

**Philips Medical Systems
DICOM Conformance Statement**

Inturis DICOM Recorder

Release 1.1

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1 Introduction

This chapter provides general information about the purpose, scope and contents of this Conformance Statement.

1.1 Scope and field of application

The scope of this DICOM Conformance Statement is to facilitate data exchange with equipment of Philips Medical Systems. This document specifies the compliance to the DICOM standard (formally called the NEMA PS 3.X standards). It contains a short description of the applications involved and provides technical information about the data exchange capabilities of the equipment. The main elements describing these capabilities are: the supported DICOM Service Object Pair (SOP) Classes, Roles, Information Object Definitions (IOD) and Transfer Syntaxes.

The field of application is the integration of the Philips Medical Systems equipment into an environment of medical devices.

This Conformance Statement should be read in conjunction with the DICOM standard and its addenda.

1.2 Intended audience

This Conformance Statement is intended for:

- (potential) customers,
- system integrators of medical equipment,
- marketing staff interested in system functionality,
- software designers implementing DICOM interfaces.

It is assumed that the reader is familiar with the DICOM standard.

1.3 Contents and structure

The DICOM Conformance Statement is contained in chapter 2 through 7 and follows the contents and structuring requirements of DICOM PS 3.2.

1.4 Used definitions, terms and abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3 and PS 3.4.

The word Philips in this document refers to Philips Medical Systems.

1.5 References

- [DICOM] The Digital Imaging and Communications in Medicine (DICOM) standard:
NEMA PS 3.X.
National Electrical Manufacturers Association (NEMA) Publication Sales
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Rosslyn, Va. 22209, United States of America

1.6 Important note to the reader

This Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

- **Interoperability**

Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into a networked environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment. It is the user's responsibility to analyse thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

- **Validation**

Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.

Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

- **New versions of the DICOM Standard**

The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery.

The user should ensure that any non-Philips provider linking to Philips equipment, also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

Introduction

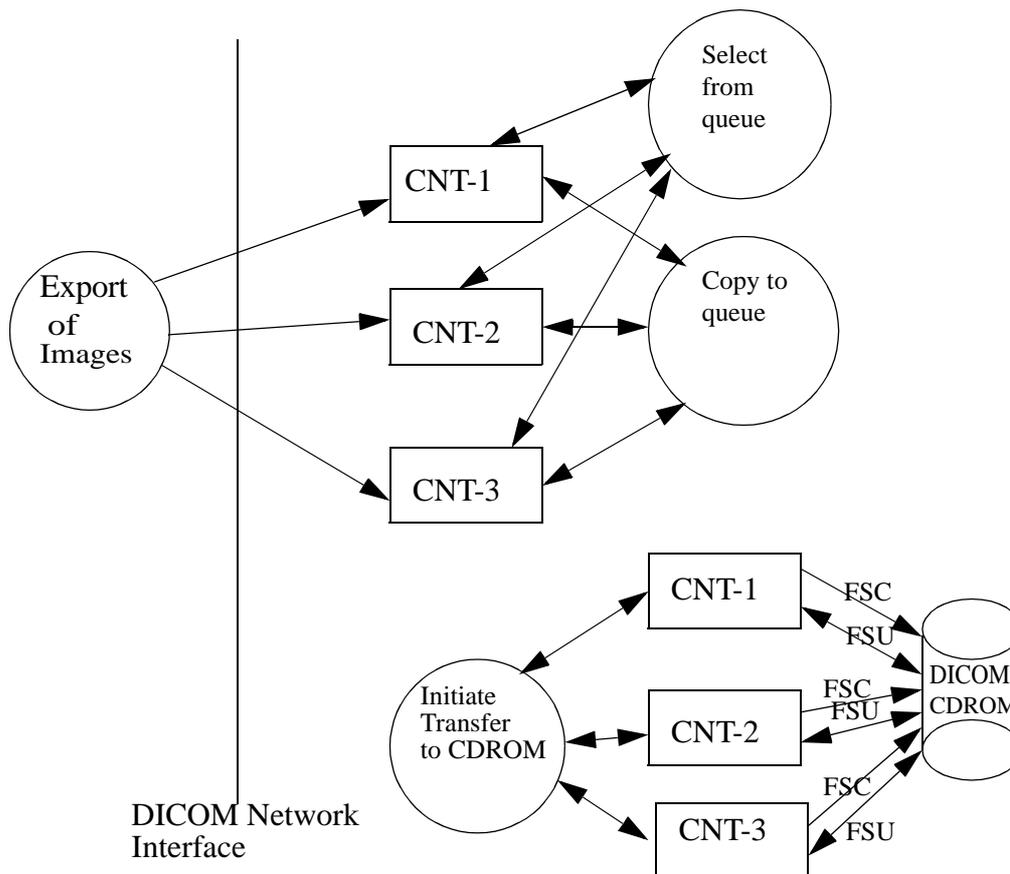
1.7 Acronyms and Abbreviations.

