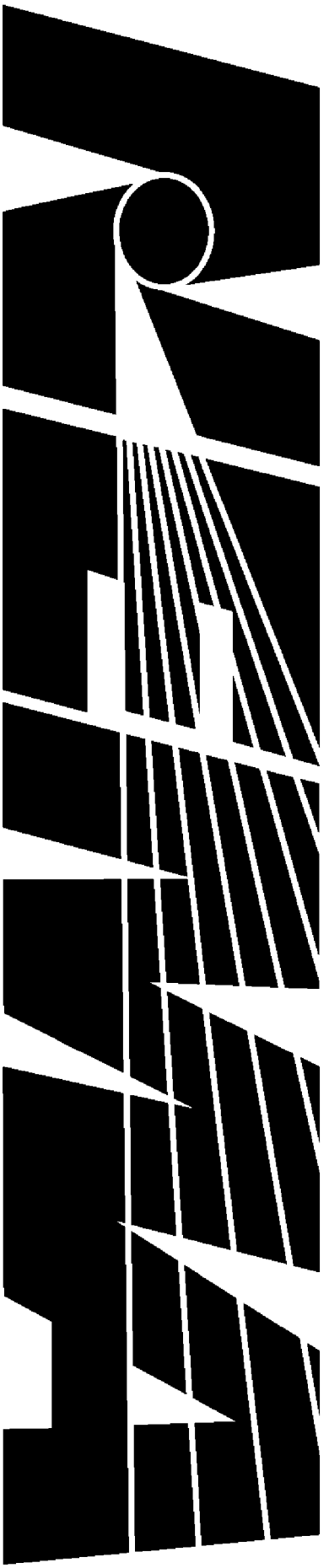
DICOM

Part 10

Media Storage and File Format for Media Exchange



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Digital Imaging and Communications in Medicine

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Digital Imaging and Communications in Medicine (DICOM)

Part 10: Media Storage and File Format for Media Interchange

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FOREWORD

The American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA) formed a joint committee to develop a Standard for Digital Imaging and Communications in Medicine. This DICOM Standard was developed according to NEMA procedures. The ACC (American College of Cardiology) has decided to join this standardization effort with a particular interest in the definition of Digital Media Storage Standards.

This standard is developed in liaison with other Standard Organizations including CEN TC251 in Europe and JIRA in Japan, with review also by other organizations including IEEE, 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 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 Formats 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 Display Function Standard
PS 3.15: Security Profiles
PS 3.16: Content Mapping Resource

These parts are independent but related documents. PS 3.4, PS 3.7, PS 3.8, and PS 3.9 focus on the communication of digital image data across point-to-point and network interfaces. PS 3.10 of the DICOM standard addresses the open media interchange of medical images in files or on removable storage media. It takes into account past and current related efforts:

a. The ACR-NEMA Standard for Magnetic Tape (PS1) has defined a generic means to store on a 9 track magnetic tape one or more Data Sets formatted per the ACR-NEMA V2.0 Standard;
b. A Japanese effort called IS&C (Image Save and Carry) has also used an ACR-NEMA V2.0-based format to store images on a 130 millimeter or 5 1/4 inch Magneto-Optical Disk with an IS&C specific media organization format;
c. A European effort initiated by the University of Geneva in Switzerland has defined PAPYRUS, an ACR-NEMA V2.0-based format to store one or more images grouped as folders in files irrespective of the physical media and its file organization format. The new PAPYRUS V3.0 is intended to be a specific Application Profile compatible with PS 3.10.

