Kodak PACS Link Medical Image Manager 100
Kodak PACS Link Medical Image Manager 200
as
Service Class User (SCU)
Software Version 6.1.1

DICOM Conformance Statement

July 20, 2005
Document # 2E0380, Rev. Q

Revision History

Revision	Date	Author	Description
Revisions A to P			Please refer to previous documents.
Q	7/20/2005	Trac Tran	Software version 6.1.1, trademarks and DICOM terms. Remove annexes that are not applicable.

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Rochester, NY 14650

Contents

1 Introduction

1.1 Executive Overview

This document covers the following products:

- *Kodak* PACS Link Medical Image Manager 200 (Print/Store Service Class User)
- *Kodak* PACS Link Medical Image Manager 100

The following DICOM SOP Classes are supported:

SOP Class Name	SOP Class UID	Service Class Role
Verification SOP Class	1.2.840.10008.1.1	SCU
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	SCU
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	SCU
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	SCU
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	SCU
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	SCU
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	SCU
Study Component Management	1.2.840.10008.3.1.2.3.2	SCU
Study Management	1.2.840.10008.3.1.2.3.1	SCU
Basic Study Content Notification	1.2.840.10008.1.9	SCU

1.2 Scope and Field of Application

This document describes the DICOM functionality of the *Kodak* PACS Link Medical Image Manager 200 (MIM 200) and *Kodak* PACS Link Medical Image Manager 100 (MIM 100). The MIM 100 and MIM 200 function as system components (collectively referred to as MIM) for capturing exam images and patient demographics then distributing them within and between institutions. The MIM acts as a DICOM Service Class User (SCU) and performs transactions over a TCP/IP network via the DICOM messages exchange protocol.

1.3 Important Considerations for the Reader

This DICOM Conformance Statement by itself is not sufficient to guarantee successful connectivity between the MIM and equipment from other vendors. The following considerations should be made:

- The integration of equipment from different vendors (including Kodak) goes beyond the scope of the DICOM 3.0 standard and the DICOM Conformance Statements from Kodak and other vendors. It is the responsibility of the user (or user's agent) to assess the application requirements and to design a solution that integrates *Kodak* equipment with equipment from other vendors.
- When the comparison of this DICOM Conformance Statement with a DICOM Conformance Statement from another vendor indicates that connectivity should be possible, it is the responsibility of the user (or user's agent) to verify this by carrying out validation tests and to check whether all required functionality (such as cut lines) is met.
- With regard to the future evolution of the DICOM 3.0 standard Eastman Kodak Company reserves the right to make changes to the *Kodak* PACS Link Medical Image Manager 100 and the *Kodak* PACS Link Medical Image Manager 200 architecture described in this document. The user (or user's agent) should ensure that any equipment connected via DICOM to *Kodak* equipment also follows the future evolution of the DICOM 3.0 standard. Failure to do so may result in (partial) loss of connectivity.

This implementation is based on the DICOM Standard, publication PS 3.1-2004.

1.4 Accessing this Conformance Statement on the World Wide Web

As the MIM product changes, changes to this DICOM Conformance Statement are inevitable. To obtain the most recent revision of this DICOM Conformance Statement, access the following URL (case sensitive):

http://www.kodak.com/global/en/health/serviceAndSupport/dicom.jhtml

1.5 Definitions, Acronyms, Abbreviations

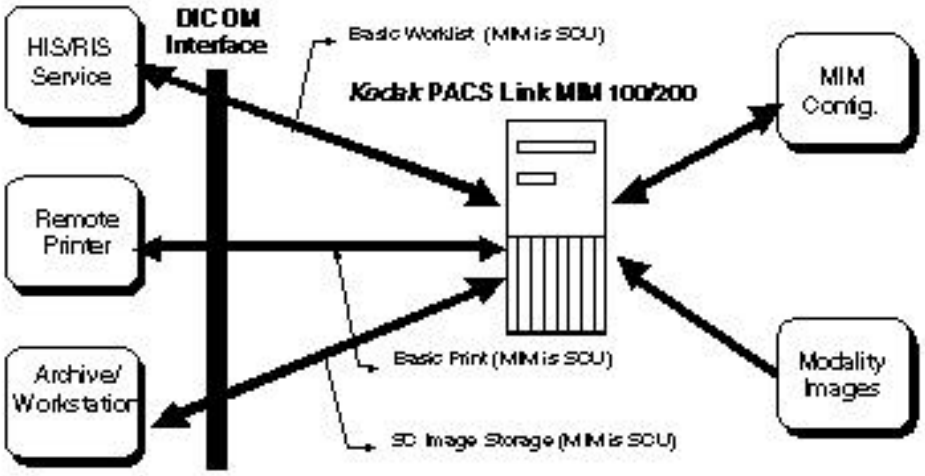
The following abbreviations and acronyms are used in this document.

Term	Description
AE	Application Entity
ASCII	American Standard Code for Information Interchange
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
HIS/RIS	Hospital Information System/Radiology Information System
IOD	Information Object Definition.

