Digital Imaging and Communications in Medicine (DICOM)

Supplement 27

Media Formats and Physical Media for Data Interchange

New and Revised Magneto-Optical Disk Formats

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Digital Imaging and Communications in Medicine (DICOM)

Part 12 and Annex A,C,D and E - Corrections

Relax and Explain Boot Sector Specfications

Part 12: Media Formats and Physical Media for Media Interchange

2 NORMATIVE REFERENCES

Append additional references:

Microsoft MS-DOS Programmer's Reference Version 6.0, Microsoft Press, Redmond WA, 1993. ISBN 1-55615-546-8.

ECMA-201 and ISO/IEC 13963:1995 Data Interchange on 90mm Optical Disk Cartridges - Capacity 230 MB Per Cartridge.

ISO/IEC DIS 14517 Data Interchange on 130mm Optical Disk Cartridges - Capacity 2.6GB Per Cartridge.

ISO/IEC DIS 15041 Data Interchange on 90mm Optical Disk Cartridges - Capacity 640 MB Per Cartridge

Annex A (Normative) PC File System

A.2 LOGICAL FORMAT

*Ammend the second paragraph with the changes in **BOLD and UNDERLINED** to include a reference to the Microsoft documentation:*

The PC File System shall be organized as an "mtools" unpartitioned file system **(see Note)**, using either 12-bit or 16-bit File Allocation Table (FAT). The layout of the boot sector shall be as shown in Table A.2-1. The FAT and related file structures are compatible with the DOS 4.0 and later file systems**, and are described in detail in the Microsoft MS-DOS Programmer's Reference**. Two byte integers shall be encoded in little endian.

And append the following new note:

Note: A PC File system may be either unpartitioned or partitioned. Traditionally, removable media such as floppy disks have been formatted as unpartitioned, and fixed media like hard disks have been formatted with a different form of Master Boot Record that specifies several partitions, each of which has the format of a complete unpartitioned system. When forms of removable media with larger capacity were introduced, some driver vendors chose to format them as unpartitioned, and others as partitioned. In order to facilitate interoperability with existing implementations this Part of the DICOM standard currently specifies one format, the unpartitioned format. Some implementations of the PC DOS filesystem may experience difficulty reading or writing to large capacity unpartitioned removable media, and require special drivers.

Replace Table A.2-1 Boot Sector and accompanying notes as follows:

Table A.2-1 - Boot Sector

Byte(s)	Value	Description
00 - 02	varies	Jump instruction to loader (NOPs) (see note 1)
03 - 10	“ddddddddd”	The formatting DOS(vendor specific) (see note 2)
11 -12	0200H	512 bytes/sector
13	see note 5	sectors/cluster
14 - 15	0001H	1 sector in boot record
16	02H	2 File Allocation Tables (FAT) (see note 3)
17 - 18	200H	512 root directory entries
19 - 20	0000H	Flag for more than 65536 sector/disk. Use offset 32 value
21	see note 5	Flag for disk type; F0H if not otherwise specified
22 -23	varies	sectors/FAT
24 - 25	see note ~~5~~ **6**	sectors/track
26 - 27	see note ~~5~~ **6**	side (head) per disk
28 - 31	00000000	0 reserved or hidden sectors

32 - 35	varies	Total sector/disk. Varies from disk to disk
36 - 37	0000	Physical Drive number = 0
38	29H	Extended boot record signature = 41
39 - 42	undefined	Volume serial number. (see note 4)
43 - 53	varies	The volume ID (vendor specific)
54 - 61	varies	The file system label
62 - 509	varies	Don't care. Any contents acceptable
510	**55H**	**Signature flag - first byte**
511	**AAH**	**Signature flag - second byte**
~~510 - 511~~	~~55AAH~~	~~Signature flag~~

Notes:

1. These three bytes should either be ~~EB0090H~~ **EBH,00H,90H** (indicating a relative jump) or 909090H indicating NOPs. The bytes are for booting off the optical drive which DICOM does not standardize. Some programs use them to validate the disk. The use of EB0090H is known to be more commonly used and is the recommended choice. Readers of DICOM disks that use the PC File System should ignore this field.

