



Kodak Point of Care CR systems

DICOM Conformance Statement

Kodak QC

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Revision History

Date	Rev	Editor	Comments
Aug 21, 2005	1.0	Arnon Dukeman	Initial Release

Acronyms, Abbreviations and Symbols

ACC	American College of Cardiology
ACR	American College of Radiology
ASCII	American Standard Code for Information Interchange
AE	Application Entity
ANSI	American National Standards Institute
CD	Compact Disc
CR	Computed Radiography
DICOM	Digital Imaging and COmmunications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DICOM Message Service Element-Composite
DIMSE-N	DICOM Message Service Element-Normalized
HD	Hard Disc
HIS	Hospital Information System
HL7	Health Level 7
IE	Information Entity
IOD	Information Object Definition
ISO	International Standard Organization
MOD	Magneto Optical Disk
MWL	Modality Worklist
MWM	Modality Worklist Management
NEMA	National Electrical Manufacturers Association
PDU	Protocol Data Unit
RIS	Radiology Information System
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier

1.Introduction

This document is a DICOM Conformance Statement for the Kodak QC system.

This document is intended to provide the reader with the knowledge of how to integrate this product within a DICOM compliant hospital network. It details DICOM Service Classes and Communication Protocols that are supported in Kodak QC.

Kodak QC supports following service classes:

- Storage Service Class (SCU/SCP)
- Modality Worklist Management Service Class (SCU)

If reader is unfamiliar with DICOM, it is recommended to read the DICOM Specification (referenced in section 1.2) prior to reading this conformance statement.

1.1. Overview

This document contains 10 sections (including this Section 1 – Introduction).

Section 2 presents the DICOM implementation model of the Kodak QC, supported by detailed application data flow diagrams.

Section 3 provides definition of the Image Transfer Application Entity (AE) that is part of Kodak QC. Details are given in the AE Specification.

Section 4 provides definition of the Modality Worklist AE that is part of Kodak QC. Details are given in the AE Specification.

Communication Profiles are discussed in section 7, and configuration required by Kodak QC is provided in Section 8. Section 9 indicates support for Extended Character Sets.

Annex A provides Information Object Definitions for the modalities supported by Kodak QC.

1.2.References

ACR-NEMA Digital Imaging and Communications in Medicine, DICOM V3.0, 1999-2000.

1.3.Definitions

- **Association Establishment** - An Association Establishment is the first phase of communication between two DICOM Application Entities. The AEs use the Association Establishment to negotiate how data will be encoded and the type of data to be exchanged.
- **Called Application Entity Title** - The Called AE Title defines the intended receiver of an Association.
- **Calling Application Entity Title** - The Calling AE Title defines the requestor of an Association.
- **DICOM Message Service Element (DIMSE)** - A DIMSE defines the services and protocols utilized by an Application Entity to exchange messages.
- **Information Object Definition (IOD)** - An IOD is a data model, which is an abstraction of real-world information. This data model defines the nature and attributes relevant to the class of real-world objects represented.

- **Service Class Provider (SCP)** - A Service Class Provider plays the "server" role to perform operations and invoke notifications during an Association. An example of a Storage Service Class Provider would be an image storage device. In this case, the image storage device is storing the image that was sent by a Service Class User.
- **Service Class User (SCU)** - A Service Class User plays the "client" role to invoke operations and perform notifications during an Association. An example of a Storage Service Class User would be an image acquisition device. In this case, the image acquisition device will create and send a DICOM image by requesting that a Service Class Provider store that image.
- **Service/Object Pair (SOP) Class** - A SOP Class is defined by the union of an Information Object Definition and a set of DIMSE Services. A DICOM Application Entity may support one or more SOP Classes. Each SOP Class is uniquely identified by a SOP Class UID.
- **SOP Instance** - A specific occurrence of an Information Object.
- **Transfer Syntax** - The Transfer Syntax is a set of encoding rules that allow DICOM Application Entities to negotiate the encoding techniques (e.g. data element structure, byte ordering, compression) they are able to support. The Transfer Syntax is negotiated during Association Negotiation.
- **Unique Identifier (UID)** - A Unique Identifier is a globally unique, ISO compliant, ASCII-numeric string. It guarantees uniqueness across multiple countries, sites, vendors and equipment.
- **DICOM File** - A DICOM File is a File with a content of formatted according to the requirements of Part 10 of the DICOM standard.

