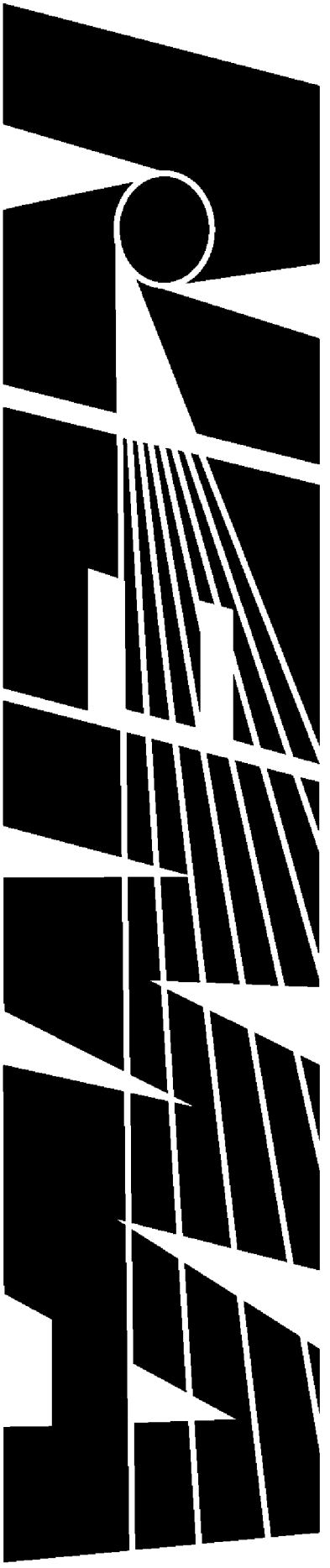
DICOM

Part 12

Media Formats and Physical Media for Media Exchange



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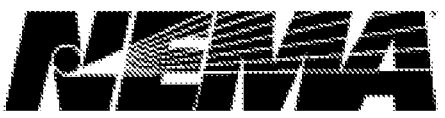

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Digital Imaging and Communications in Medicine (DICOM)

Part 12: Media Formats and Physical Media for Media Interchange

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FOREWORD

The American College of Radiology (ACR), American College of Cardiology (ACC) and the National Electrical Manufacturers Association (NEMA) formed a joint committee to develop a standard for Digital Imaging and Communications in Medicine (DICOM). This DICOM Standard was developed according to NEMA procedures.

This standard is developed in liaison with other standardization organizations including CEN TC251 in Europe and JIRA/IS&C in Japan, with review also by other organizations including IEEE, ASTM, HL7 and ANSI in the USA.

The DICOM Standard is structured as a multi-part document using the guidelines established in the following document:

- ISO/IEC Directives, 1989 Part 3 : Drafting and Presentation of International Standards

This document is one part of the DICOM Standard which consists of the following parts:

PS 3.1: Introduction and Overview

PS 3.2: Conformance

PS 3.3: Information Object Definitions

PS 3.4: Service Class Specifications

PS 3.5: Data Structures and Encoding

PS 3.6: Data Dictionary

PS 3.7: Message Exchange

PS 3.8: Network Communication Support for Message Exchange

PS 3.9: Point-to-Point Communication Support for Message Exchange

PS 3.10: Media Storage and File Format for Media Interchange

PS 3.11: Media Storage Application Profiles

PS 3.12: Media Formats and Physical Media for Media Interchange

PS 3.13: Print Management Point to Point Communication Support

PS 3.14: Grayscale Standard Display Function

PS 3.15: Security Profiles

These parts are related but independent documents. Their development level and approval status may differ. Additional parts may be added to this multi-part standard. PS 3.1 should be used as the base reference for the current parts of this standard.

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1 Scope and field of application

This part of the DICOM Standard facilitates the interchange of information between digital imaging computer systems in medical environments. This interchange will enhance diagnostic imaging and potentially other clinical applications. The multi-part DICOM Standard defines the services and data that shall be supplied to achieve this interchange of information.

This Part specifies:

a) A structure for describing the relationship between the Media Storage Model (see PS 3.10) and a specific physical media and media format

b) Specific physical media characteristics and associated media formats

2 Normative references

The following standards contain provisions that, through references in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibilities of applying the most recent editions of the standards indicated below.