2. While eight characters appear to be valid in this field, the use of “MSDOS4.0” is known to be the preferred choice for this string. Some systems, upon finding this field not set to “MSDOS4.0” will ignore the sectors/FAT field and use their own calculation. This may cause an error due to the calculation resulting in a different value than the sectors/FAT field. (MS-DOS is a trademark of Microsoft)

3. Two FATs are recommended. One FAT could also be used but again may cause some incompatibility.

4. The serial number may be any four bytes. A random or sequential number is preferred but is not required.

5. These values are specified in the Annex for each particular type of media.

6. These values are nominally specified in the Annex for each particular type of media, but vary considerably between implementations, and should not affect interoperability.

Annex C (Normative) 90mm 128MB Magneto-Optical Disk

C.2.2 LOGICAL FORMAT

Ammend Table C.2-1 as follows:

Table C.2-1
Boot parameter values for 90mm 128MB magneto-optical disk

Byte(s)	Value	Description
13	**08H,** 10H, 20H**, 40H or 80H**	Sectors / cluster, either **8,** 16, 32, 64 **or 128.**
21	F8H	Flag for disk type F8H = Hard Disk.
24 - 25	0019H **(Nominal)**	**Nominally** 25 sectors/track**, but may vary, and any value should not affect interoperability**.
26 - 27	0001H **(Nominal)**	**Nominally** 1 head**, but may vary, and any value should not affect interoperability**.

Annex D (Normative) 130mm 650MB Magneto-Optical Disk

D.2.2 LOGICAL FORMAT

Ammend Table D.2-1 as follows:

Table D.2-1
Boot parameter values for 130mm 650MB magneto-optical disk

Byte(s)	Value	Description
13	10H, 20H, **40H or 80H**	Sectors / cluster, either 16, 32, **64 or 128. See Note 1.**
21	F8H	Flag for disk type F8H = Hard Disk.
24 - 25	001FH **(Nominal)**	**Nominally** 31 sectors/track**, but may vary, and any value should not affect interoperability**.
26 - 27	0001H **(Nominal)**	**Nominally** 1 head**, but may vary, and any value should not affect interoperability**.

Note**s:** **1. Lower values would not utilize all the disk sectors on a side**.

2. When formatted the total formatted capacity **of one side** of the disk is approximately 300MB.

Annex E (Normative) 130mm 1.2GB Magneto-Optical Disk

E.2.2 LOGICAL FORMAT

Ammend Table E.2-1 as follows:

Table E.2-1
Boot parameter values for 130mm 1.2GB magneto-optical disk

Byte(s)	Value	Description
13	~~10H,~~ 20H, **40H or 80H**	Sectors / cluster, either ~~16,~~ 32, **64 or 128. See Note 1.**
21	F8H	Flag for disk type F8H = Hard Disk.
24 - 25	001FH **(Nominal)**	**Nominally** 31 sectors/track**, but may vary, and any value should not affect interoperability**.
26 - 27	0001H **(Nominal)**	**Nominally** 1 head**, but may vary, and any value should not affect interoperability**.

Note**s**: **1. Lower values would not utilize all the disk sectors on a side**.

2. When formatted the total formatted capacity **of one side** of the disk is approximately 600MB.

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Part 12 Addendum

230 MB 90mm Magneto-Optical Disk

Annex X (Normative) 90 mm 230MB Magneto-Optical Disk

X.1 DICOM MAPPING TO MEDIA FORMATS

Only one DICOM File-set shall be stored onto a single 90 mm disk.

X.2 MEDIA FORMATS

The media format comprises two distinct components:

a. The Recording format, which addresses magnetic recording, track definition, sector headers, etc.

b. The Logical format, which addresses the organization of the data portion of sectors to support semantics of the file system.

X.2.1 RECORDING FORMAT

The low level formatting shall be done using the ECMA-201 and ISO/IEC 13963:1995 standards. The Secondary Defect Management Table shall be used.

X.2.2 LOGICAL FORMAT

The Logical Format for the 90 mm 230MB disk shall be the PC File System (see Annex A).

The boot sector defined in Annex A shall have the following values.

Table X.2.2-1
Boot parameter values for 90mm 230MB magneto-optical disk

Byte(s)	Value	Description
13	08H, 10H, 20H or 40H	Sectors / cluster, either 8, 16, 32 or 64.
21	F8H	Flag for disk type F8H = Hard Disk.
24 - 25	0019H (Nominal)	Nominally 25 sectors/track, but may vary, and any value should not affect interoperability.
26 - 27	0001H (Nominal)	Nominally 1 head, but may vary, and any value should not affect interoperability.

Note: When formatted the total formatted capacity of the disk is approximately 220MB.