2.Implementation Model

Kodak QC is a medical acquisition system that supports Computed Radiography (CR).

Kodak QC encompasses the following DICOM Application Entities:

- KODAK QC IMAGE TRANSFER AE - to exchange images with other Application Entities by the means of DICOM network exchange. It implements the following Service Class:
 - Storage as SCU
- KODAK QC MWL AE - to fetch modality worklists from a worklist manager. It implements the following Service Class:
 - DICOM Modality Worklist SCU

2.1. Image Transfer

KODAK QC IMAGE TRANSFER AE is implemented as a single application entity and performs the following services:

- sends/exports images to remote DICOM storage devices (acts as Storage SCU)

2.1.1. Application Data Flow

Figure 1 illustrates the following scenarios:

- Send a **STORE Request** to a remote DICOM AE in case KodakDICOMSend service found a DICOM file in the DICOM file directory.

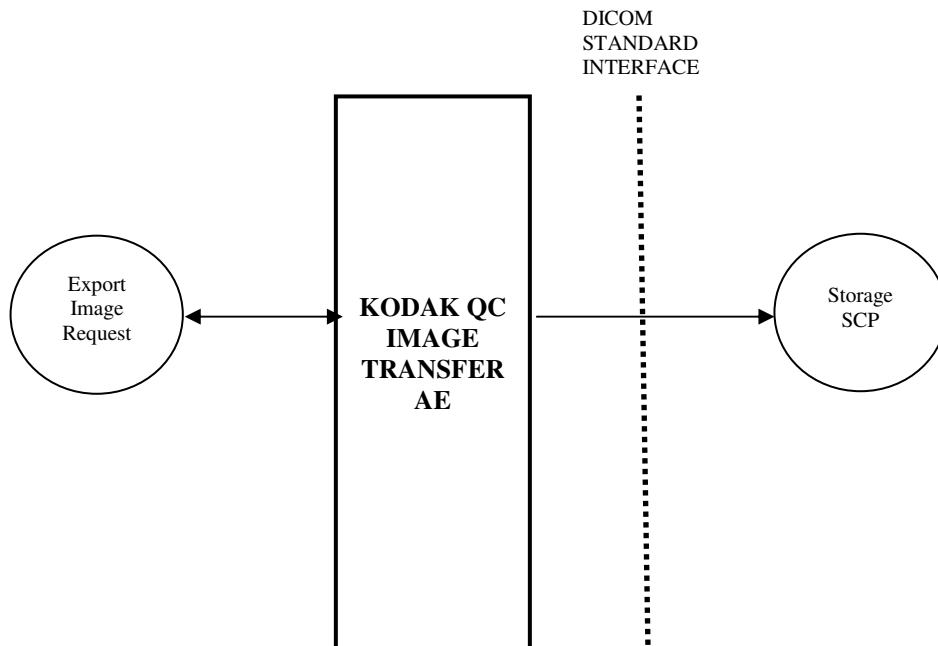


Figure 1: Image Transfer Data Flow Diagram

2.1.2.Functional Definitions of Application Entities

The KODAK QC IMAGE TRANSFER AE component operates as a service. The startup sequence of the Kodak QC system initiates its execution. The service is NOT shut down when the Kodak QC application is closed

KODAK QC IMAGE TRANSFER AE uses a configuration file that contains information used to describe both local as well as remote Application Entities. After the configuration is loaded KODAK QC IMAGE TRANSFER AE listens on the configured port for association requests.