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As both network communication and media interchange share a number of common characteristics, significant parts of the existing Parts of DICOM are leveraged :

PS 3.3: Information Object Definitions
PS 3.5: Data Set Structures and Encoding
PS 3.6: Data Dictionary

PS 3.10 lays a foundation for two other Parts of the DICOM Standard:

PS 3.11: Media Storage Application Profiles
PS 3.12: Media Formats and Physical Media for Data Interchange

These Parts may need to be expanded as the technologies related to Physical Media and the clinical needs evolve. PS 3.11 and PS 3.12 are necessary for DICOM to provide a complete solution for open Media Storage Interchange. In particular conformance to DICOM in the area of Media Storage Interchange is defined by PS 3.2 of the DICOM Standard and is based on the Application Profiles defined by PS 3.11.

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1 Scope and Field of Application

This Part of the DICOM Standard specifies a general model for the storage of Medical Imaging information on removable media. The purpose of this Part is to provide a framework allowing the interchange of various types of medical images and related information on a broad range of physical storage media.

This Part specifies:

a. a layered model for the storage of medical images and related information on storage media. This model introduces the concept of Media Storage Application Profiles, which specify application specific subsets of the DICOM Standard to which a Media Storage implementation may claim conformance. Such a conformance applies only to the writing, reading and updating of the content of storage media. Specific Application Profiles are not included in this Part but in PS 3.11 of the DICOM Standard;

b. a DICOM File Format supporting the encapsulation of any Information Object Definition;

c. a Secure DICOM File Format supporting the encapsulation of a DICOM File Format in a cryptographic envelope;

d. a DICOM File Service providing independence from the underlying media format and physical media. The policies specific to the DICOMDIR file used to store the Media Storage Directory Service/Object Pair Class are also addressed.

This Part is related to other parts of the DICOM Standard in that:

- PS 3.2, Conformance, specifies the requirements which shall be met to achieve DICOM Conformance in Media Storage;
- PS 3.3, Information Object Definitions, specifies a number of Information Object Definitions (e.g., various types of images) which may be used in conjunction with this part;
- PS 3.4, builds upon this part to define the Media Storage Service Class;
- PS 3.5, Data Structure and Encoding, addresses the encoding rules necessary to construct a Data Set which is encapsulated in a file as specified in this part;
- PS 3.6, Data Dictionary, contains a registry by Tag of all Data Elements related to the Attributes of Information Objects defined in PS 3.3. This index includes the Value Representation and Value Multiplicity for each Data Element;
- PS 3.11, Media Storage Application Profiles standardizes a number of choices related to a specific clinical need (selection of a Physical Medium and Media Format as well as specific Service/Object Pair Classes). It aims at facilitating the interoperability between implementations which claim conformance to the same Application Profile. PS 3.11 is intended to be extended as the clinical needs for Media Storage Interchange evolve;
- PS 3.12, Media Formats and Physical Media for Data Interchange, defines a number of selected Physical Medium and corresponding Media Formats. These Media Formats and Physical Medium selections are referenced by one or more of the Application Profiles of PS 3.11. PS 3.12 is intended to be extended as the technologies related to Physical Medium evolve.
- PS 3.15, Security Profiles defines a number of profiles for use with Secure DICOM Media Storage Application Profiles. The Media Storage Security Profiles specify the cryptographic techniques to be used for each Secure DICOM File in a Secure Media Storage Application Profile.

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PS 3.10 lays a foundation for open Media Interchange by standardizing an overall architecture and addressing some of the major barriers to interoperability: the definition of a DICOM File Format, a DICOM File Service and the policies associated with a Media Storage Directory structure.

Note: PS 3.3 specifies a general medical imaging Basic Directory Information Object Definition and PS 3.4 specifies the corresponding Media Storage Directory SOP Class which is a member of the Media Storage Service Class.

Adherence to the provisions of DICOM PS 3.10 by implementations reading, writing or updating Storage Media represents a key foundation for open Storage Media Interchange. However, it is only with the selection of standard Physical Media and corresponding Media Formats in PS 3.12 and the use of specific Application Profiles in PS 3.11 that effective Media Storage Interchange interoperability is achieved. Therefore, claiming conformance to DICOM PS 3.10 only, is not a valid DICOM Conformance Statement. DICOM Media Storage Conformance shall be made in relation to a PS 3.11 Application Profile according to the framework defined by PS 3.2.