Term	Description
ISO	International Standards Organization
LUT	Look-up Table
MIM	*Kodak* PACS Link Medical Image Manager 100/200
PDU	Protocol Data Unit
PLUT	Presentation Look-up Table
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
TFT/ULUT	Transfer Function Table/User Look-Up Table
UID	Unique Identifier

2 Implementation Model

This implementation model uses the DICOM Basic Print Management Meta SOP Class to deliver studies to remote printers. The SC Image Storage SOP Class is used to deliver studies to archives. Basic Worklist Management service is used for the acquisition of patient demographics.



2.1 Functional Definitions

The MIM acquires images from the connected devices and demographics via manual entry or connection to an Information System. Studies are temporarily stored on disk. The images are then sent to the selected destinations.

2.2 Sequencing of Real-World Activities

If a HIS/RIS service is present, the MIM establishes an association when the MIM application is started to obtain a modality worklist. The worklist is used as a source of patient demographics. The MIM establishes an association for each patient study to obtain the study component. The study component is used as a source of the study description information.

The MIM establishes an association with a selected SCP when the MIM has collected sufficient information to begin sending images. This may be before the acquisition session has ended.

3 Application Entity Specifications

The MIM provides Standard Conformance to the following SOP Classes as an SCU.

SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Basic Study Content Notification	1.2.840.10008.1.9
Detached Study Management	1.2.840.10008.3.1.2.3.1
Study Component Management	1.2.840.10008.3.1.2.3.2

3.1 Association Establishment Policies

3.1.1 General

3.1.1.1 Delivery

An Association may be attempted whenever a valid destination is selected and at least one image has been acquired.

The maximum PDU size which the MIM will negotiate is 64 Kbytes.

3.1.1.2 HIS/RIS

An Association for Basic Worklist will be attempted when the MIM application is started and then periodically thereafter.

3.1.2 Number of Associations

3.1.2.1 Delivery

Associations are initiated with the limitation that no more than three total SCU delivery associations may be open at any given time. If more destinations are desired, the requests are queued. The MIM will not create two associations to the same device, even if there are multiple jobs queued for delivery.

3.1.2.2 HIS/RIS

Only one association will be initiated at a time. The MIM will open/close an independent association after receiving a C-FIND response and each N-GET response

3.1.3 Asynchronous Nature

The MIM allows up to 1 invoked and 1 performed operation on an Association (it is synchronous, e.g. the SCU sends only 1 Request and waits for the corresponding Response before sending the next Request).

3.1.4 Implementation Identifying Information

The MIM provides the Implementation Class UID of “1.2.840.113564.3.1.8”.

The implementation version name attribute is of the form of “MIMyyvxxx” where yy is the Released Year and xxx is the Version Number. (i.e. MIM03v6.0 stands for Medical Image Manager software, released in 2003, of version 6.0)

The MIM establishes an Association using its network node name for the Calling DICOM Application Entity Title (AE Title). The network node name is configurable through the MIM Service Application.

The MIM stores a called DICOM Application Entity Title and socket number for each DICOM compatible network destination it knows about.

3.2 Association Initiation Policy

3.2.1 Associated Real-World Activity

3.2.1.1 Delivery

The MIM initiates Associations for the purpose of sending images and associated information for printing to a Basic Grayscale Print Management SCP and archiving to an SC Image Storage SCP.

The default well-known socket 5040 will be used for making the Association unless a different one is configured by a product service provider.

3.2.1.2 HIS/RIS

The MIM initiates Associations for the purpose of obtaining the current Modality Worklist IOD.

3.2.2 Presentation Context Table

The MIM proposes the Presentation Contexts shown below.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Negotiation**
Name	**UID**	**Name List**	**UID**		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Print Management	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Print Management	1.2.840.10008.5.1.1.18	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Annotation Box	1.2.840.10008.5.1.1.15	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Presentation LUT	1.2.840.10008.5.1.1.23	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Modality Worklist	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Study Content Notification	1.2.840.10008.1.9	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.2.3 SOP Specific Conformance

3.2.3.1 Verification

The MIM provides standard conformance to the DICOM Verification Service Class. When prompted by a user, the MIM will request verification of communication to a remote DICOM AE using the C-ECHO primitive.

3.2.3.2 Delivery

Association attempts will be retried if the SCP rejects the request with the RESULT = 2 (rejected transient) and the REASON = 1 (temporary congestion). If all Association attempts fail, then the user will be notified and the Film Session or Study is saved for resending or deletion. No undelivered image files are deleted without manual user direction.

3.2.3.3 HIS/RIS

The MIM will poll the HIS/RIS broker on power-up to initialize the local patient database on the MIM and asynchronously on demand from the user. If the MIM does not automatically start receiving modality worklist changes from the HIS/RIS broker, the MIM will poll the HIS/RIS broker in 2-minute cycles when the user is in the “Study Info” or “Patient List” keypad screens.

3.2.4 Association Acceptance Policy

None.

