR FILE (SINGLE DENSITY)  !  !           )   )
!----------------------------------!          > <   the disk of the
! TRACK + SECTOR ADDRESS FOR BAD!  !    15     )   )
! SECTOR FILE (DOUBLE DENSITY)  !  !           )   )  DEC STD 144
!----------------------------------!           )   )
! CYLINDER ADDRESS FOR BAD         !    16     )   )  bad sector file.
! SECTOR FILE (DOUBLE DENSITY)  !  !           )   )
+----------------------------------+
```

4.1.2 User File Directory

The User File Directory (UFD) is a list of the files on the media.
It is created by the utility 'ZERO' command. The UFD is arranged as
a linked list of logical blocks and the number of blocks that the
UFD occupies depends on the device. Each block of the UFD contains
space for 28(10) file entries.

```
+----------------------------+
! LINK TO NEXT UFD BLOCK     !
!----------------------------!
! FILE ENTRY #1              !
!----------------------------!
! FILE ENTRY #2              !
!----------------------------!
!                            !
!             .              !
!             .              !
!             .              !
!----------------------------!
! FILE ENTRY #28(10)         !
+----------------------------+
```

Each file entry is a table of 9(10) words that contains the
following information about the file.

```
                               WORD
+----------------------------+
!                            !  1   - Six character encoded  RAD-50.
!       FILE NAME            !  2     Zeros if deleted file.
!                            !
!----------------------------!
!                            !  3   - Three character encoded RAD-50.
!     FILE EXTENSION         !        Zeros if deleted file
!                            !
!----------------------------!
!                            !  4   - DOS-11 format DATE given the
!       FILE DATE            !        file when put on media
!                            !
!----------------------------!
!                            !  5   - ACT-11 use only.
!    ACT-11 LOGICAL END      !        Not used in XXDP+.
!                            !
!----------------------------!
!                            !  6   - 1st logical block that file
!      FIRST BLOCK #         !        occupies.
!                            !
!----------------------------!
!                            !  7   - Number of logical blocks that
!      FILE LENGTH           !        file occupies.
!                            !
!----------------------------!
!                            !  8   - Block number of last logical
!      LAST BLOCK            !        block that the file occupies.
!                            !
!----------------------------!
!                            !  9   - ACT-11 use only.
!    ACT-11 LOGICAL 52       !        Not used in XXDP+.
!                            !
+----------------------------+
```

4.1.3 Bit Map

The bit map is a file that contains the current status of every
supported logical block on the media.

The bit map is arranged as a linked list of logical blocks. The
number of blocks that the map occupies depends on the device. It
is created by the utility 'ZERO' command. Only the first 64 words
of each map block have meaning. Each word maps 16 blocks and 60
words are used for mapping. Therefore this map will map 960 blocks.
A bit set means a block is used and a bit is clear when not used.

```
                                    WORD
+--------------------------------+
! LINK TO NEXT MAP BLOCK    !      1    - Logical block number of next
!                           !                map block contains zero if
!                           !                it is the last map.
!---------------------------!
! MAP NUMBER                !      2    - Which map this one is.
!---------------------------!
!  60(10)                   !      3    - Number of words used for map.
!---------------------------!
! LINK TO FIRST MAP         !      4    - Logical block number of first
!                           !                bit map.
!---------------------------!
! MAP FOR BLOCKS 0-15 (10)  !      5    - Map for 960 blocks.
!---------------------------!
! MAP FOR BLOCKS 16-31(10)  !      6
!---------------------------!
!                           !
!            .              !      .        Bit set when block is used.
!            .              !      .        Bit cleared when block free.
!            .              !      .
!---------------------------!
!MAP FOR BLOCKS 944-959(10) !     64
+--------------------------------+
!                           !
```

WORDS 65-255 - NOT USED.

4.1.4 Random Access Device Information

DEVICE	MNEMONIC	1st UFD BLK #	# of UFD Blocks	1st BIT MAP BLK	# OF MAPS	MFD1	MFD2
TU58	DD	3	4	7	1	1	2
RP04,5,6	DB	3	170.	173.	50.	1	2
RK03,5	DK	3	16.	4795.	5.	1	4794.
RL01/2	DL	24.	146.	2	22.	1	-
RK06,7	DM	31.	96.	2	29.	1	-
RP02,3	DP	3	170.	173.	50.	1	2
RM03	DR	52.	170.	2.	50.	1	-
RS03,4	DS	3	4	7	2	1	2
TU56	DT	102	2	104	1	100	101
RX01	DX	3	4	7	1	1	2
RX02	DY	3	16.	19.	4	1	2
UDA50	DU	35.	234.	269.	69.	1	2
RDRX	DQ	3	16.	19.	4	1	2
RC25	DA	35.	181.	216.	53.	1	2

DEVICE	# OF BLKS ON DEV	# OF BLKS TO PREALLOCATE	INTER-LEAVE	BOOT BLK #	MONITOR BLOCK #
TU58	511.	40.	1	0	8.
RP04,5,6	48000.	255.	1	0	223.
RK03,5	4800.	69.	5	0	30
RL02 RL01	20460. or 10200.	200.	1	0	170.
RK06,7	27104.	157.	1	0	127.
RP02,3	48000.	255.	1	0	223.
RM03	48000.	255.	1	0	222.
RS03,4	989.	41.	1	0	9.
TU56	576.	69.	5	0	30
RX01	494.	40.	1	0	8.
RX02	988.	55.	1	0	23.
UDA50	65535.	338.	1	0	3.
RDRX	790.	55.	0	0	23.
RC25	50840.	269.	1	0	3.

4.2 Sequential Access Devices

4.2.1 Magtape

Although magtape is not usually considered as a file structured device, certain structure features are implemented to enable creation and retrieval of multiple files.

The files on magtape are terminated by an end-of-file mark (EOF) or tape mark (TM). The last file on the tape is terminated by 2 consecutive EOFs to indicate logical-end-of-tape.