2.2.Modality Worklist

2.2.1.Application Data Flow

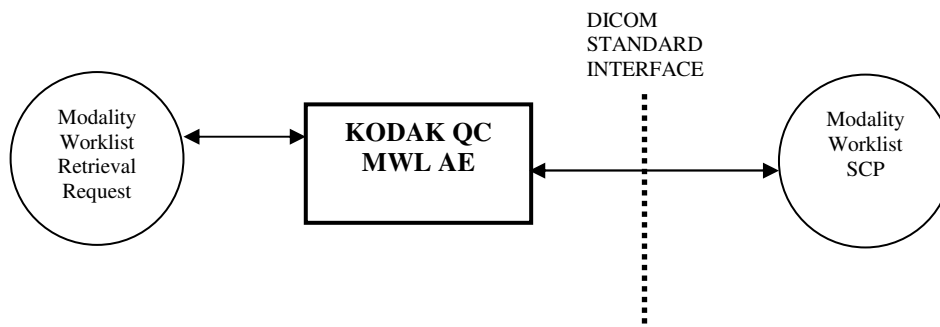


Figure 2: Modality Worklist Data Flow Diagram

2.2.2.Functional Definitions of Application Entities

KODAK QC MWL AE is used to query modality worklist information from a remote DICOM device. It therefore performs the following tasks:

- Establishes a DICOM Association with a remote DICOM device.
- Issues a request for a worklist to a remote DICOM device.
- Retrieves Modality Worklist from a remote DICOM device.

KODAK QC MWL AE component operates as part of the Kodak QC application. It is shut down when the application terminates.

2.2.3.Sequencing of Real-World Activities

Not applicable.

3.KODAK QC IMAGE TRANSFER AE Specification

KODAK QC IMAGE TRANSFER AE provides Standard Conformance to the following DICOM SOP Class as an SCU:

SOP Class Name	SOP Class UID
CR Image Storage	1.2.840.10008.5.1.4.1.1.1

3.1.Association Establishment Policy

3.1.1.General

The maximum length of PDU that the KODAK QC IMAGE TRANSFER AE will receive is 16384.

3.1.2.Number of Associations

The KODAK QC IMAGE TRANSFER AE can initiate one association concurrently..

3.1.3.Asynchronous nature

The KODAK QC IMAGE TRANSFER AE allows a single outstanding operation on any association. Therefore, Kodak QC AE does not support asynchronous operations and will not perform asynchronous window negotiation, other than the default as specified by the DICOM specification.

3.1.4.Implementation Identifying Information

The KODAK QC IMAGE TRANSFER AE is identified by the following ids:

Implementation Class UID: 1.2.840.114062.2.4.1.4

Implementation Version Name: VizCOM3 4.1.d

3.2.Association Initiation by Real World Activity

This section details the action of the KODAK QC IMAGE TRANSFER AE SCU component as a result of user initiated activity on the Kodak QC Application User Interface.

3.2.1.Export Image Request

3.2.1.1.Associated Real World Activity

Automatic export:

The user configures the Kodak QC application to automatically export a study after it has been performed. The user sets up the default destination and no further intervention on the user part is required. The KODAK QC IMAGE TRANSFER AE transfers the images in the background.

3.2.1.2.Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.2.1.3.SOP-Specific Conformance

This implementation supports transfers as an SCU as described in NEMA PS3.4 (2000) Annex B.

The Information Object attributes that are encapsulated in a dataset and sent with the C-STORE request are specified in Annex A of this document.

3.3.Association Acceptance Policy

The KODAK QC IMAGE TRANSFER AE does not accept association requests.

4. KODAK QC MWL AE Specification

4.1.Association Establishment Policy

4.1.1.General

When Kodak QC Application issues a request to retrieve a Modality Worklist, it initiates an association to the Modality Worklist SCP through the KODAK QC MWL AE Component.