3.3 Basic Print Management Meta SOP Class

The Meta SOP Class is defined by the following set of supported SOP Classes:

SOP Class	UID Value
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1
Printer SOP Class	1.2.840.10008.5.1.1.16

3.3.1 Basic Film Session SOP Class

3.3.2 DIMSE Service N-CREATE

Attribute	SCU Usage	Tag	Possible Values
Number of Copies	U	(2000,0010)	1 –> 99
Print Priority	U	(2000,0020)	HIGH, MED, LOW
Medium Type	U	(2000,0030)	PAPER, CLEAR FILM, BLUE FILM, NONE

Attribute	SCU Usage	Tag	Possible Values
Film Destination	U	(2000,0040)	MAGAZINE, PROCESSOR, BIN_n (where n=1 to 9)
Film Session Label	U	(2000,0050)	Up to 64 characters may be provided
Memory Allocation	U	(2000,0060)	Not used

3.3.2.1 DIMSE Service N-ACTION

The MIM uses the N-ACTION to instruct the SCP to print all films in the session. The MIM is configurable (when the destination is installed) to issue the N-ACTION at the Film Session for destinations known to support this optional service. If the destination is not known to support collation, the MIM will only issue the N-ACTION on the Film Box. For Print SCPs that conform to the N-ACTION specification in Part 4 section H.4.1.2.4 of the DICOM standard, the MIM expects that all film boxes will be collated when printed.

3.3.2.2 DIMSE Service N-SET

All attributes supported in the N-CREATE are used with this command.

3.3.2.3 DIMSE Service N-DELETE

Once a Film Session is deleted, another will not be created on the same association. The association will be released.

3.3.3 Basic Film Box SOP Class

3.3.3.1 DIMSE Service N-CREATE

Attribute	SCU Usage	Tag	Possible Values
Image Display Format	M	(2010,0010)	STANDARD\C,R For LANDSCAPE Film Orientation, (C,R) may = (1,1) (2,1) (2,2) (3,2) (4,2) (3,3) (4,3) (5,3) (4,4) (5,4) (6,4) (6,5) (7,5) For PORTRAIT Film Orientation, (C,R) may = (1,1) (1,2) (2,2) (2,3) (2,4) (3,3) (3,4) (3,5) (4,4) (4,5) (4,6) (5,6) (5,7) SLIDE (35 mm) ROW\r1,r2,r3…where r1, r2, r3…is the number of images in each row. For PORTRAIT Film Orientation the rows are limited to 7 and the number of images in each row is limited to 5. For LANDSCAPE Film Orientation the rows are limited to 5 and the number of images in each row is limited to 7. CUSTOM\I I = 101, 102 See Annex B for description
Referenced Film Session Sequence	M	(2010,0500)	
>Referenced SOP Class UID	M	(0008,1150)	
>Referenced SOP Instance UID	M	(0008,1155)	
Referenced Basic Image Box Sequence	–	(2010,0510)	Not used.
Referenced Basic Annotation Box Sequence	–	(2010,0520)	Not used.
Film Orientation	U	(2010,0040)	PORTRAIT, LANDSCAPE
Film Size ID	U	(2010,0050)	4INX6IN 8INX10IN 85INX11IN (Non standard for legacy support) 10INX12IN 11INX11IN 11INX14IN 14INX14IN 14INX17IN A4

Attribute	SCU Usage	Tag	Possible Values
Magnification Type	U	(2010,0060)	REPLICATE, BILINEAR, CUBIC, NONE Will be constant for the entire Film Box.
Max Density	U	(2010,0130)	0-399
Configuration Information	U	(2010,0150)	Curve Shape (CS): 000 to 999 Contrast Values (CN): -1 to -5 Lower contrast 0 Normal +1 to +5 Higher contrast Pivot Density (PD): 0 to 2.4 in increments of 0.2 Perception LUT Selection (LUT): LUT=m, n (m=string, n = 1 to 15) Text Macros (TM): %PRNTDAT%, %TIM%,%FOF%, %$TIME$%,%ACTU%,%SES% Perception LUT cannot be used with Curve Shape, Contrast or Pivot Density. See Annex A for description
Referenced Presentation LUT Sequence	U	(2050,0500)	
>SOP Class UID	U	(0008,1150)	
>SOP Instance UID	U	(0008,1155)	
Annotation Display Format ID	U	(2010,0030)	NONE, LABEL, 6 NONE – No annotation LABEL – Annotation at bottom of film. 6 – Six annotation positions on two lines, centered at bottom of film.
Smoothing Type	U	(2010,0080)	NORMAL (minimum cubic convolution error) ENHANCED, ENHANCED1 (Valid only for Magnification Type CUBIC) 0-15 (Valid only for Magnification Type CUBIC)
Border Density	U	(2010,0100)	BLACK, WHITE, i, where i may = 1-399
Empty Image Density	U	(2010,0110)	Not used
Min Density	U	(2010,0120)	0-399 (Value must be less than Max Density (2010,0130))

Attribute	SCU Usage	Tag	Possible Values
Illumination	MC	(2010,015E)	Positive integer in units of cd/m^2
Reflective Ambient Light	MC	(2010,0160)	Positive integer in units of cd/m^2
Trim	U	(2010,0140)	YES, NO

3.3.3.2 DIMSE Service N-ACTION

The MIM uses the N-ACTION to instruct the SCP to print the current film in the session.