2 References

2.1 NORMATIVE REFERENCES

The following standards contain provisions which, through reference 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 Directives, 1989 Part 3 - Drafting and presentation of International Standards.

ISO 7498-1, Information Processing Systems - Open Systems Interconnection - Basic Reference Model.

ISO 7498-2, Information processing systems - Open Systems Interconnection - Basic reference Model - Part 2: Security Architecture

ISO/TR 8509, Information Processing Systems - Open Systems Interconnection - Service Conventions

ISO 8822, Information Processing Systems - Open Systems Interconnection - Connection-Oriented Presentation Service Definition.

ISO 8859, Information Processing - 8-bit single-byte coded graphic character sets - Part 1: Latin Alphabet No. 1

NEMA PS 3.1 - Digital Imaging and Communications in Medicine - Part 1, Introduction and Overview of Part 1 through 9.

NEMA PS 3.2 - Digital Imaging and Communications in Medicine - Part 2, Conformance.

NEMA PS 3.3 - Digital Imaging and Communications in Medicine - Part 3, Information Object Definitions

NEMA PS 3.4 - Digital Imaging and Communications in Medicine - Part 4, Service Class Specifications

NEMA PS 3.5 - Digital Imaging and Communications in Medicine - Part 5, Data Structures and Encoding

NEMA PS 3.6 - Digital Imaging and Communications in Medicine - Part 6, Data Dictionary

NEMA PS 3.7 - Digital Imaging and Communications in Medicine - Part 7, Message Exchange

NEMA PS 3.8 - Digital Imaging and Communications in Medicine - Part 8, Network Communication Support for Message Exchange

NEMA PS 3.11 - Digital Imaging and Communications in Medicine - Part 11, Media Storage Application Profiles.

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NEMA PS 3.12 - Digital Imaging and Communications in Medicine - Part 12, Media Formats and Physical Media for Data Interchange.

RFC-2630, Cryptographic Message Syntax, June 1999

3 Definitions

For the purposes of this Standard the following definitions apply.

3.1 REFERENCE MODEL DEFINITIONS

This Part of the Standard is based on the concepts developed in ISO 7498-1 and makes use of the following terms defined in it:

a. Application Entity;
b. Application Process;
c. Service or Layer Service;
d. Transfer Syntax.

This Part of the Standard makes use of the following terms defined in ISO 7498-2:

a. Data Confidentiality

Note: The definition is "the property that information is not made available or disclosed to unauthorized individuals, entities or processes."

b. Data Origin Authentication

Note: The definition is "the corroboration that the source of data received is as claimed."

c. Data Integrity

Note: The definition is "the property that data has not been altered or destroyed in an unauthorized manner."

3.2 SERVICE CONVENTIONS DEFINITIONS

This Part of the Standard makes use of the following terms defined in ISO/TR 8509:

a. Service Provider;
b. Service User.

3.3 PRESENTATION SERVICE DEFINITIONS

This Part of the Standard makes use of the following terms defined in ISO 8822:

a. Abstract Syntax;
b. Abstract Syntax Name.

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3.4 DICOM INTRODUCTION AND OVERVIEW DEFINITIONS

This Part of the Standard makes use of the following terms defined in PS 3.1 of the DICOM Standard:

- Attribute.

3.5 DICOM INFORMATION OBJECT DEFINITIONS

This Part of the Standard makes use of the following terms defined in PS 3.3 of the DICOM Standard:

a. Information Object Definition.