The following acronyms and abbreviations are used in the document.

- AE Application Entity
- ACR American College of Radiology
- ANSI American National Standard Institute
- CD-R Compact Disk Recorder
- DICOM Digital Imaging and Communication in Medicine
- DICOMDIR DICOM File containing the Media Storage Directory SOP Class
- EBE Explicit Big Endian Transfer Syntax
- ELE Explicit Little Endian Transfer Syntax
- FSC File Set Creator
- FSU File Set Updater
- ILE Implicit Little Endian Transfer Syntax
- IOD Image Object Definition
- JPEGLossless JPEG Lossless, Non-Hierarchical First Order Prediction (Process 14, Selection Value 1) Transfer Syntax
- NEMA National Electric Manufacturers Association
- PDU Protocol Data Unit
- RWA Real World Activity
- SCP Service Class Provider
- SCU Service Class User
- SOP Service Object Pair
- TCP/IP Transmission Control Protocol/Internet protocol
- UID Unique Identifier

2 Implementation model Network and Media

2.1 Application Data Flow Diagram



The Cardio-NT recording station can receive DICOM XA and SC images over the network. All images received in *one* DICOM association and belonging to the same patient are combined in *one* entry in the queue of the recording station. Afterwards, the operator can select the entries for inclusion on a DICOM CDROM.

Depending on the AE-title used for receipt of the cases, different types of CDROMs are produced by the Cardio-NT. Three Classes of AE-titles are possible:

1. **CNT-1.** Received XA Image Storage Instances are written in accordance to STD-XABC-CD, while received SC Image Instances are written in accordance to STD-GEN-CD.
2. **CNT-2.** Received XA Image Storage Instances are written in accordance to STD-XA1K-CD and SC Image Instances still in accordance to STD-GEN-CD.
3. **CNT-3.** The produced CDROMs are written in accordance to STD-GEN-CD.

The produced CDROMs are usually multi-session. If the space left on the CDROMs is smaller than 25 MB the CD is finalized.

In case a CDROM contained DICOM media data before addition of the selected entries, the new data is merged with the existing data. So the DICOMDIR is updated to include the records for the added entries.

2.2 Functional definition of Application Entities

The actual Application Entities are configurable. Each configured Application Entity supports the following functionality:

- Receipt of a number of Secondary Capture and X-Ray Angio images over the network and placing them in the queue.
- Initialization of the CD-R Media, writing a DICOM File-set onto the media. Or in case a DICOM File-set existed on the CD-R medium: updating the existing File-set.
- Copying of selected Secondary Capture and X-Ray Angio images from the queue to the CD-R device.
- Creation of a DICOMDIR file that represents the contents of the recorded data.

The Application Entities mainly differ in the support of transfer syntaxes and the Application Profiles used to write the CD-R contents.

2.3 Sequencing of Real World Activities

The operator selects entries from the queue and initiates the transfer to the CD-R medium.

3 AE Specifications Network Part

This chapter describes in more detail the DICOM network context for Application Entities. The actual Application Entities are configurable and behave as one of the following Application Entity templates.

3.1 AE Template Specification: CNT-1

3.1.1 Association Establishment Policies

3.1.1.1 General

The Inturis DICOM Recorder always uses a PDU size of 16 kB.

3.1.1.2 Number of Associations

In total no more than licenced numbers of associations are supported, chapter 6.5 on page 12. This number is the total of all associations for the CNT-1, CNT-2 and CNT-3 AE titles.

3.1.1.3 Asynchronous Nature

None.

3.1.1.4 Implementation Identifying Information

Implementation Class UID = "1.3.46.670589.7.10.1.1".

Implementation Version Name = "1_1_2_N", where N is a digit string that identifies the software build version.

The Demonstration version have the version names: 0_0_0_1, 0_0_0_2.

3.1.2 Association Initiated by Real-World Activity

None.