3.3.3.3 DIMSE Service N-SET

This service is not used.

3.3.3.4 DIMSE Service N-DELETE

This service is not used.

3.3.4 Basic Grayscale Image Box SOP Class

3.3.4.1 DIMSE Service N-SET

Attribute & Usage	SCU Usage	Tag	Supported Values
Image Position	M	(2020,0010)	All values within the range of Image Display Format
Preformatted Grayscale Image Sequence	M	(2020,0110)	
>Samples Per Pixel	M	(0028,0002)	1
>Photometric Interpretation	M	(0028,0004)	MONOCHROME2, MONOCHROME1
>Rows	M	(0028,0010)	Minimum Value 64 Maximum Values: Known for all *Kodak* printers, configurable for others. The aspect ratio is used with the printer's page extents, display format, etc., to calculate this value.

Attribute & Usage	SCU Usage	Tag	Supported Values
>Columns	M	(0028,0011)	Minimum Value 64 Maximum Values: Known for all *Kodak* printers, configurable for others. The aspect ratio is used with the printer's page extents, display format, etc., to calculate this value.
>Pixel Aspect Ratio	MC	(0028,0034)	R\C R, C = 1 to 9999 (Integer) **Note**: This attribute is always included, even if it is 1\1. It's value will always be 1\1 if Magnification Type is NONE.
>Bits Allocated	M	(0028,0100)	8, 16
>Bits Stored	M	(0028,0101)	8, 10, 12
>High Bit	M	(0028,0102)	Bits Stored -1
>Pixel Representation	M	(0028,0103)	0000H (unsigned integer)
>Pixel Data	M	(7FE0,0010)	All values consistent with Bits Stored
Polarity	U	(2020,0020)	NORMAL, REVERSE
Magnification Type	U	(2010,0060)	REPLICATE, BILINEAR, CUBIC, NONE **Note:** Is always the same as the Magnification Type specified for the Film Box.
Smoothing Type	U	(2010,0080)	NORMAL, ENHANCED, ENHANCED1 0-15 (Valid only for Magnification Type CUBIC) **Note:** Is always the same as the Smoothing Type specified for the Film Box.
Configuration Information	U	(2010,0150)	Setting these values is expected to override the film box settings for this image position. Curve Shape (CS): 000 to 999 Perception LUT Selection (LUT): LUT=m, n (m=string, n = 1 to 15) Curve Shape and Perception LUT are mutually exclusive. See Annex A for description
Requested Image Size	U	(2020,0030)	Row length in fractional mm up to the size of the printable image, which is a function of Image Display Format and Film Size ID.

Attribute & Usage	SCU Usage	Tag	Supported Values
Referenced Presentation LUT Sequence	U	(2020,0030)	
>SOP Class UID	U	(0008,1150)	
>SOP Instance UID	U	(0008,1155)	
Body Part Examined	U	(0018,0015)	ABDOMEN, ANKLE, ARM, BREAST, CHEST, CLAVICLE, COCCYX, CSPINE, ELBOW, EXTREMITY, FOOT, HAND, HEAD, HEART, HIP, KNEE, LEG, LSPINE, NECK, PELVIS, SHOULDER, SKULL, SSPINE See section 4 for more information.
Modality	U	(0008,0060)	AS, BI, CD, CP, CR, CS, CT, DD, DG, DM, EC, ES, FA, FS, LP, LS, MA, MR, MS, NM, OT, PT, RF, RG, ST, TG, US, XA OT = Other See section 4 for more information.
Image Tone Adjustment	U	(2011,0170)	-9 to 9 See section 4 for more information.

3.3.5 Basic Color Image Box SOP Class

3.3.5.1 DIMSE Service N-SET

Attribute & Usage	SCU Usage	Tag	Supported Values
Image Position	M	(2020,0010)	All values within the range of Image Display Format
Basic Color Image Sequence	M	(2020,0111)	
>Samples Per Pixel	U	(0028,0002)	3
>Photometric Interpretation	U	(0028,0004)	RGB
>Planar Configuration	M	(0028,0006)	000H or 001H 000H – pixels arrive in $R_1G_1B_1R_2G_2B_2R_3G_3B_3$ order 001H – pixels arrive in $R_1R_2R_3$, $G_1G_2G_3$, $B_1B_2B_3$ order