3.6 DICOM DATA STRUCTURE AND ENCODING DEFINITIONS

This Part of the Standard makes use of the following terms defined in PS 3.5 of the DICOM Standard:

a. Data Element;
b. Data Set;
c. Data Element Type;
d. Value;
e. Value Multiplicity;
f. Value Representation;

3.7 DICOM MESSAGE EXCHANGE DEFINITIONS

This Part of the Standard makes use of the following terms defined in PS 3.7 of the DICOM Standard:

a. Service Object Pair (SOP) Class;
b. Service Object Pair (SOP) Instance;
c. Implementation Class UID.

3.8 DICOM MEDIA STORAGE AND FILE FORMAT DEFINITIONS

The following definitions are commonly used in this Part of the Standard:

Application Profile: A Media Storage Application Profile defines a selection of choices at the various layers of the DICOM Media Storage Model which are applicable to a specific need or context in which the media interchange is intended to be performed.

DICOM File Service: The DICOM File Service specifies a minimum abstract view of files to be provided by the Media Format Layer. Constraining access to the content of files by the Application Entities through such a DICOM File Service boundary ensures Media Format and Physical Media independence.

DICOM File: A DICOM File is a File with a content formatted according to the requirements of this Part of the DICOM Standard. In particular such files shall contain, the File Meta Information and a properly formatted Data Set.

DICOMDIR File: A unique and mandatory DICOM File within a File-set which contains the Media Storage Directory SOP Class. This File is given a single component File ID, DICOMDIR.

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Media Operations Roles	M-WRITE	M-READ	M-DELETE	M-INQUIRE FILE-SET	M-INQUIRE FILE
FSC	Mandatory	*Not required*	*Not required*	Mandatory	*Not required*
FSR	*Not required*	Mandatory	*Not required*	*Not required*	Mandatory
FSC+FSR	Mandatory	Mandatory	*Not required*	Mandatory	Mandatory
FSU	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
FSU+FSC	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
FSU+FSR	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
FSU+FSC+FSR	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory

Notes: 1. Media Preparation is outside the scope of this Part of the DICOM Standard. However it is assumed to be performed by the FS Creator.

2. The DICOM File Service does not require that file update capabilities (e.g., append) be supported by every Media Format Definition selected. The non-support of such file update capabilities to the DICOMDIR File may simply result in having to delete and create a new file in order to keep the directory information consistent.

3. If the content of a file needs to be updated or changed by an FSU, it is considered by this Part of the DICOM Standard as an M-DELETE Operation followed by an M-WRITE Operation. The FSU is responsible for ensuring the internal consistency of the File and its conformance to PS 3.10 and the specific SOP Class stored, exactly as if the FSU was creating a new File. In particular, if an FSU implementation needs to update the file content but is not able to recognize and fully process the content of the File Preamble (See Section 7.1), it may consider setting the first four bytes of the Preamble to "DICM" followed by 124 bytes to 00H. This would avoid introducing inconsistencies between the content of the File Preamble and the remainder of the file content. An example of this situation may occur when a TIFF IFD 0 Offset in the File Preamble points at a further TIFF IFD embedded in the DICOM Data Set, and the update operation changes the location of this embedded TIFF IFD.

8.4 FILE CONTENT ACCESS

The DICOM File Service offers the ability to access the content of any File of a File-set. The File content is an ordered string of zero or more bytes, where the first byte is at the beginning of the file and the last byte at the end of the File.

Note: This File content definition as an ordered string of bytes is related to the view provided at the DICOM File Service level. It may not correspond to the physical ordering of bytes of data on a specific medium.

The DICOM File Service shall manage the delimitation of the end of the File by ensuring the user of the File Service that read access beyond the last byte will be detected and reported to the DICOM File Service user. This delimitation function is performed by the Media Format Layer.

The DICOM File Service shall offer the ability:

a. for an FSR or FSU to perform an M-READ to read zero or more bytes of the content of a File;
b. for an FSC or FSU to perform an M-WRITE to write one or more bytes making the content of a File.

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Note: The DICOM File Service does not require any specific capability for the selective read access or write access of the content of a file (e.g., seek or append). However it does not restrict specific Media Format definitions to support such features.