```
+----------------------------------------------------------+
! 1ST FILE ! EOF ! 2ND FILE ! EOF ! LAST FILE ! EOF ! EOF !
+----------------------------------------------------------+
```

Each file on magtape is made up of a header and data records.

```
+-------------------------------------------------------------------+
! HEADER  ! IRG ! DATA RECORD ! IRG ! DATA RECORD ! IRG ! EOF ! IRG !
! 7 WORDS !     ! 256 WORDS   !     ! 256 WORDS   !     !     !     !
+-------------------------------------------------------------------+
```

The header record is structured as follows:

WORD

```
+-------------------+
!                   !
!   FILE NAME       !      1    - Filename encoded in RAD-50.
!                   !      2
!-------------------!
!   FILE EXTENSION  !      3    - Extension encoded in RAD-50.
!-------------------!
!       401         !      4    - DOS-11 UIC [1,1]
!-------------------!
!        0          !      5    - Set to zero.
!-------------------!
!   FILE DATE       !      6    - DOS-11 format for Date given file
!                   !             when written on tape. File is
!                   !             contiguous if bit 15 of date, is set.
!-------------------!
!   FILE SIZE       !      7    - Number of logical blocks (records)
!                   !             in the file.
+-------------------+
```

The first file on a magtape is normally the XXDP+ monitor core image. It is written as a contiguous file. Every new file is written at the logical end of tape. The last file on tape may be written so part lies after the physical EOT marker but no file will be written entirely after the physical EOT mark. The number of files that a magtape can accommodate is a function of the file size, the drive density and the tape length.

4.2.2 Cassette (TU60)

Cassette is structured similarily to magtape in that each file is
preceded by a header and a marker that identifies the logical end
of tape. However, the actual data in the header and   end-of-file
marker are different.

The files on cassette are terminated by a file gap. The last file
on the tape is terminated by a sentinel file. A file gap must
precede the first file on the cassette. The tape is formatted as
follows:

```
+------------------------------------------------------------------+
! GAP ! FILE A ! GAP ! FILE B ! GAP ! FILE C ! GAP ! SENTINEL !
+------------------------------------------------------------------+
```

The sentinel file is a 32 byte record containing all zero's.

Each file on cassette is made up of a file header record and file
data records in multiples of 4.

```
+------------------------------------------------------------------------+
! FILE      ! DATA     ! DATA     ! DATA     ! DATA     ! GAP !
) HEADER    ) RECORD   ) RECORD   ) RECORD   ) RECORD   )     )
! 32 BYTES  ! 128 BYTES ! 128 BYTES ! 128 BYTES ! 128 BYTES !   !
+------------------------------------------------------------------------+
```

The file header record is structured as follows:

BYTE

	BYTE	
FILE NAME	1-6	- Filename encoded in RAD-50.
FILE EXTENSION	7,8,9	- Extension encoded in RAD-50.
FILE TYPE	10	- File type indicator. 0=6000, 14=Deleted.
100000	11,12	- Word indicating record length set to 100,000 (128 byte records).
0	13	- Sequence number not used in XXDP+.
0	14	- Header continuation not used in XXDP+.
	15,16	- Not used.
DATE	17,18	- DOS-11 format of date for when file was put on tape.
FILE LENGTH	19,20	- Number of logical blocks in file. Only meaningful for contiguous files
0	21,32	- Not used.

5.0 GLOSSARY

IRG   -   Interrecord gap. The gap that is written between
            records on magtape.

MFD   -   Master File Directory

RAD-50 -   RADIX-50. A method of encoding 3 ASC11 characters into
            one 16 bit word.

UFD   -   User File Directory.

UIC   -   User Identification code.