3.1.3 Association Acceptance Policy

3.1.3.1 Inturis DICOM Recorder runs

3.1.3.1.1 Associated Real-World Activity

The Inturis DICOM Recorder software must be running.

3.1.3.1.2 Presentation Context Table

Table 3-1 : Acceptable Presentation Contexts for CNT-1

<i>Abstract Syntax Name</i>	<i>Abstract Syntax UID</i>	<i>Transfer Syntax Name</i>	<i>Transfer Syntax UID</i>	<i>Role</i>	<i>Extended Negotiation</i>
Verification SOP Class	1.2.840.10008.1.1	ILE	1.2.840.10008.1.2	SCP	None

Table 3-1 : Acceptable Presentation Contexts for CNT-1

<i>Abstract Syntax Name</i>	<i>Abstract Syntax UID</i>	<i>Transfer Syntax Name</i>	<i>Transfer Syntax UID</i>	<i>Role</i>	<i>Extended Negotiation</i>
Verification SOP Class	1.2.840.10008.1.1	ELE	1.2.840.10008.1.2.1	SCP	None
Verification SOP Class	1.2.840.10008.1.1	EBE	1.2.840.10008.1.2.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ILE	1.2.840.10008.1.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ELE	1.2.840.10008.1.2.1	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	EBE	1.2.840.10008.1.2.2	SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	JPEG Lossless	1.2.840.10008.1.2.4.70	SCP	None

3.1.3.1.2.1 SOP Specific Conformance for Secondary Capture Image Storage

CNT-1 provides Level 2 (Full) conformance for the Secondary Capture Image Storage SOP Class.

3.1.3.1.2.2 SOP Specific Conformance for X-Ray Angiographic Image Storage

CNT-1 provides Level 2 (Full) conformance for the X-Ray Angiographic Image Storage SOP Class.

The intention of CNT-1 is to write the images to CDROM using the STD-XABC-CD Application Profile. So the pixel data should meet the criteria stated in that Application Profile. Image instances, that violate these restrictions, are rejected.

3.1.3.1.3 Presentation Context Acceptance Criteria

CNT-1 always accepts any presentation context from the list defined in Table 3-1 on page 6.

3.1.3.1.4 Transfer Syntax Selection Policies

The Inturis DICOM Recorder uses the JPEG Lossless transfer syntax for the XA images. When given a choice during association negotiation, it prefers ELE over EBE over the ILE transfer syntax for the Secondary Capture images.

3.2 AE Template Specification: CNT-2

3.2.1 Association Establishment Policies

3.2.1.1 General

See "General" on page 6.

3.2.1.2 Number of Associations

See “Number of Associations” on page 6.

3.2.1.3 Asynchronous Nature

See “Asynchronous Nature” on page 6.

3.2.1.4 Implementation Identifying Information

See “Implementation Identifying Information” on page 6.

3.2.2 Association Initiated by Real-World Activity

See “Association Initiated by Real-World Activity” on page 6.

3.2.3 Association Acceptance Policy

3.2.3.1 Inturis DICOM Recorder runs

3.2.3.1.1 Associated Real-World Activity

See “Associated Real-World Activity” on page 8.

3.2.3.1.2 Presentation Context Table

See “Presentation Context Table” on page 8.

3.2.3.1.2.1 SOP Specific Conformance for Secondary Capture Image Storage

CNT-2 provides Level 2 (Full) conformance for the Secondary Capture Image Storage SOP Class.

3.2.3.1.2.2 SOP Specific Conformance for X-Ray Angiographic Image Storage

CNT-2 provides Level 2 (Full) conformance for the X-Ray Angiographic Image Storage SOP Class.

Whenever an image is written to the CDROM, the Application Profile STD-XA1K-CD has to be used. So the pixel data should meet the restrictions stated in that Application Profile. Image instances, that violate the restrictions, are rejected.

3.2.3.1.3 Presentation Context Acceptance Criteria

See “Presentation Context Acceptance Criteria” on page 7.

3.2.3.1.4 Transfer Syntax Selection Policies

See “Transfer Syntax Selection Policies” on page 7.

3.3 AE Template Specification: CNT-3

3.3.1 Association Establishment Policies

3.3.1.1 General

See “General” on page 6.

3.3.1.2 Number of Associations

See “Number of Associations” on page 6.

3.3.1.3 Asynchronous Nature

See “Asynchronous Nature” on page 6.

3.3.1.4 Implementation Identifying Information

See “Implementation Identifying Information” on page 6.

