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IDENTIFICATION

PRODUCT NAME: AC-S866B-MC

PRODUCT NAME: CHQFSBO XXDP+ FILE STRUCT DOC

PRODUCT DATE: 8 Oct 1984

MAINTAINER: Low End Diagnostic Engineering

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XXDP+ FILE STRUCTURE
SPECIFICATION

REVISION 1.0

XXDP Version: 1.3

Maintained by: MSD DIAGNOSTIC ENGINEERING

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Revision	Date	By
0.0	17 FEB 1981	Michael Cinnamon
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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 indicated 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
MFD1:

	WORD OFFSET 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.

MFD2:

	WORD OFFSET INTO BLOCK	
0	0	- Link of zero 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	

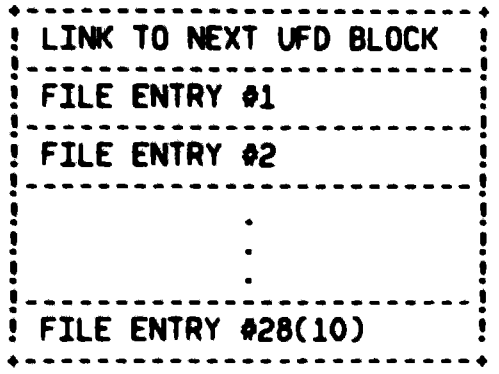
MFD VARIETY #2

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 MONITOR CORE IMAGE	11	
0	12	
TRACK + SECTOR ADDRESS FOR BAD SECTOR FILE (SINGLE DENSITY)	13	refers to the
CYLINDER ADDRESS FOR BAD SECTOR FILE (SINGLE DENSITY)	14	location on
TRACK + SECTOR ADDRESS FOR BAD SECTOR FILE (DOUBLE DENSITY)	15	the disk of the DEC STD 144
CYLINDER ADDRESS FOR BAD SECTOR FILE (DOUBLE DENSITY)	16	bad sector file.

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.



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

	WORD	
FILE NAME	1 2	- Six character encoded RAD-50. Zeros if deleted file.
FILE EXTENSION	3	- Three character encoded RAD-50. Zeros if deleted file
FILE DATE	4	- DOS-11 format DATE given the file when put on media
ACT-11 LOGICAL END	5	- ACT-11 use only. Not used in XXDP+.
FIRST BLOCK #	6	- 1st logical block that file occupies.
FILE LENGTH	7	- Number of logical blocks that file occupies.
LAST BLOCK	8	- Block number of last logical block that the file occupies.
ACT-11 LOGICAL 52	9	- ACT-11 use only. 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	998.	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.

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

The header record is structured as follows:

	WORD	
FILE NAME	1 2	- Filename encoded in RAD-50.
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:

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.

The file header record is structured as follows:

	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.