Attribute & Usage	SCU Usage	Tag	Supported Values
>Rows	M	(0028,0010)	Minimum Value 64 Maximum Values: Known for all *Kodak* printers, configurable for others. The aspect ratio is used with the printer's page extents, display format, etc. to calculate this value.
>Columns	M	(0028,0011)	Minimum Value 64 Maximum Values: Known for all *Kodak* printers, configurable for others. The aspect ratio is used with the printer's page extents, display format, etc. to calculate this value.
>Pixel Aspect Ratio	MC	(0028,0034)	R\C R, C = 1 to 9999 (Integer)
>Bits Allocated	U	(0028,0100)	8
>Bits Stored	U	(0028,0101)	8
>High Bit	U	(0028,0102)	7
>Pixel Representation	M	(0028,0103)	0000H (unsigned integer)
>Pixel Data	M	(7FE0,0010)	All values consistent with Bits Stored
Polarity	U	(2020,0020)	NORMAL, REVERSE
Magnification Type	U	(2010,0060)	REPLICATE, BILINEAR, CUBIC, NONE
Smoothing Type	U	(2010,0080)	NORMAL ENHANCED, ENHANCED1 (Valid only for Magnification Type CUBIC) 0-15 (Valid only for Magnification Type CUBIC)
Configuration Information	U	(2010,0150)	Setting these values is expected to override the film box settings for this image position. Curve Shape (CS): 000 to 999 Perception LUT Selection (LUT): LUT=m, n (m=string, n = 1 to 15) Curve Shape and Perception LUT are mutually exclusive. See Annex A for description
Requested Image Size	U	(2020,0030)	Row length in fractional mm up to the size of the printable image, which is a function of Image Display Format and Film Size ID.

Attribute & Usage	SCU Usage	Tag	Supported Values
Color Profile	U	(2011,0160)	DEFAULT1, DEFAULT2, DEFAULT3, DEFAULT4, DEFAULT5, DEFAULT6 See section 4 for more information.

3.3.6 Printer SOP Class

3.3.6.1 DIMSE Service N-EVENT-REPORT

The MIM will process the indication of the N-EVENT-REPORT operation. Any string sent by the SCP is accepted and displayed on the MIM user interface. Some outflanking links require printer status notification so the MIM will translate some common Printer Status Info values to appropriate outflanking notifications. In this translation, all characters that are not space characters or in the ASCII range “A” - “Z” are stripped.

The MIM translates Attributes as described in the following table. Other strings are not translated but may be displayed on a MIM keypad.

Attribute	SCU Usage	Tag	Expected Values
Printer Status	U	(2110,0010)	NORMAL WARNING FAILURE

Attribute	SCU Usage	Tag	Expected Values
Printer Status Info	U	(2110,0020)	BAD RECEIVE MGZ BAD SUPPLY MGZ CALIBRATING CALIBRATION ERR CHECK CHEMISTRY CHECK INK CART CHECK PRINTER CHECK PROC CHECK PROCESSOR CHECK RIBBON CHECK R MAG CHECK SORTER CHECK SUPPLY MAG CHEMICALS EMPTY CHEMICALS LOW COVER OPEN ELEC CONFIG ERR ELEC DOWN ELEC SW ERROR EXPOSURE FAILURE FATAL FATAL ERROR FILM JAM FILM TRANSP ERR FINISHER EMPTY FINISHER ERROR FINISHER LOW INK OUT INSUFFIC MEMORY INVALID PAGE DES NO RECEIVE MGZ NO RESPONSE NO RIBBON NO SUPPLY MGZ NO STATE NO TONER NORMAL OFFLINE PRINTER BUSY PRINTER DOWN PRINTER INIT PRINTER NOT RDY PRINTER OFFLINE PRINTER STOPPED PROCESSOR DOWN PROC DOWN PROC INIT PROC NOT READY PROC NOT RDY PROC OVERFLOW FL PROC OVERFLOW HI

Attribute	SCU Usage	Tag	Expected Values
Printer Status Info (continued)			QUEUED RECEIVER FULL REQ MED NOT INST REQ MED NOT AVAI RIBBON ERROR RIBBON MISMATCH STATE UNKNOWN SUPPLY EMPTY SUPPLY LOW TIME OUT UNKNOWN UNKNOWN STATUS
Printer Name	U	(2110,0030)	Any valid string
Printer Manufacturer	U	(0008,0070)	Any valid string
Printer Manufacturer Model Name	U	(0008,1090)	Any valid string
Printer Device Serial Number	U	(0018,1000)	Any valid string
Software Version	U	(0018,1020)	Any valid string
Date of Last Calibration	U	(0018,1200)	Ignored
Time of Last Calibration	U	(0018,1201)	Ignored

3.4 Basic Annotation Box SOP Class

3.4.1 DIMSE Service N-SET

The Basic Annotation Box SOP Instance is created at the time the Basic Film Box SOP Instance is created, based on the value of the Annotation Display Format ID attribute (2010,0030) of the Basic Film Box.

Attribute & Usage	SCU Usage	Tag	Supported Values
Annotation Position	M	(2030,0010)	0 for FormatID LABEL, 1..6 for FormatID 6
Text String	M	(2030,0020)	Up to 64 characters

3.5 Presentation LUT SOP Class

3.5.1 DIMSE Service N-CREATE

The Presentation LUT SOP Instance is created by the SCU prior to the creation of the Basic Film Box SOP Instance. Multiple Presentation LUT instances are supported in an association, but only one instance will be supported for each image.

The SCU shall send either Presentation LUT Sequence or the Presentation LUT Shape. These values are mutually exclusive. The presence of the Presentation LUT instance overrides any data set in the Configuration Information attribute (2010,0150) of the Film Box or Image Box.