3.3.2 Association Initiated by Real-World Activity

See “Association Initiated by Real-World Activity” on page 6.

3.3.3 Association Acceptance Policy**3.3.3.1 Inturis DICOM Recorder runs****3.3.3.1.1 Associated Real-World Activity**

See “Associated Real-World Activity” on page 8.

3.3.3.1.2 Presentation Context Table

Table 3-2 : Acceptable Presentation Contexts for CNT-3

<i>Abstract Syntax Name</i>	<i>Abstract Syntax UID</i>	<i>Transfer Syntax Name</i>	<i>Transfer Syntax UID</i>	<i>Role</i>	<i>Extended Negotiation</i>
Verification SOP Class	1.2.840.10008.1.1	ILE	1.2.840.10008.1.2	SCP	None
Verification SOP Class	1.2.840.10008.1.1	ELE	1.2.840.10008.1.2.1	SCP	None
Verification SOP Class	1.2.840.10008.1.1	EBE	1.2.840.10008.1.2.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ILE	1.2.840.10008.1.2	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	ELE	1.2.840.10008.1.2.1	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	EBE	1.2.840.10008.1.2.2	SCP	None
X-Ray Angio-graphic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ILE	1.2.840.10008.1.2	SCP	None
X-Ray Angio-graphic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	ELE	1.2.840.10008.1.2.1	SCP	None

<i>Abstract Syntax Name</i>	<i>Abstract Syntax UID</i>	<i>Transfer Syntax Name</i>	<i>Transfer Syntax UID</i>	<i>Role</i>	<i>Extended Negotiation</i>
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	EBE	1.2.840.10008.1.2.2	SCP	None

3.3.3.1.2.1 SOP Specific Conformance for Secondary Capture Image Storage

CNT-3 provides Level 2 (Full) conformance for the Secondary Capture Image Storage SOP Class.

3.3.3.1.2.2 SOP Specific Conformance for X-Ray Angiographic Image Storage

CNT-3 provides Level 2 (Full) conformance for the X-Ray Angiographic Image Storage SOP Class.

It is the intention of CNT-3 to write the image instances to CDROM using the STD-GEN-CD Application Profile. The pixel data resolution shall not exceed 1024*1024. The pixeldepth shall have a value of 8, 10 or 12 bits. Image instances, that violate these restrictions, are rejected.

3.3.3.1.3 Presentation Context Acceptance Criteria

See "Presentation Context Acceptance Criteria" on page 7.

3.3.3.1.4 Transfer Syntax Selection Policies

When given a choice during association negotiation, the Inturis DICOM Recorder prefers ELE over EBE over the ILE transfer syntax for the received images.

4 Communication Profiles

4.1 Supported Communications Stacks

The Inturis DICOM Recorder provides the DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8.

4.2 TCP/IP Stack

Inturis DICOM Recorder uses the TCP/IP stack provided by Windows-NT platform. The minimal requirement is a Ethernet ISO.8802-3 Standard AUI, optional twisted pair 100-BaseT.

4.2.1 Physical Media

Not applicable as the recorder uses the network capabilities of the underlying Windows-NT platform.

5 Extensions/Specializations/Privitazations

Not applicable.

6 Configuration

6.1 IP Address

The Inturis DICOM Recorder inherits its IP address from the underlying Windows NT platform.

6.2 Inturis DICOM Recorder Listen Port

The Cardio-NT recorder listens on *one* (configurable) listen port for incoming DICOM network traffic.

6.3 Inturis DICOM Recorder AE-Titles

The Cardio-NT recorder allows the configuration of AE-Titles for the recorder *itself* up to a maximum of one hundred. Each of these AE-Titles should be made equivalent to one of the AE-Title templates CNT-1, CNT-2 or CNT-3. Such an AE-Title inherits the properties as described in “AE Template Specification: CNT-1” on page 6, “AE Template Specification: CNT-2” on page 7 and “AE Template Specification: CNT-3” on page 8 respectively. Afterwards, each configured AE-Title can be further restricted in the use of allowed SOP Classes.

6.4 Remote AE-Titles

Each remote AE-Title should be defined during configuration of the Cardio-NT recorder. For each entered AE-Title, the configuration defines *one* recorder AE-Title, as defined in “Inturis DICOM Recorder AE-Titles” on page 12, to which it can connect. Furthermore, the configuration process requires the entry of the IP-address for each remote AE-Title.