8.5 CHARACTER SET

File IDs and File-set IDs shall be character strings made of characters from a subset of the G0 repertoire of ISO 8859. The following characters form this subset:

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z (uppercase)
1, 2, 3, 4, 5, 6, 7, 8, 9, 0 and _ (underscore)

Notes: 1. This is the character set defined for Control Strings (Value Representation CS - see PS 3.5 of the DICOM Standard) except that SPACE is not included.

2. This character set is selected to limit characters in File IDs and File-set IDs to those that do not conflict with reserved characters and delimiters in the file systems defined in PS 3.12. Component delimiters or other required demarcations defined in PS 3.12 are not part of File IDs or File-set IDs

8.6 RESERVED DICOMDIR FILE ID

A single File with a File ID, DICOMDIR, shall exist as a member of every File-set. This File ID is made of a single Component (see Section 8.2 for the File ID structure). It contains the DICOM Media Storage Directory (see PS 3.3 for detailed specification of the Basic Directory IOD) which includes general information about the whole File-set. This general information is always present, but optionally the directory content may be left empty in environments where it would not be needed. If the DICOMDIR File does not exist in a File-set, the File-set does not conform to PS 3.10 of the DICOM Standard. The DICOMDIR shall not reference Files outside of the File-set to which it belongs.

Notes: 1. Two examples of content of the DICOMDIR File may be found in Annex A.

2. If one chooses to map the origin of a File-set to a specific directory node in a specific Media Format, the File IDs, including the DICOMDIR File IDs, would be relative to this directory node path name.

The DICOMDIR File shall use the Explicit VR Little Endian Transfer Syntax (UID=1.2.840.10008.1.2.1) to encode the Media Storage Directory SOP Class. The DICOMDIR File shall comply with the DICOM File Format specified in Section 7 of this Standard. In particular the:

a. SOP Class UID in the File Meta Information (header of the DICOMDIR File) shall have the Value specified in PS 3.4 of this Standard for the Media Storage Directory SOP Class;
b. SOP Instance UID in the File Meta Information (header of the DICOMDIR File) shall contain the File-set UID Value. The File-set UID is assigned by the Application Entity which created the File-set (FSC role, see Section 8.3) with zero or more DICOM Files. This File-set UID Value shall not be changed by any other Application Entities reading or updating the content of the File-set.

Notes: 1. This policy reflects that a File-set is an abstraction of a "container" within which Files may be created or read. The File-set UID is related to the "container" not its content. A File-set in the DICOM File Service is intended to be mapped to a supporting feature of a selected Media Format (e.g., volume or partition).

2. The Standard does not prevent the making of duplicate copies of a File-set (i.e., a File-set with the same File-set UID). However, within a managed domain of File-sets, a domain specific policy may be used to prevent the creation of such duplicate File-sets.

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9 Conformance Requirements

An implementation of PS 3.10 of the DICOM Standard shall:

a. have a Conformance Statement based on a PS 3.11 Application Profile in accordance with the framework defined in PS 3.2;
b. meet the requirements of the DICOM File Format as specified in Section 7 of this Part;
c. support the DICOM File Service as specified in Section 8 of this Part, in one or more of the roles identified in Section 8.3;
d. perform the Media Operations defined in Table 8.3-1 according to the role supported;
e. support the DICOMDIR File with a content as specified in the Media Storage Directory SOP Class in PS 3.4 of this Standard.

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Annex A Example of DICOMDIR File Content (Informative)

This Annex provides an example of a File content which is based on selected aspects of the example introduced in PS 3.3 for the Basic Directory Information Object. This is not a normative Annex. It is only an illustration, which is simply intended to help the reader better understand the organization of a DICOM Directory stored in a DICOMDIR File.