X.3 PHYSICAL MEDIA

The physical media shall be the 90 mm Magneto-Optical Rewritable disk with 512 bytes per sector. It shall be compatible with the standards defined in the ECMA-201 and ISO/IEC 13963:1995 Data Interchange on 90mm Optical Disk Cartridges - Capacity 230 MB Per Cartridge standards.

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Part 12 Addendum

540 MB 90mm Magneto-Optical Disk

Annex X (Normative) 90 mm 540MB Magneto-Optical Disk

X.1 DICOM MAPPING TO MEDIA FORMATS

Only one DICOM File-set shall be stored onto a single 90 mm disk.

X.2 MEDIA FORMATS

The media format comprises two distinct components:

a. The Recording format, which addresses magnetic recording, track definition, sector headers, etc.

b. The Logical format, which addresses the organization of the data portion of sectors to support semantics of the file system.

X.2.1 RECORDING FORMAT

The low level formatting shall be done using the ISO/IEC DIS 15041 standard. The Secondary Defect List shall be used.

X.2.2 LOGICAL FORMAT

The Logical Format for the 90 mm 540MB disk shall be the PC File System (see Annex A).

The boot sector defined in Annex A shall have the following values.

Table X.2.2-1
Boot parameter values for 90mm 540MB magneto-optical disk

Byte(s)	Value	Description
13	08H, 10H, 20H or 40H	Sectors / cluster, either 8, 16, 32 or 64.
21	F8H	Flag for disk type F8H = Hard Disk.
24 - 25	0019H (Nominal)	Nominally 25 sectors/track, but may vary, and any value should not affect interoperability.
26 - 27	0001H (Nominal)	Nominally 1 head, but may vary, and any value should not affect interoperability.

Note: When formatted the total formatted capacity of the disk is approximately 513MB.

X.3 PHYSICAL MEDIA

The physical media shall be the 90 mm Magneto-Optical Rewritable disk with 512 bytes per sector. It shall be compatible with the R/W Type cartridge defined in the ISO/IEC DIS 15041 Data Interchange on 90mm Optical Disk Cartridges - Capacity 640 MB Per Cartridge standard.

Note: The 530MB nomenclature refers to the capacity when formatted with 512 bytes per sector compared to the 640MB nomenclature when formatted with 1024 bytes per sector (which is not supported by DICOM).

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2.3 GB 130mm Magneto-Optical Disk

Annex X (Normative) 130 mm 2.3GB Magneto-Optical Disk

X.1 DICOM MAPPING TO MEDIA FORMATS

Only one DICOM File-set shall be stored onto each side of a single 130 mm disk.

X.2 MEDIA FORMATS

The media format comprises two distinct components:

a. The Recording format, which addresses magnetic recording, track definition, sector headers, etc.

b. The Logical format, which addresses the organization of the data portion of sectors to support semantics of the file system.

X.2.1 RECORDING FORMAT

The low level formatting shall be done using the ISO/IEC DIS 14517 standard. The Secondary Defect List shall be used.

X.2.2 LOGICAL FORMAT

The Logical Format for the 130 mm 2.3GB disk shall be the PC File System (see Annex A).

The boot sector defined in Annex A shall have the following values.

Table X.2.2-1
Boot Parameter Values for 130mm 2.3GB Magneto-Optical Disk

Byte(s)	Value	Description
13	40H or 80H	Sectors / cluster, either 64 or 128. See Note 1.
21	F8H	Flag for disk type F8H = Hard Disk.
24 - 25	003EH (Nominal)	Nominally 62 sectors/track, but may vary, and any value should not affect interoperability. See Note 3.
26 - 27	0001H (Nominal)	Nominally 1 head, but may vary, and any value should not affect interoperability.

Notes:
1. Lower values would not utilize all the disk sectors on a side.
2. When formatted the total formatted capacity of one side of the disk is approximately 1.07GB.
3. Though ISO/IEC DIS 14517 specifies 31 sectors/ logical track, the number of cylinders for a DOS file system must fit within a 16 bit unsigned word, and hence 62 are nominally specified.

X.3 PHYSICAL MEDIA

The physical media shall be the 130 mm Magneto-Optical Rewritable disk with 512 bytes per sector. It shall be compatible with the standard defined in the ISO/IEC DIS 14517 Data Interchange on 130mm Optical Disk Cartridges - Capacity 2.6GB Per Cartridge standard.

Note: The 2.3GB nomenclature refers to the capacity when formatted with 512 bytes per sector compared to the 2.6GB nomenclature when formatted with 1024 bytes per sector (which is not supported by DICOM).