6.5 Allowed Connections from Remote AE-Titles

The software licence of the Cardio-NT recorder defines a maximum number of connections, that can be open at any one time. That implies that only the first “maximum number” of remote AE-Titles from the list configured during “Remote AE-Titles” on page 12 can connect.

7 Support of Extended Character Sets

The Inturis DICOM Recorder recorder supports the Extended character set “ISO_IR_100”, so the Latin alphabet ISO_IR No. 101 supplementary set.

8 Implementation Model for Media

8.1 Application Data Flow Diagram

Refer to “Implementation model Network and Media” on page 4.

8.2 Functional Definition of Application Entities

Refer to “Functional definition of Application Entities” on page 5.

8.3 Sequencing of Real-World Activities

See “Sequencing of Real World Activities” on page 5.

8.4 File Meta Information for Implementation Class UID and Version

The attribute “File Meta Information Version” has the values “0,1”.

The attributes “Implementation Class UID” and “Implementation Version Name” have the values as specified in “Implementation Identifying Information” on page 6.

9 AE Specifications Media Part

9.1 DICOMDIR Record Identifying Information

The DICOMDIR PATIENT, STUDY, SERIES and IMAGE records are identified by respectively the attributes “Patient ID”, “Study Instance UID”, “Series Instance UID” and “SOP Instance UID” from first XA Image Storage SOP Instance of the entries from the queue. In case only Secondary Capture Image Storage SOP Instances are available: use the values from first Secondary Capture Image Storage SOP Class Instance instead.

9.2 Patient Merging

The attribute “Patient ID” is treated as the only identifying attribute on PATIENT level. When it has either no value or the value “?” for a particular selected entry from the queue, a possible merge with one of the other “available” patients is proposed. Available means any of the other selected entries and any of the patients that are already present on the CDROM. When merging is possible and selected, the UI displays the values for both “patient ID” values and lets the operator select one of them. Likewise, the operator can select the value to use for “Patient’s Name”, “Patient’s Birth Date” and “Patient’s Sex” from any of the two merge candidates. The resulting PATIENT Record contains the selected values.

Notes:

- in case the “Patient ID” attribute had a value, a merge is proposed with any of the “available” entries with the same value for “Patient ID”.
- When merging was prohibited: build the new PATIENT record from the selected queue entry only.

9.3 Merging on Study and Series Level

While adding entries to a CDROM, the Inturis DICOM Recorder will merge added entries in the PATIENT/STUDY/SERIES hierarchy of the DICOMDIR when the higher level identifying information of the added entries equals the information as present on the CDROM.

9.4 AE Template CNT-1 Specification

9.4.1 File Meta Information for AE Template CNT-1

The attribute “Source AE Title” has the value “CNT-1” for all DICOM files that have been written or updated by AE template CNT-1.

9.4.2 Real-World Activities

The real world activities and invoked Application Profiles are listed in following table.

Table 9-1 : Application Profiles, RWAs and Roles

<i>Supported AP</i>	<i>RWA</i>	<i>Roles</i>	<i>SC option</i>
STD-XABC-CD	Transfer to CDROM	FSC/FSU	Interchange
STD-GEN-CD	Transfer to CDROM	FSC/FSU	Interchange

9.4.2.1 STD-XABC-CD**9.4.2.1.1 Detached Patient Management SOP Class**

The Detached Patient Management SOP Class is not supported.

9.4.2.1.2 Basic Directory SOP Class

The following paragraphs describe how a value for the record keys from the various DICOM-DIR records is derived.

9.4.2.1.2.1 PATIENT Record Keys**Table 9-2 : Directory Record Keys for PATIENT Records**

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in first Image Instance, see "DICOMDIR Record Identifying Information" on page 14.
Patient's Name	(0008,0010)	2	See "Patient Merging" on page 14.
Patient ID	(0008,0020)	1	See "Patient Merging" on page 14. When it still has no value: use two blanks.
Patient Birth Date	(0008,0030)	2	See "Patient Merging" on page 14.
Patient's Name	(0008,0010)	2	See "Patient Merging" on page 14.

9.4.2.1.2.2 STUDY Record Keys**Table 9-3 : Directory Record Keys for STUDY Records**

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in first Image Instance, see "DICOMDIR Record Identifying Information" on page 14.
Study Date	(0008,0020)	1	As in first Image Instance. When absent: insert current date.
Study Time	(0008,0030)	1	As in first Image Instance. When absent: insert current time.
Accession Number	(0008,0050)	2	As in first Image Instance. When absent: insert zero length value.
Study Description	(0008,1030)	2	As in first Image Instance. When absent: insert zero length value.
Study Instance UID	(0020,000D)	1C	As in first Image Instance.
Study ID	(0020,0010)	1	As in first Image Instance. When absent: do <i>not</i> record the queue entry.