ISO/IEC 10090 Continuous Composite Format and Cartridge Standard

ISO/IEC 10089 Continuous Composite Format and Cartridge Standard

ECMA-184 and ISO/IEC 13549 Continuous Composite Format and Cartridge Standard

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

ANSI X3.171 - One and Two Sided High Density, Unformatted, 90 mm (3.5 in), 5.3 tpmm (135 tpi), Flexible Disk Cartridge for 15916 bpr Use

ISO 9660: 1988 (E) Information processing - Volume and file structure of CD ROM for information interchange

ISO/IEC 10149 Information technology - Data interchange on read-only optical discs (CD-ROM), 1989

Part II: CD-WO version 2.0 in Orange Book

Note: This reference will be replaced by the corresponding ISO reference when available.

System Description CD-ROM XA (eXtended Architecture) Specification

Note: This reference will be replaced by the corresponding ISO reference when available.

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

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OSTA Universal Disk Format Specification (UDF) Version 1.5. February 4, 1997.

ISO/IEC 13346:1995 - Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange.

ECMA 167 3rd Edition June 1997 - Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange.

Unicode Standard, Version 2.0 (ISBN 0-201-48345-9) Addison-Wesley.

DVD Forum. DVD Specifications for Rewritable Disc (DVD-RAM 4.7GB): Part 1 - Physical Specifications Version 2.0.

Note: This reference will be replaced by the corresponding ISO or ECMA reference when available.

DVD Forum. DVD Specifications for Rewritable Disc (DVD-RAM 4.7GB): Part 2 – File System Specifications Version 2.0.

Note: This reference will be replaced by the corresponding ISO or ECMA reference when available.

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1 DICOM MEDIA STORAGE AND FILE FORMAT DEFINITIONS

This Part of the Standard makes use of the following terms defined in NEMA PS 3.10 of the DICOM Standard.

a) Application Profile

b) DICOM File Service

c) DICOM File

d) DICOMDIR File

e) File

f) File ID

g) File-set

3.2 PC FILE SYSTEM

A PC file system is commonly used for storing and exchanging files on removable media. This file system is available as either standard or optional software for most models of personal computers. It is available as standard or optional software for most models of workstations. A public domain implementation of this file system, known as "mtools," was developed by the U.S. Army and is available from various public servers on the Internet.

4 Symbols and abbreviations

The following symbols and abbreviations are used in this part of the standard.

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ACR American College of Radiology

ANSI American National Standards Institute

ASTM American Society for Testing and Materials

CD Compact Disk

CD-R Compact Disc – Recordable

CD-ROM Compact Disk - Read Only

CD-RW Compact Disk - Rewritable

CD-WO Compact Disc – Write Once

CEN Comite Europeen de Normalisation

DICOM Digital Imaging and Communications in Medicine

DIS Draft International Standard

DVD A trademark of the DVD Forum that is not an abbreviation

DVD-RAM DVD-Random Access

ECMA European Computer Manufacturers Association

HL7 Health Level 7

IEC International Electrotechnical Commission

IEEE Institute of Electrical and Electronics Engineers

ISO International Standards Organization

IS&C Image Save and Carry

JIRA Japan Industries Association of Radiation Apparatus

NEMA National Electrical Manufacturers Association

OSTA Optical Storage Technology Association

UDF Universal Disk Format

UID Unique Identifier

5 Conventions

Words are capitalized in this document to help the reader understand that these words have been previously defined in Section 3 of this document and are to be interpreted with that meaning.

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6 Relationship to the DICOM media storage model

PS 3.10 defines various media storage concepts. The implementation of these generic concepts on a specific medium and file system is defined in an annex. For each physical medium and file system a mapping is described between these media storage concepts and the specific physical media and file system facilities:

a) File-set ID - The method for providing a File-set ID

b) File ID - The method for mapping a DICOM File ID into a specific file system

c) File creation/update date and time - The specific file system mechanisms used to provide this information

d) File-set location

Processing of DICOM removable media requires that the DICOMDIR be in a known location. Most file systems provide a hierarchical directory structure with a root directory for an entire medium or medium partition. The annex defines where the DICOMDIR(s) are located. When only one File-set is permitted on one medium, the DICOMDIR shall be in the root directory of that medium. When multiple File-sets are permitted on a single medium, the annex will describe how File-sets are found and identified. When a File-set is permitted to span multiple pieces of physical media, the appropriate annex will describe how this is managed.