4.1.2.Number of Associations

KODAK QC MWL AE initiates one association with the default remote Modality Worklist SCP. The association is released once the worklist has been fetched.

4.1.3.Asynchronous nature

This release does not support asynchronous operations and will not perform asynchronous window negotiation.

4.1.4.Implementation Identifying Information

The KODAK QC MWL AE is identified by the following ids:
Implementation Class UID: 1.2.840.114062.62771.1
Implementation Version Name: VIZCOM103

4.2.Association Initiation by Real World Activity

4.2.1.Modality Worklist Retrieval Request

4.2.1.1.Associated Real World Activity

The user of the Kodak QC Application selects the Retrieve Worklist operation button on the user interface.

4.2.1.2. Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Modality Worklist Model FIND	1.2.840.10008.5.1.4.31	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1		
		Explicit VR, Big Endian	1.2.840.10008.1.2.2		

4.3. Association Acceptance Policy

The KODAK QC MWL AE does not accept association requests.

5. Communications Profiles

5.1. Supported Communication Stacks

The DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard is supported.

5.2. OSI Stack

Not applicable to this product.

5.3. TCP/IP Stack

5.3.1. API

The KODAK QC IMAGE TRANSFER AE KODAK QC MWL AE implementations use Berkeley style sockets.

5.3.2. Physical Media Support

Kodak QC is indifferent to the physical medium over which TCP/IP executes; it inherits the medium from the computer system upon which it executes.

5.4. Point to Point Stack

Not applicable to this product.

6.Configuration

6.1.KODAK QC IMAGE TRANSFER AE Configuration

Kodak QC Service Manual, supplied with the product, defines the available configuration parameters.

Application entity host names can be specified as either IP address or host name.

6.2.KODAK QC MWL AE Configuration

Kodak QC Service Manual, supplied with the product, defines the available configuration parameters.

Local AE title can be set.

Parameters of the remote MWL SCP can be set (i.e., AE title, host name or IP address)

7.Support of Extended Character Sets

Kodak QC does not support extended character set for this release.

8. Annex A - Information Object Definitions

The Information Object Definitions for Digital Computed Radiography (CR) image is described in this section.

8.1. Computed Radiography (CR) Information Object Definition

Kodak QC supports sending of CR images.

8.1.1.Information Object Definitions For CR Image IOD

8.1.1.1.Patient Module

Attribute Name	Tag	Type	Attribute Assignment
Patient's Name	(0010, 0010)	2	Always set
Patient ID	(0010, 0020)	2	Always set
Patient's Birth Date	(0010, 0030)	2	Always set
Patient's Sex	(0010, 0040)	2	Always set
Referenced Patient Sequence	(0008,1120)	3	Not set
>Referenced SOP Class UID	(0008,1150)	1C	Required if Referenced Patient Sequence is set
>Referenced SOP Class Instance UID	(0008,1155)	1C	Required if Referenced Patient Sequence is set

8.1.1.2. General Study Module

Attribute Name	Tag	Type	Attribute Assignment
Study Instance UID	(0020, 000D)	1	Always set
Study Date	(0008, 0020)	2	Always set
Study Time	(0008, 0030)	2	Always set
Referring Physician's Name	(0008, 0090)	2	Length=0
Study ID	(0020, 0010)	2	Length=0
Accession Number	(0008, 0050)	2	Always set
Study Description	(0008,1030)	3	Not set
Physician(s) of Record	(0008,1048)	3	Not set
Name of Physician(s) Reading Study	(0008,1060)	3	Not set
Referenced Study Sequence	(0008,1110)	3	Not set
>Referenced SOP Class UID	(0008,1150)	1C	Required Referenced Study Sequence is set
>Referenced SOP Class Instance UID	(0008,1155)	1C	Required Referenced Study Sequence is set
Procedure Code Sequence	(0008,1032)	3	Not set
>Code Value	(0008,0100)	1C	Required if Procedure Code Sequence present
>Coding Scheme Designator	(0008,0102)	1C	Required if Procedure Code Sequence present
>Coding Scheme Version	(0008,0103)	1C	Required if Procedure Code Sequence present and its value is available