9.4.2.1.2.3 SERIES Record Keys**Table 9-4 : Directory Record Keys for SERIES Records**

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in first Image Instance, see "DICOMDIR Record Identifying Information" on page 14.
Modality	(0008,0060)	1	As in first Image Instance. When absent: insert zero length value.
Series Instance UID	(0020,000E)	1	As in first Image Instance. When absent: do <i>not</i> record the queue entry.
Series Number	(0020,0011)	1	As in first Image Instance. When absent: do <i>not</i> record the queue entry.
Institution Name	(0008,0080)	2	As in first Image Instance. When absent: insert zero length value.
Institution Address	(0008,0081)	2	As in first Image Instance. When absent: insert zero length value.
Performing Physician	(0008,1050)	2	As in first Image Instance. When absent: insert zero length value.

9.4.2.1.2.4 IMAGE Record Keys**Table 9-5 : Directory Record Keys for IMAGE Records**

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in the related Image Instance.
Image Type	(0008,0008)	1	As in the related Image Instance.
Referenced Image Sequence	(0008,1140)	1C	As in the related Image Instance when third value of "Image Type" equals "BIPLANE A" or "BIPLANE B".
Image Number	(0020,0013)	1	As in the related Image Instance. When absent: do <i>not</i> record the queue entry.
Calibration Image	(0050,0004)	2	As in the related Image Instance. When absent: insert zero length value.
Icon Image Sequence	(0088,0200)	1	Always generated for XA images only. In case "Representative Frame Number" (0028,6010) has a value: use that frame. Otherwise if basic offset table is present then use the frame (number of frames)/3, else use first frame.

9.4.2.1.3 Standard X-Ray Angiographic Image Storage SOP Class

The following points are of particular interest for the recording of XA Image Instances:

1. the attributes from the selected entries from the queue are copied *as is* to the CDROM. No

checks on legality on attribute values like Dates etc. are performed. In case the process described in “Patient Merging” on page 14 results in updates of the patient demographics, these updates do *not* appear in the Image Instances on the CDROM.

2. Instances, which violate the restrictions on pixel data as described in the Application Profile, are *not* recorded.
3. The presence of a biplane acquisition is indicated by the presence of the “Referenced Image Sequence” attribute. When that referenced Image Instance does not occur in the selected queue entries, the referring instance is *not* recorded.
4. It might happen that a particular selection no longer fits on a CDROM, so a split over more CDROMs is necessary. The recorder tries to keep the two planes of biplane acquisitions on one CDROM. The recorder will insist on *blank* CDROMs for the second and further CDROMs.

9.4.2.2 STD-GEN-CD

9.4.2.2.1 Detached Patient Management SOP Class

The Detached Patient Management SOP Class is not supported.

9.4.2.2.2 Secondary Capture Image Storage SOP Class

The following points are of particular interest for the recording of Secondary Capture Image Instances:

1. the attributes from the selected entries from the queue are copied *as is* to the CDROM. No checks on legality on attribute values like Dates etc. are performed. In case the process described in “Patient Merging” on page 14 results in updates of the patient demographics, these updates do *not* appear in the Image Instances on the CDROM.
2. It might happen that a particular selection no longer fits on a CDROM, so a split over more CDROMs is necessary. The recorder tries to keep the two planes of biplane acquisitions on one CDROM. The recorder will insist on *blank* CDROMs for the second and further CDROMs.

9.5 AE Template CNT-2 Specification

9.5.1 File Meta Information for AE Template CNT-2

The attribute “Source AE Title” has the value “CNT-2” for all DICOM files that have been written or updated by AE template CNT-2.

9.5.2 Real-World Activities

The real world activities and invoked Application Profiles are listed in following table.

Table 9-6 : Application Profiles, RWAs and Roles

<i>Supported AP</i>	<i>RWA</i>	<i>Roles</i>	<i>SC option</i>
STD-XA1K-CD	Transfer to CDROM	FSC/FSU	Interchange
STD-GEN-CD	Transfer to CDROM	FSC/FSU	Interchange

9.5.2.1 STD-XA1K-CD

9.5.2.1.1 Detached Patient Management SOP Class

The Detached Patient Management SOP Class is not supported.