Figure 6-1 illustrates the structure of a DICOM removable medium that supports a single DICOM File-set per medium partition. Figure 6-2 illustrates the structure of a DICOM medium that supports multiple File-sets per partition. DICOM File-sets shall not intersect when media permit multiple File-sets.

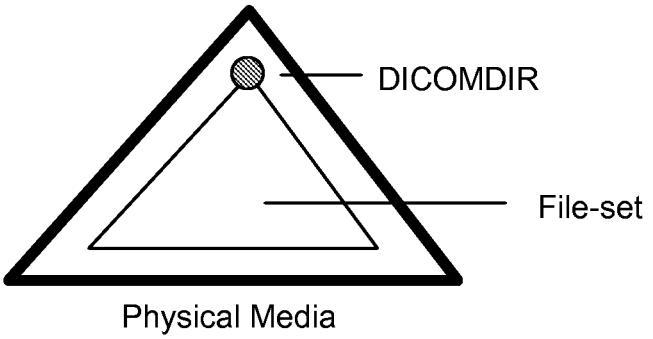
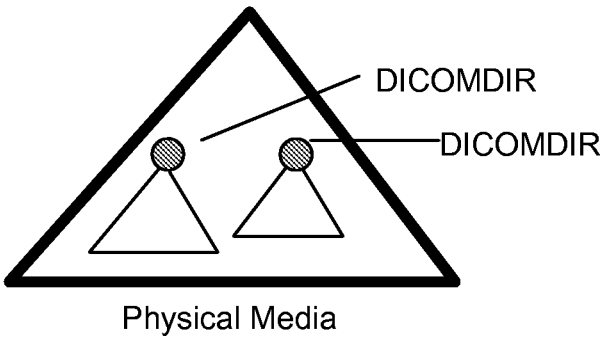


Figure 6-1
MEDIA SUPPORTING A SINGLE FILE-SET



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Annex F 120mm CD-R Medium (Normative)

The terms "CD-R" and "CD-WO" refer to the same medium and are used interchangeably. Originally this medium was designated CD-WO, but the most common vernacular today is CD-R. There are mixed references in this annex to accommodate the common CD-R usage unless a specific reference to CD-WO is required to reflect the historical documents accurately. The term "CD-ROM," when used in reference to a disc, is a disc fabricated with all the digital data already on it. "CD-R" media is a fabricated blank, with the ability to have digital data written to it. The term "CD-ROM" is also used to refer to a CD reader, e.g., "CD-ROM drive." A CD-ROM drive can read either CD-R discs or CD-ROM discs.

Note: Capitalization in this annex is inconsistent with other DICOM standards in order to be consistent with historical usage for terms.

F.1 DICOM MAPPING TO MEDIA FORMAT

Only one File-set shall be stored onto a single CD-R.

F.1.1 DICOM file-set

The ISO 9660 Standard provides a Volume Identifier in byte position 41 to 72 of the Primary Volume Descriptor. A DICOM File-Set is defined to be one volume, and the File-Set ID shall be placed in the Volume Identifier, starting with byte position 41. Extra bytes within the Volume Identifier shall be spaces (20H).

The Volume Identifier for a File-Set ID consisting of zero characters shall consist of all spaces (20H).

Notes: 1. The character set for File IDs and File-set IDs (see PS 3.10) is a subset of the ISO 9660 character set, therefore no further restrictions need to be imposed.

2. Multiple ISO 9660 File-Sets on a single volume are achievable, but this profile does not support multiple file-sets.

F.1.2 DICOM file ID mapping

The ISO 9660 standard provides a hierarchical structure for directories and files within directories. Each volume has a root directory that may contain references to both files and subdirectories. Subdirectories may contain reference to both files and other subdirectories.

F.1.2.1 FILE ID

A volume may have at most 8 levels of directories, where the root directory is defined as level 1. The nomenclature for referring to a file in the ISO 9660 standard is dependent upon the receiving system. For the purposes of this document, the following notation will be used:

a) / – For the root directory

b) /FILENAME.;1 – For a file in the root directory

c) /SUBDIR – For a subdirectory in the root directory

d) /SUBDIR/FILENAME.;1 – For a file in the subdirectory

Given a File ID consisting of N components, referred to as Comp1 through CompN, then the corresponding ISO 9660 file shall be named /Comp1/.../CompN.;1

The ISO 9660 File Name Extension shall not be used.