>Code Meaning	(0008,0104)	1C	Required if Procedure Code Sequence present
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8.1.1.3. Patient Study Module

Attribute Name	Tag	Type	Attribute Assignment
Admitting Diagnoses Description	(0008,1080)	3	Not set
Patient's Age	(0010, 1010)	3	Not set
Patient's Size	(0010,1020)	3	Not set
Patient's Weight	(0010,1030)	3	Not set
Occupation	(0010,2180)	3	Not set
Additional Patient's History	(0010,21B0)	3	Not set

8.1.1.4. General Series Module

Attribute Name	Tag	Type	Attribute Assignment
Modality	(0008, 0060)	1	Always set
Series Instance UID	(0020, 000E)	1	Always set
Series Number	(0020, 0011)	2	Always set
Laterality	(0020,0060)	2C	Length=0
Series Date	(0008,0021)	3	Not set
Series Time	(0008,0031)	3	Not set
Performing Physician's Name	(0008,1050)	3	Not set
Protocol Name	(0018,1030)	3	Not set
Series Description	(0018,103E)	3	Not set
Operator's Name	(0008,1070)	3	Not set
Referenced Study Component Sequence	(0008,1111)	3	Not set
>Referenced SOP Class UID	(0008,1150)	1C	Set if Referenced Study Component Sequence is present
>Referenced SOP Instance UID	(0008,1155)	1C	Set if Referenced Study Component Sequence is present
Body Part Examined	(0018,0015)	2	Always set
Patient Position	(0018,5100)	2	Length=0
Smallest Pixel Value in Series	(0028,0108)	3	Not set
Largest Pixel Value in Series	(0028,0109)	3	Not set
Request Attributes Sequence	(0040,0275)	3	Not set
>Requested Procedure ID	(0040,1001)	1C	Set if Request Attributes Sequence is present

>Scheduled Procedure Step ID	(0040,0009)	1C	Set if Request Attributes Sequence is present
>Scheduled Procedure Step Description	(0040,0007)	1C	Set if Request Attributes Sequence is present and the value is available
>Scheduled Action Item Code Sequence	(0040,0008)	3	Not set
>>Code Value	(0008,0100)	1C	Required if Scheduled Action Item Code Sequence is present
>>Coding Scheme Designator	(0008,0102)	1C	Required if Scheduled Action Item Code Sequence is present
>>Coding Scheme Version	(0008,0103)	1C	Required if Scheduled Action Item Code Sequence is present and its value is available
>>Code Meaning	(0008,0104)	1C	Required if Scheduled Action Item Code Sequence is present
Performed Procedure Step ID	(0040,0253)	3	Not set
Performed Procedure Step Start Date	(0040,0244)	3	Not set
Performed Procedure Step Start Time	(0040,0245)	3	Not set
Performed Procedure Step Description	(0040,0254)	3	Not set
Performed Action Item Code Sequence	(0040,0260)	3	Not set
>Code Value	(0008,0100)	1C	Required if Performed Action Item Code Sequence is present
>Coding Scheme Designator	(0008,0102)	1C	Required if Performed Action Item Code Sequence is present
>Coding Scheme Version	(0008,0103)	1C	Required if Performed Action Item Code Sequence is present and its value is available
>Code Meaning	(0008,0104)	1C	Required if Performed Action Item Code Sequence is present

8.1.1.5.CR Series Module

Attribute Name	Tag	Type	Attribute Assignment
Body Part Examined	(0018, 0015)	2	Always set
View Position	(0018,5101)	2	Always set
Filter Type	(0018,1160)	3	Not set
Colimator/grid Name	(0018,1180)	3	Not set
Focal Spot	(0018, 1190)	3	Not set
Plate Type	(0018, 1260)	3	Not set
Phosphor Type	(0018, 1261)	3	Not set