A.1 SIMPLE DIRECTORY CONTENT EXAMPLE

Table A.1-1 shows in a simplified manner, the content of a simple (i.e. without Multiple Referenced Files) DICOMDIR File. Values of elements are noted between square brackets (e.g. [1.840.10008.34.7.6]). Byte Offsets are shown by symbolic Values noted between brackets (e.g. {1493}).

Table A.1-1
Directory Content Example

Meta-Info	128 bytes 4 bytes 0002,0000 0002,0001 0002,0002 0002,0003 0002,0010 0002,0012 ...	File Preamble [**all bytes set to 00H]** DICOM Prefix **[DICM]** Group Length File Meta-Information Version **[0001]** SOP Class UID **[1.2.840.10008.1.3.10]** SOP Instance UID **[1.840.23856.36.45.3]** Transfer Syntax UID **[1.840.10008.1.1]** Implementation Class UID **[1.840.23856.34.90.3]** ...
File-set Identification	0004,1130 ...	File-set ID [**EXAMPLE]** ...
General Directory Information	0004,1200 0004,1202 0004,1212 ... 0004,1220	Offset of First Record of Root Directory Entity **{1236}** Offset of Last Record of Root Directory Entity **{6F18}** File-set Consistency Flag **[0000H]** ... Directory Record Sequence. This Data Element Value includes the following Sequence of Items.

{1236}	**Item Tag**	FFFE,E000	Item Data Element (includes the following Data Elements)
	Patient B Directory Record	0004,1400 0004,1410 0004,1420 ... 0004,1430	Offset of the next Directory Record in Dir. Entity **{1493}** Record In-Use Flag **[FFFFH]** Offset of Referenced Lower Level Dir. Entity (not shown in example) Directory Record Type **[PATIENT]**
		0004,1500 0004,1510 0004,1511 0004,1512	Referenced File ID **[DIR\THRE\KC48]** Referenced SOP Class UID in File **[1.840.10008.3.1.2.1.1]** Referenced SOP Instance UID in File **[1.840.23856.3.9879]** Referenced Transfer Syntax UID in File **[1.2.840.10008.1.2.2]**
	Selection Keys	0010,0010 0010,0020 ...	Patient Name **[Patient B]** Patient ID **[550-31-8623]** ...

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Item Del. Tag	FFFE,E00D	Item Delimitation Tag is present only if Item is of undefined Length

{1493}

Item Tag	FFFE,E000	Item Data Element (includes the following Data Elements)
Patient A Directory Record	0004,1400 0004,1410 0004,1420 ... 0004,1430	Offset of the next Dir. Record in Dir. Entity **{6F18}** Record In-use Flag **[FFFFH]** Offset of Referenced Lower Level Directory Entity **{1829}** ... Directory Record Type **[PATIENT]**
	0004,1500 0004,1510 0004,1511 0004,1512	Referenced File ID **[DIR\TDRE\GC48]** Referenced SOP Class UID in File **[1.840.10008.3.1.2.1.1]** Referenced SOP Instance UID in File **[1.840.23856.3.9789]** Referenced Transfer Syntax UID in File **[1.2.840.10008.1.2.2]**
Selection Keys	0010,0010 0010,0020	Patient Name **[Patient A]** Patient ID **[535-71-7321]** ....
Item Del. Tag	FFFE,E00D	Item Delimitation Tag is present only if Item is of undefined length

{1829}

Item Tag	FFFE,E000	Item Data Element (includes the following Data Elements)
Study 1 Directory Record	0004,1400 0004,1410 0004,1420 ... 0004,1430	Offset of the next Dir. Record in Dir. Entity (not shown in example) Record In-use Flag **[FFFFH]** Offset of Referenced Lower Level Directory Entity **{2299}** ... Directory Record Type [**STUDY]**
Selection Keys	0020,000D 0020,0010 ...	Study Instance UID **[1.840.4656.23.4568745]** Study ID **[srt78UJ]** ....
Item Del. Tag	FFFE,E00D	Item Delimitation Tag is present only if Item is of undefined length