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The ISO 9660 standard requires the two separators "." and ";" to demarcate a "File Name Extension" and a "Version Number". To remain compatible with the ISO standard, the version number shall be 1.

Notes: 1. The above specified file ID mapping corresponds to ISO 9660 Level 1 compliance. This ensures the greatest level of compatibility across receiving systems.

2. The following is an example of the DICOM to ISO 9660 file mapping:

DICOM File ID	ISO 9660 File Name
DICOMDIR	/DICOMDIR.;1
SUBDIRA\IMAGE1	/SUBDIRA/IMAGE1.;1

F.1.2.2 DICOMDIR FILE

A DICOMDIR file in a DICOM File-set shall reside in the root directory of the directory hierarchy, and shall be named /DICOMDIR.;1.

Multiple DICOMDIR files shall not be stored on a single volume under this annex.

F.1.3 DICOM file management information

A Directory record in ISO 9660 provides for a Recording Data and Time field which shall be set to the creation date of the file.

File modification data, file owner identification, and permissions are part of the ISO 9660 - Extended Attribute Record. The Extended Attribute Record is not required by this annex and shall be ignored at this time. To ensure future backwards compatibility and file accessibility, the Extended Attribute Record Length and File Flag of the Directory record shall be set as follows for each file. The Extended Attribute Record Length (byte position 2) shall be zero. The File Flags (byte position 26) shall have bit positions 3 and 4 set to zero.

F.2 MEDIA FORMATS

F.2.1 Physical format

The physical format of DICOM CD-R discs shall comply with the applicable definitions within ISO/IEC 10149, Part II: CD-WO in Orange Book and CD-ROM-XA (extended Architecture) (if Mode 1 sectors are not used), with the additional modifications described in sections F.2.1.1 and F.2.1.2.

F.2.1.1 SECTOR FORMAT

All DICOM files and all data that comprise the ISO 9660 file system of the DICOM CD-R disc shall be stored either:

- within Mode 1 sectors, or
- within Mode 2, Form 1 sectors with CD-ROM-XA File Number = 0, Channel Number = 0 and Coding Information Byte = 0.

F.2.1.2 MULTI-SESSION FORMAT

An area on the disc consisting of a Lead-In area, a Program area, and a Lead-Out area, is called a "Session." If a disc contains or is able to contain more than one session then this disc is called a "Multi-session" disk. If the Lead-In area contains a pointer to the next session, then the disc is appendable. The Lead-In and Lead-Out areas are written at the conclusion of writing the program Area. The process of writing the Lead-In and Lead-Out areas is commonly referred to as "Finalizing the Session." The last recorded session contains all the information needed to access the entire disc.

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DICOM CD-R disc may contain multiple sessions. Data are added to a disc by opening and writing a new session. A disc is non-appendable if the last recorded session is designated as the "Final Session," as defined in Part II: CD-WO version 2.0, Section 5.5.2.

CD-ROM readers shall support Multi-session CDs.

CD-R writers may choose to support Multi-session writing.

F.2.2 Logical format

The logical format of CD-R shall conform to ISO 9660 level 1, with the extensions described in sections F.2.2.1 through F.2.2.2

F.2.2.1 SYSTEM IDENTIFIER FIELD

The ISO 9660 System Identifier Field of the PVD (Primary Volume Descriptor) shall contain "CD-RTOS CD-BRIDGE" if a CD-I (Compact Disc-Interactive) application is present. If a CD-I application is not present, then this field shall be padded with space characters.

F.2.2.2 SYSTEM AND VOLUME DESCRIPTOR AREA

The ISO 9660 System and Volume Descriptor Area (SVD) from the last session points to the set of ISO 9660 Path Tables and Directory Records that describes the file system of the DICOM CD-R disc. The SVD area starts at the first logical sector of each session and continues through to the first instance of the Volume Descriptor Set Terminator.

Adding, replacing or deleting files from the disc is accomplished by opening a new session and writing within the new session new data (if any), a new set of Path Tables, and Directory Records that reflect the changes, and an SVD area that points to the new set of Path Tables and Directory records.

F.3 PHYSICAL MEDIA

The physical medium shall be the 120 mm CD-R disc as defined in Part II: CD-WO Version 2.0 in the Orange Book.

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

G.1 DICOM MAPPING TO MEDIA FORMATS

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

G.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.