9.5.2.1.2 Basic Directory SOP Class

The following paragraphs describe how a value for the record keys from the various DICOM-DIR records is derived.

9.5.2.1.2.1 PATIENT Record Keys

Table 9-7 : Directory Record Keys for PATIENT Records

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in first Image Instance, see “DICOMDIR Record Identifying Information” on page 14.
Patient’s Name	(0008,0010)	2	See “Patient Merging” on page 14.
Patient ID	(0008,0020)	1	See “Patient Merging” on page 14. When it still has no value: use two blanks.
Patient Birth Date	(0008,0030)	2	See “Patient Merging” on page 14.
Patient’s Sex	(0008,0040)	2	See “Patient Merging” on page 14.

9.5.2.1.2.2 STUDY Record Keys

Table 9-8 : Directory Record Keys for STUDY Records

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in first Image Instance, see “DICOMDIR Record Identifying Information” on page 14.
Study Date	(0008,0020)	1	As in first Image Instance. When absent: insert current date.

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Study Time	(0008,0030)	1	As in first Image Instance. When absent: insert current time.
Accession Number	(0008,0050)	2	As in first Image Instance. When absent: insert zero length value.
Study Description	(0008,1030)	2	As in first Image Instance. When absent: insert zero length value.
Study Instance UID	(0020,000D)	1C	As in first Image Instance.
Study ID	(0020,0010)	1	As in first Image Instance. When absent: do <i>not</i> record the queue entry.

9.5.2.1.2.3 SERIES Record Keys

Table 9-9 : Directory Record Keys for SERIES Records

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in first Image Instance, see “DICOMDIR Record Identifying Information” on page 14.
Modality	(0008,0060)	1	As in first Image Instance. When absent: insert zero length value.
Series Instance UID	(0020,000E)	1	As in first Image Instance. When absent: do <i>not</i> record the queue entry.
Series Number	(0020,0011)	1	As in first Image Instance. When absent: do <i>not</i> record the queue entry.
Institution Name	(0008,0080)	2	As in first Image Instance. When absent: insert zero length value.
Institution Address	(0008,0081)	2	As in first Image Instance. When absent: insert zero length value.
Performing Physician	(0008,1050)	2	As in first Image Instance. When absent: insert zero length value.

9.5.2.1.2.4 IMAGE Record Keys

Table 9-10 : Directory Record Keys for IMAGE Records

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in the related Image Instance.
Image Type	(0008,0008)	1C	As in the related Image Instance.
Referenced Image Sequence	(0008,1140)	1C	As in the related Image Instance, when third value of “Image Type” equals “BIPLANE A” or “BIPLANE B”.
Image Number	(0020,0013)	1	As in the related Image Instance. When absent: do <i>not</i> record the queue entry.

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Calibration Image	(0050,0004)	2	As in the related Image Instance. When absent: insert zero length value.
Icon Image Sequence	(0088,0200)	1	Always generated for XA images only. In case "Representative Frame Number" (0028,6010) has a value: use that frame. Otherwise if basic offset table is present then use the frame (number of frames)/3, else use first frame.

9.5.2.1.3 Standard X-Ray Angiographic Image Storage SOP Class

See the remarks under "Standard X-Ray Angiographic Image Storage SOP Class" on page 16.

9.5.2.1.4 STD-GEN-CD

9.5.2.1.5 Detached Patient Management SOP Class

The Detached Patient Management SOP Class is not supported.

9.5.2.1.6 Secondary Capture Image Storage SOP Class

See the remarks under "Secondary Capture Image Storage SOP Class" on page 17.

9.6 AE Template CNT-3 Specification

9.6.1 File Meta Information for AE Template CNT-3

The attribute “Source AE Title” has the value “CNT-3” for all DICOM files that have been written or updated by AE template CNT-3.

9.6.2 Real-World Activities

The real world activities and invoked Application Profiles are listed in following table.

Table 9-11 : Application Profiles, RWAs and Roles

<i>Supported AP</i>	<i>RWA</i>	<i>Roles</i>	<i>SC option</i>
STD-GEN-CD	Transfer to CDROM	FSC/FSU	Interchange

9.6.2.1 STD-GEN-CD

9.6.2.1.1 Detached Patient Management SOP Class

The Detached Patient Management SOP Class is not supported.

9.6.2.1.2 Basic Directory SOP Class

The following paragraphs describe how a value for the record keys from the various DICOM-DIR records is derived.