The Presentation LUT values are calculated using the Perception LUT (TFT) values and Contrast values or the Curve Shape and Contrast values set at the MIM keypad or autofilming links.

Attribute & Usage	SCU Usage	Tag	Supported Values
Presentation LUT Sequence	MC	(2050,0010)	
>LUT Descriptor	MC	(0028,3002)	The first value is the number of entries in the lookup table. The number of entries shall be equal to the number of possible values in the input. (For 8 bit input it will be 256 entries, for 12 bit input it will be 4096 entries) . The second value is the first input value mapped, and shall always be 0. The third value specifies the number of bits for each entry in the LUT Data. It shall be between 10 and 16 inclusive.
>LUT Explanation	U	(0028,3003)	
>LUT Data	MC	(0028,3006)	The LUT Data shall be stored in a format equivalent to 16 bits allocated where the high bit is equal to bits stored - 1, where bits stored is the third value of the LUT Descriptor.
Presentation LUT Shape	MC	(2050,0020)	Enumerated values IDENTITY and LIN OD.

3.6 Store Service Class

Secondary Capture Images are sent to the SC Storage SCP.

3.6.1 Secondary Capture IOD

The IOD sent from the MIM minimally contains the following attributes:

Attribute Name	Tag	DICOM Type	MIM Type
Patient			
Patient Name	(0010,0010)	2	2
Patient ID	(0010,0020)	2	2
Patient Birth Date	(0010,0030)	2	2
Patient Birth Time	(0010,0032)	3	2
Patient Sex	(0010,0040)	2	2
General Study			
Study Instance UID*	(0020,000D)	1	1
Study ID**	(0020,0010)	2	2
Referring Physician	(0008,0090)	2	2
Accession Number	(0008,0050)	2	2
Study Description***	(0008,1030)	3	3
Study Date	(0008,0020)	2	1
Study Time	(0008,0030)	2	1
Requested Procedure Code Sequence	(0032,1064)	3	3
General Series			
Modality	(0008,0060)	1	1
Series Number	(0020,0011)	1	1
Series Instance UID	(0020,000E)	1	1

Attribute Name	Tag	DICOM Type	MIM Type
Series Description	(0008,103E)	3	3
Body Part Examined	(0018,0015)	3	3
Protocol Name	(0018,1030)	3	3
General Equipment			
Manufacturer	(0008,0070)	2	2
Institution Name	(0008,0080)	3	3
Station Name	(0008,1010)	3	3
Manufacturer Model Name	(0008,1090)	3	3
SC Equipment			
Conversion Type	(0008,0064)	1	1
General Image			
Image Number	(0020,0013)	1	1
Image SOP Class UID	(0008,1150)	1	1
Image Instance UID	(0008,1155)	1	1
SC Image			
Conversion Type	(0008,0064)	1	1
Image Pixel			
Samples per Pixel	(0028,0002	1	1
Photometric Interpretation	(0028,0004)	1	1
Rows	(0028,0010)	1	1
Columns	(0028,0011)	1	1
Bits Allocated	(0028,0100)	1	1
Bits Stored	(0028,0101)	1	1
High Bit	(0028,0102)	1	1

Attribute Name	Tag	DICOM Type	MIM Type
Pixel Representation	(0028,0103)	1	1
Pixel Data	(7FE0,0010)	1	1
Planar Configuration	(0028,0006)	1C	1C
Pixel Aspect Ratio	(0028,0034)	1C	1C
SOP Common			
SOP Class UID	(0008,0016)	1	1
SOP Instance UID	(0008,0018)	1	1

Notes

*The Study Instance UID is normally provided by the HIS/RIS Broker. In the case where the Broker is not present, a unique UID will automatically be generated.

**The StudyID will contain either the Scheduled Procedure Step Description or the Requested Procedure Description or the Patient Name in that order of availability from HIS/RIS server.

***The Qualified Service Provider can configure the system to replace the contents of the Study Description tag (0008, 1030) with information from the Requested Procedure Description tag (0032, 1060).

3.7 Basic Study Content Notification SOP Class

Basic Study Content Notification is used to notify the Store SCP that all images in a study have been sent.

3.7.1 Basic Study Descriptor IOD

The IOD sent from the MIM minimally contains the following attributes:

Attribute Name	Tag	DICOM Type	MIM Type
Patient Summary			
Patient Name	(0010,0010)	2	2
Patient ID	(0010,0020)	2	2
Study Content			
Study ID	(0020,0010)	2	2

Attribute Name	Tag	DICOM Type	MIM Type
Study Instance UID	(0020,000D)	1	1
Referenced Series Sequence	(0008,1115)	1	1
>Series Instance UID	(0020,000E)	1	1
>Retrieve AE Title	(0008,0054)	2C	2C
>Referenced Image Sequence	(0008,1140)	1	1
>>Referenced SOP Class UID	(0008,1150)	2	2
>>Referenced SOP Instance UID	(0008,1150)	2	2
SOP Common			
SOP Class UID	(0008,0016)	1	1
SOP Instance UID	(0008,0018)	1	1
Specific Character Set	(0008,0005)	1C	1C