G.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.

G.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 G.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.

G.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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Annex H (Normative) 90 mm 540MB Magneto-Optical Disk

H.1 DICOM MAPPING TO MEDIA FORMATS

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

H.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.

H.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.

H.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 H.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.

H.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 540MB 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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Annex I (Normative) 130 mm 2.3GB Magneto-Optical Disk

I.1 DICOM MAPPING TO MEDIA FORMATS

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

I.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.

I.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.

I.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 I.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.

I.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).

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Annex J UDF on 120 mm DVD-RAM Medium (Normative)

This Annex defines the use of the UDF 1.5 file system with DVD-RAM media.

Notes: 1. Capitalization in this annex may be inconsistent with other DICOM standards in order to be consistent with historical usage for terms in referenced documents.

2. DVD-ROM is a pre-mastered medium, that is it is manufactured rather than written on a one-off basis by a medical device. While it is likely that a device conforming to this Annex will be able to read a UDF file system from DVD-ROM, it is not a requirement.

Universal Disk Format (UDF) version 1.5 is a profile of the ECMA 167 3rd edition file system.

Notes: 1. The ECMA 167 3rd edition is more recent than ISO 13346:1995 which is equivalent to ECMA 167 2nd edition.

2. Though later revisions of UDF such as 2.0 are defined with additional features compared to 1.5, these features are not required to support recording of a DICOM file set.

3. A reader of a UDF 2.0 file system can also read a 1.5 or 1.02 file system.

4. A UDF 1.02 reader cannot read the Virtual Allocation Table (VAT) used to incrementally write a UDF 1.5 or later disk.

5. A UDF 1.5 file system reader can theoretically read those structures of a UDF 2.0 file system that are common to both versions. However, a UDF 1.5 reader cannot read the Named Streams or extended file entries that may be recorded on a UDF 2.0 file system.

Since a UDF 1.5 reader may completely reject a 2.0 disk based on the version number written on the media, without attempting to read compatible structures of the file system, it is not permitted to write DICOM media with a version greater than 1.5.

6. A writer (FSC or FSU) is not permitted to add structures from a later version of UDF to a file system that has been created with an earlier version of the file system.

J.1 DICOM MAPPING TO MEDIA FORMAT

J.1.1 Media Character Set

The character set used in UDF fields shall be the CS0 OSTA Compressed Unicode character set, required by the UDF standard.

Notes: 1. The CS0 OSTA Unicode character set is defined in UDF and is a subset of Unicode 2.0.

2. UDF defines a specific form of compression of 8 and 16 bit Unicode characters that must be supported.

2. The character set defined elsewhere in this section for DICOM File-set fields is a subset of this character set. However other fields in the UDF file system, and other files in the UDF file system not in the DICOM File-set, may use characters beyond those defined by DICOM for File ID Components, including those encoded in 16 bits.

J.1.2 DICOM File-set

One and only one DICOM File-set shall be stored on each side of a single piece of media.

A DICOM File-set is defined to be completely contained within one UDF File-set.

Only a single UDF File-set shall be present in the UDF Volume.

Each side of the media will comprise a single self-contained UDF Volume. That is the UDF Volume Set shall not consist of more than one UDF Volume.

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Only a single UDF Partition shall be present on each side the media.

Note: Other partitions containing other file systems, possibly sharing the same data, may be present, such as an ISO-9660 bridge disk, a Mac HFS or Unix UFS hybrid disk, etc.

J.1.3 DICOM File ID Mapping

The UDF Standard provides a hierarchical structure for directories and files within directories. Each volume has a root directory that may contain references to both files and subdirectories. Subdirectories may contain reference to both files and other subdirectories.

J.1.3.1 File ID

PS 3.10 defines a DICOM File ID Component as a string of 8 characters from a subset of the G0 repertoire of ISO 8859. Each of these File ID Components is mapped to a UDF File Identifier or Path Component in the OSTA CS0 character set.

Note: This mapping is a subset of the MS-DOS mapping specified in UDF.

Filename extensions are not used in DICOM File ID Components, hence a UDF File Identifier shall not contain a File Extension or the '.' that would precede such a File Extension.

The maximum number of levels of a Resolved Pathname in a UDF file-set shall be at most 8 levels, to comply with the definition of a DICOM File-set in PS 3.10.