8.1.1.6.General Equipment Module

Attribute Name	Tag	Type	Attribute Assignment
Manufacturer	(0008, 0070)	2	Always set
Institution Name	(0008, 0080)	3	Always set
Institution Address	(0008, 0080)	3	Not set
Station Name	(0008,1010)	3	Not set
Institutional Department Name	(0008,1040)	3	Not set when no entry is made
Manufacturer's Model Name	(0008,1090)	3	Always set
Device Serial Number	(0018,1000)	3	Not set
Software Versions	(0018,1020)	3	Not set

8.1.1.7.General Image Module

Attribute Name	Tag	Type	Attribute Assignment
Instance Number	(0020, 0013)	2	Always set
Patient Orientation	(0020,0020)	2C	Not set
Content Date	(0008, 0023)	2C	Not set
Content Time	(0008, 0033)	2C	Not set
Image Type	(0008, 0008)	3	Not set
Image Comments	(0020,4000)	3	Not set
Derivation Description	(0008, 2111)	3	Not set
Pixel Spacing	(0028, 0030)	3	Always set
Lossy Image Compression	(0028, 2110)	3	Not set

8.1.1.8. Image Pixel Module

Attribute Name	Tag	Type	Attribute Assignment
Samples per Pixel	(0028, 0002)	1	1
Photometric Interpretation	(0028, 0004)	1	MONOCHROME2
Rows	(0028, 0010)	1	Always set
Columns	(0028, 0011)	1	Always set
Bits Allocated	(0028, 0100)	1	Always set (16)
Bits Stored	(0028, 0101)	1	Always set (12)
High Bit	(0028, 0102)	1	Always set (11)
Pixel Representation	(0028, 0103)	1	Always set (0)
Pixel Data	(7FE0, 0010)	1	Always set

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Planar Configuration	(0028, 0006)	1C	Not set
Pixel Aspect Ratio	(0028, 0034)	1C	Always set (1\1)
Smallest Image Pixel Value	(0028, 0106)	3	Not set
Largest Image Pixel Value	(0028, 0107)	3	Not set

8.1.1.9.CR Image Module

Attribute Name	Tag	Type	Attribute Assignment
KVP	(0018, 0060)	3	Not set
Plate ID	(0018,1004)	3	Always set
X-Ray Tube Current	(0018, 1151)	3	Not set
Exposure Time	(0018,1150)	3	Not set
Exposure	(0018,1152)	3	Not set
Focal Spot	(0018,1190)	3	Not set
Relative X-Ray Exposure	(0018,1405)	3	Always set

8.1.1.10.Modality LUT Module

Attribute Name	Tag	Type	Attribute Assignment
Modality LUT Sequence	(0028, 3000)	1C	Not set
>LUT Descriptor	(0028,3002)	1C	Not set
>LUT Explanation	(0028,3003)	3	Not set
>Modality LUT Type	(0028,3004)	1C	Not set
>LUT Data	(0028,3006)	1C	Not set
Rescale Intercept	(0028,1052)	1C	Always set (0)
Rescale Slope	(0028,1053)	1C	Always set (1)
Rescale Type	(0028, 1054)	1C	Not set

8.1.1.11.VOI LUT Module

Attribute Name	Tag	Type	Attribute Assignment
VOI LUT Sequence	(0028,3010)	3	Not set
>LUT Descriptor	(0028,3002)	1C	Not set
>LUT Explanation	(0028,3003)	1C	Not set
>LUT Data	(0028,3006)	1C	Not set
Window Center	(0028,1050)	1C	Always set
Window Width	(0028,1051)	1C	Always set

8.1.1.12.SOP Common Module

Attribute Name	Tag	Type	Attribute Assignment
SOP Class UID	(0008, 0016)	1	Always set
SOP Instance UID	(0008, 0018)	1	Always set
Specific Character Set	(0008, 0005)	1C	Not Set