3.8 Basic Worklist Service

The C-FIND request for a Modality Worklist sends an Identifier object that contains all the attributes of the Modality Worklist Information Model. The Matching Key attributes that may optionally contain a non-NULL value in the request are:

Attribute	Tag
Accession Number	(0008, 0050)
Patient's Name	(0010, 0010)
Patient's ID	(0010, 0020)
Scheduled Station Name	(0040, 0010)
Scheduled Procedure Step Start Date	(0040, 0002)
Scheduled Procedure Step Start Time	(0040, 0003)

This is intended to produce a series of responses from the Worklist SCP for all matching Scheduled Procedures on the said Station.

3.8.1 Modality Worklist IOD

For additional information on the Modality Worklist Information Model, refer to the DICOM specification, Part 4, Table K.6-1. The MIM will only accept the ISO registration number ISO-IR 6 or ISO-IR 100 character sets for the Specific Character Set attribute (0008, 0005).

Attributes For The Modality Worklist Information Model

Attribute	Tag
Accession Number	(0008,0050)
Modality	(0008,0060)
Referring Physician's Name	(0008,0090)
Patient's Name	(0010,0010)
Patient's ID	(0010,0020)
Patient's Birth Date	(0010,0030)
Patient's Sex	(0010,0040)
Study Instance UID	(0020, 000D)
Requested Procedure Description	(0032,1060)
Requested Procedure Code Sequence	(0032,1064)
Schedule Procedure Step Sequence	(0040,0100)

3.8.2 DIMSE Service N-GET

Once configured to retrieve Study Description from a HIS/RIS Server, a Study N-GET is initiated to obtain the Referenced Study Component sequence using the Study Instance UID attribute returned from the Modality Worklist C-FIND. A Study Component N-GET is initiated to obtain the actual Study Component information using the Referenced Study Component sequence returned from the Study N-GET. The Study Description tag (0008,1030) is extracted and used with DICOM Store Service Class.

3.8.2.1 Study Management

A Study N-GET is initiated to obtain the Referenced Study Component sequence using the Study Instance UID attribute returned from the Modality Worklist C-FIND.

Attributes from Study Management N-GET:

Attribute	Tag
Referenced Study Component Sequence	(0008, 1111)

3.8.2.2 Study Component Management

A Study Component N-GET is initiated to obtain the actual Study Component information using the Referenced Study Component sequence returned from the Study N-GET. The Study Description tag (0008,1030) is extracted and used with DICOM Store Service Class.

Attributes from Study Management N-GET:

Attribute	Tag
Study Descriptions	(0008, 1030)

4 Communication Profiles

4.1 Supported Communications Stacks

The MIM provides TCP/IP Network Communication Support as defined in Part 8 of the DICOM standard.

The MIM normally issues a network ping prior to delivering a job to a qualified DICOM Print or DICOM Store destination to ensure that the device is active. The MIM does not issue a network ping to destinations for which this capability has not been previously verified by the Kodak DICOM Verification and Validation group.

If a destination does not support a network ping, or if the customer has disabled this service on the network, the MIM configuration must be changed for each destination as appropriate to disable the issuing of the network ping.

4.2 Physical Media

The MIM supports Ethernet with the following physical connectors:

Standard Twisted pair (10BaseT and 100BaseT)

5 Extensions/Specializations/Privatizations

The following extensions to DICOM SOP classes are supported by the MIM. The extensions are all optional attributes.

5.1 Extensions on Basic Grayscale Image Box SOP

Three new attributes have been added to the standard SOP class:

- Body Part Examined (0018, 0015) may be used to specify the body part corresponding to the image being transmitted.
- Modality (0008,0060) may be sent to specify the modality type corresponding to the image being transmitted.
- A new private element of Image Tone Adjustment (2011, 0170) may also be used to specify tone scaling for the image.

5.2 Extension on the definition of Modality (0008,0060)

The defined terms for Modality (0008,0060) have been extended to include KCR (*Kodak DirectView* CR Systems), FCR (*Fuji* Computed Radiography Systems), DN (Dental), and FD (*Kodak* LS Digitizers).

6 Configuration

The following attributes are configurable by a qualified service provider:

- IP address
- Subnet Mask
- Local Network Host Name (MIM AE Title)
- Router Address (Gateway)
- SCP DICOM Called Application Entity Title
- SCP port number
- SCP DICOM Service(s) available
- SCP Film Sizes available
- Other destination properties as indicated in this document.

7 Support of Extended Character Sets

The MIM supports the ISO-IR 100 Latin 1 character set as well as the ISO-IR 6 default character set.

8 Error Handling

The MIM has limited recovery from communication errors. Some specific warnings will be logged locally and communication will continue. All other DICOM status codes (warning or error) will result in an aborted session (A-ABORT sent).

Codes that will NOT cause A-ABORT:

0x0000 SUCCESS

0xb602 Film session does not contain Image

0xb603 Film Box does not contain Image

0x0210 Duplicate Invocation

0x0107 Attribute List Error. Interpreted as Value out of range, default used

0x0116 Attribute value is out of range, default used.