The File Version Number is always equal to 1, as specified by UDF.

Note: This file ID mapping is also compatible with ISO 9660 Level 1.

J.1.3.2 DICOMDIR File

A DICOMDIR file in a DICOM File-set shall reside in the root directory of the directory hierarchy, as specified in PS 3.10.

J.1.4 DICOM File Management Information

No file management information beyond that specified in the UDF File Entry is required. In particular no Extended Attributes or Named Streams are required.

J.2 FILESYSTEM

J.2.1 UDF File system

The reader shall be able to read a logical format conforming to UDF 1.02 or 1.5, as required by the UDF 1.5 standard.

The creator shall be able to create a logical format conforming to UDF 1.5.

The updater shall be able to update a logical format conforming to UDF 1.02 or 1.5, without updating the UDF revision level of the file system already recorded on the media, as required by the UDF 1.5 standard.

Options or extensions defined in UDF are required or restricted as specified in the following sub-sections, and in the media specific sub-sections.

J.2.1.1 Interchange Levels

For the UDF Primary Volume Descriptor, both the Interchange Level and Maximum Interchange Level shall always be set to 2.

Notes: 1. This means that the volume is not and will never be, part of a multi-volume set.

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2. The Interchange Level and Maximum Interchange Level in the File Set Descriptor are defined by UDF to always be 3. This is despite the fact that restrictions specified for the DICOM File-set may be very similar to lower Interchange Levels specified in ECMA 167.

J.2.1.2 Virtual Partition Map and Allocation Tables

Creators and updaters shall not write UDF Virtual Partition Maps and Virtual Allocation Tables on DVD-RAM media.

J.2.1.3 Sparable Partition Maps and Sparing Tables

Creators and updaters shall not write UDF Sparable Partition Maps and Sparing Tables on DVD-RAM media, since defect management is performed in the drive.

J.2.1.4 System Dependent Requirements

The reader shall not depend on any system dependent requirements as specified in UDF to be able to read the DICOM File-set, and shall not behave differently if they are present. Any unrecognized system dependent requirements shall be gracefully ignored.

Notes: 1. For example, a particular form of file permissions, particular extended attributes or particular named streams may not be required or affect application behavior.

2. This does not mean that Extended Attributes or Named Streams may not be present and associated with files within the DICOM File-set.

J.2.1.5 Permissions and File Characteristics

Creators and updaters shall always create permissions for files within the DICOM File Set such that all users may read, write and delete all files, and all users may access and delete all directories on all systems.

Notes: 1. These requirements are equivalent to setting a Unix permission of 644 for files and 755 for directories.

2. The intent of these requirements is that for DICOM interchange media, implementation specific access control is not used or required.

The UDF File Identifier Descriptor for files within the DICOM File Set shall not specify a File Characteristic of "hidden."

J.2.1.6 File Types

The UDF File Types within the DICOM File Set shall only be files (that is a File Type of 0, meaning unspecified interpretation) or symbolic links to files (that is a File Type of 12).

J.3 MEDIA FORMATS

J.3.1 DVD-RAM

J.3.1.1 DVD- RAM Physical Format

The physical format of DVD-RAM media shall comply with the applicable definitions within "DVD Specifications for Rewritable Disc (DVD-RAM 4.7GB): Part 1 - Physical Specifications Version 2.0" with the additional modifications described in the following sub-sections.

Note: Two physical forms of DVD-RAM are available, a double-sided variety (Type 1), and a single-sided variety (Type 2). Only Type 2 media can be removed from its cartridge and inserted in a conventional DVD-ROM drive.

J.3.1.1.1 DVD- RAM Sector Format

The sector format of DVD-RAM media shall comply with the applicable definitions in "DVD Specifications for Rewritable Disc (DVD-RAM 4.7GB): Part 2 - File System Specifications Version 2.0".

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DVD-RAM is a truly random access media, providing random access to fixed length sectors, hence no multi-session or packet-written format is applicable.

J.3.1.2 DVD- RAM Logical Format

There are no requirements, restrictions, options or extensions to the logical format that are specific to this media type, beyond those specified in section J.2.

J.3.1.3 DVD- RAM Physical Media

The physical medium shall be the 120 mm DVD-RAM medium as defined in “DVD Specifications for Rewritable Disc (DVD-RAM 4.7GB): Part 1 - Physical Specifications Version 2.0”.

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