{2299}

Item Tag	FFFE,E000	Item Data Element (includes the following Data Elements)
Series 1 Directory Record	0004,1400 0004,1410 0004,1420 ... 0004,1430	Offset of the next Dir. Record in Dir. Entity (not shown in example) Record In-use Flag **[0FFFFH]** Offset of Referenced Lower Level Directory Entity **{2681}** ... Directory Record Type [**SERIES]**
Selection Keys	0008,0060 0020,0011 ...	Modality **[NM]** Series Number **[2]** ...
Item Del. Tag	FFFE,E00D	Item Delimitation Tag is present only if Item is of undefined length

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{2681}	**Item Tag**	FFFE,E000	Item Data Element (includes the following Data Elements)
	Image 1 Directory Record	0004,1400 0004,1410 0004,1420 ... 0004,1430	Offset of the next Dir. Record in Dir. Entity {**3419**} Record In-use Flag **[FFFFH]** Offset of Referenced Lower Level Directory Entity **[00000000H]** ... Directory Record Type [**IMAGE**]
		0004,1500 0004,1510 0004,1511 0004,1512	Referenced File ID **[DIR\TDRI\3856G3]** Referenced SOP Class UID in File **[1.840.10008.5.1.4.1.1.5]** Referenced SOP Instance UID in File **[1.840.34.56.78999654.234]** Referenced Transfer Syntax UID in File **[1.2.840.10008.1.2.1]**
	Selection Keys	0008,0018 0020,0013 ...	Image SOP Instance UID **[1.840.34.56.78999654.234]** Image Number **[1]** ...
	Item Del. Tag	FFFE,E00D	Item Delimitation Tag is present only if Item is of undefined length

{3419}	**Item Tag**	FFFE,E000	Item Data Element (includes the following Data Elements)
	Image 2 Directory Record	0004,1400 0004,1410 0004,1420 ... 0004,1430	Offset of the next Dir. Record in Dir. Entity (not shown in example) Record In-use Flag **[FFFFH]** Offset of Referenced Lower Level Directory Entity [**00000000H**] ... Directory Record Type [**IMAGE**]
		0004,1500 0004,1510 0004,1511 0004,1512	Referenced File ID **[DIR\TDRI\3856G7]** Referenced SOP Class UID in File **[1.840.10008.5.1.4.1.1.5]** Referenced SOP Instance UID in File**[1.840.34.56.78999654.235]** Referenced Transfer Syntax UID in File **[1.2.840.10008.1.2.2]**
	Selection Keys	0008,0018 0020,0013 ...	Image SOP Instance UID **[1.840.34.56.78999654.235]** Image Number **[2]** ...
	Item Del. Tag	FFFE,E00D	Item Delimitation Tag is present only if Item is of undefined length

{6F18}	**Item Tag**	FFFE,E000	Item Data Element (includes the following Data Elements)
	Patient C Directory Record	0004,1400 0004,1410 0004,1430 ...	Offset of the next Dir. Record in Dir. Entity **{00000000H}** Record In-use Flag **[FFFFH]** Directory Record Type **[PATIENT]** ...
	Selection Keys	0010,0010 0010,0020	Patient Name **[Patient C]** Patient ID **[523-61-8765]** ....

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Item Del. Tag	FFFE,E00D	Item Delimitation Tag is present only if Item is of undefined length

Sequence Delimitation Tag FFFE,E0DD	Used only if the Directory Record Sequence (0004,1220) is of undefined length to delimit the end of the Value of the Directory Record Sequence Data Element.

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A.2 EXAMPLE OF DICOMDIR FILE CONTENT WITH MULTIPLE REFERENCED FILES

This section was previously defined in DICOM. It is now retired. See PS 3.3-1998.

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Annex B Index of Attribute Tags and UIDs (Informative)

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(FFFC,FFFC) 14
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