9.6.2.1.2.1 PATIENT Record Keys

Table 9-12 : Directory Record Keys for PATIENT Records

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in first Image Instance, see “DICOMDIR Record Identifying Information” on page 14.
Patient’s Name	(0008,0010)	2	See “Patient Merging” on page 14. When it still has no value: use two blanks.
Patient ID	(0008,0020)	1	See “Patient Merging” on page 14. When it still has no value: use two blanks.
Patient Birth Date	(0008,0030)	3	See “Patient Merging” on page 14.
Patient’s Sex	(0008,0040)	3	See “Patient Merging” on page 14.

9.6.2.1.2.2 STUDY Record Keys

Table 9-13 : Directory Record Keys for STUDY Records

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in first Image Instance, see “DICOMDIR Record Identifying Information” on page 14.

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Study Date	(0008,0020)	1	As in first Image Instance. When absent: insert current date.
Study Time	(0008,0030)	1	As in first Image Instance. When absent: insert current time.
Accession Number	(0008,0050)	2	As in first Image Instance. When absent: insert zero length value.
Study Description	(0008,1030)	2	As in first Image Instance. When absent: insert zero length value.
Study Instance UID	(0020,000D)	1C	As in first Image Instance. When absent: do <i>not</i> record the queue entry.
Study ID	(0020,0010)	1	As in first Image Instance. When absent: do <i>not</i> record the queue entry.

9.6.2.1.2.3 SERIES Record Keys

Table 9-14 : Directory Record Keys for SERIES Records

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in first Image Instance, see “DICOMDIR Record Identifying Information” on page 14.
Modality	(0008,0060)	1	As in first Image Instance. When absent: insert zero length value.
Series Instance UID	(0020,000E)	1	As in first Image Instance. When absent: do <i>not</i> record the queue entry.
Series Number	(0020,0011)	1	As in first Image Instance. When absent: do <i>not</i> record the queue entry.
Institution Name	(0008,0080)	3	As in first Image Instance.
Institution Address	(0008,0081)	3	As in first Image Instance.
Performing Physician	(0008,1050)	3	As in first Image Instance.

9.6.2.1.2.4 IMAGE Record Keys

Table 9-15 : Directory Record Keys for IMAGE Records

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Specific Character Set	(0008,0005)	1C	As in the related Image Instance.
Image Type	(0008,0008)	1C	As in the related Image Instance.
Referenced Image Sequence	(0008,1140)	1C	As in the related Image Instance, when third value of “Image Type” equals “BIPLANE A” or “BIPLANE B”.
Image Number	(0020,0013)	1	As in the related Image Instance. When absent: do <i>not</i> record the queue entry.

<i>Attribute Name</i>	<i>Tag</i>	<i>Type</i>	<i>Value taken from</i>
Calibration Image	(0050,0004)	3	As in the related Image Instance.

9.6.2.1.3 Standard X-Ray Angiographic Image Storage SOP Class

See the remarks under “Standard X-Ray Angiographic Image Storage SOP Class” on page 16.

9.6.2.1.4 Secondary Capture Image Storage SOP Class

See the remarks under “Secondary Capture Image Storage SOP Class” on page 17.

10 Other Issues

Considering the system there are the following remarks.:

1. During an association, the recorder accepts transfer syntaxes that are useless when observed in the light of the intended Application Profile for Media recording. It accepts ELE, EBE and ILE for XA images for the AE's CNT-1 and CNT-2. Here JPEGLossless is expected. Likewise it will accept JPEGLossless for AE CNT-3 when either ELE, EBE or ILE is expected.
Received image instances, that are encoded in such a "useless" transfer syntax, are rejected in the C-STORE response.
2. Images, that violate either the pixel data constraints from the Application Profile or miss one or more of the mandatory identifying attributes for media recording, are accepted during the C-STORE operation. They are rejected at the moment of recording itself.
3. Added entries are merged into the existing PATIENT/STDY/SERIES hierarchy (if any) as present on the CDROM. No check is done whether or not the image instances are already present, so duplicate image instances will occur when the same queue entry is recorded more than once.
4. No check is done whether or not added entries match the Application Profile that might be present on a CDROM: the new entries are just added.
5. No check is done on the DICOM validity of the CDROM contents before addition of entries. Likewise, the new entries are added *as is*: no check on validity of the received DICOM data will be executed.
6. The recorder can not handle DICOM bytestreams, where a sequence is encoded with a defined length and that sequence contains one or more items encoded with an undefined length