Annex A: Configuration Information

The Configuration Information attribute contains the list of Kodak-specific values. These attributes are not DICOM standard attributes.

The Configuration Information value is an ordered list. The attribute is specified using the ASCII two character key prefix in the following sequence:

1. Curve Shape, Contrast, Pivot Density, or Perception LUT
2. Text Macros.

The Film Box Curve Shape value applies to all images in the Film Box except when Curve Shape or Perception LUT is specified for the image in the Image Box.

ATTRIBUTE	USAGE	DESCRIPTION	DEFAULT
Curve Shape designated by the ASCII two character prefix: CS	U/M	000 to 999 **Note:** 000 = linear, 999 = highest curvature Curve Shape is a tone scale adjustment used to optimize the image on film compared to the image on the operator console monitor. Curve shape is not valid when a Perception LUT is specified.	Film Box: Value set in the Printer by the user Image Box: Basic Film Box Curve Shape
Contrast designated by the ASCII two character prefix: CN	U/M	-5 to 5 **Note:** Integer values only. Negative Contrast settings are lower contrast where the amount of data that is represented by medium film densities is increased. Positive settings are higher contrast where the amount of data that is represented by high and low densities is increased.	Value set in the Printer by the user
Pivot Density designated by the ASCII two character prefix: PD	U/M	0.0 to 2.4 **Note:** Value must be specified in increments of 0.2. Densities above and below the pivot density will be adjusted up and down by an amount that is a function of the difference between the code value and the pivot density code value.	Value set in the Printer by the user
Perception LUT Selection designated by the ASCII three-character prefix: LUT	U/M	LUT=m, n Allows selection of the LUT that best suits the user's images. M is the name of the TFT set and N specifies a contrast setting within the group. Curve shape will be ignored if the LUT parameter is used. m=string (0=default group) n=0 to 15 (0=use default value)	m=0, n=0

ATTRIBUTE	USAGE	DESCRIPTION	DEFAULT
Text Macros designated by the ASCII two-character key prefix: TM	M/M	%PRNTDAT% Date of Printing DD-MMM-YY %TIM% Date of Printing HH: (HH=0-23) %FOF% Film of Film Count NN/MM %$TIME$% Time of Printing HH:MM:SS %SES% Film Session Label AAAAAA (1-64 chars from the Film Session SOP Class) **Note:** The text macros will be printed on the bottom of the film and will be truncated if necessary. These are only used when Annotation Box SOP is not supported by Print SCP.	None

Examples

“CS333”
The curve shape is set to 1/3 of the printer’s tone scale range and defaults are applied to contrast and pivot density.

”CS500\CN3\PD2.2”
The curve shape is set to 1/2 the printer’s tone scale range, Contrast is set to 3, and pivot density is set to 2.2.

”PD2.0”
The pivot density is set to 2.0., and defaults are applied to curve shape and contrast.

”CS333\CN3\PD2.2\TM%PRNTDAT%%TIM%%FOF%”
The curve shape is set to 1/3 of the range, Contrast is set to 3, and pivot density is set to 2.2.
The following text macros will be printed on the bottom of the page:
Date of Printing, Time of Printing, and Film of Film count.

“LUT=Ver693c0.w87,3”
The Perception LUT TFT set is “Ver693c0.w87” and the Contrast Setting is 3.

“LUT=0,3\ TM%PRNTDAT%%TIM%%FOF%”
The Perception LUT TFT set is 0 (default) and the Contrast Setting is 3.
The following text macros will be printed on the bottom of the page:
Date of Printing, Time of Printing, and Film of Film count.

“TM%PRNTDAT%%TIM%%FOF%”
The following text macros will be printed at the bottom of the page:
Date of Printing, Time of Printing, and Film of Film count.

”PD2.0\CN4\CS333”
This is **invalid** because the attributes are out of order, curve shape must precede pivot density and contrast, and contrast must precede pivot density. It should be “CS333\CN4\PD2.0”.

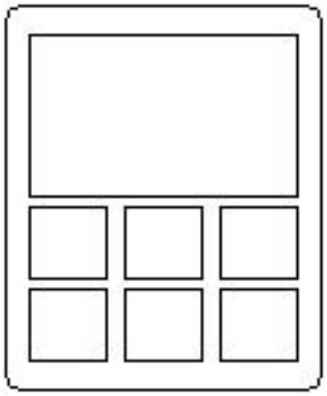
”CS333\PD1.2\LUT=0,3”
This is **invalid** because Curve Shape and Pivot Density cannot be mixed with Perception LUT. In this case, the Perception LUT setting will be used.

Annex B: Custom Formats

The following formats are expected to be supported by printers manufactured by Kodak and will only be specified to these printers.

Format ID 101

This format consists of 7 image positions, 1 large image in the upper section of the page and 6 smaller images in the lower section of the page. The size and positioning of the images are defined in terms of the standard formats 2 and 12.
Upper Section: 1 frame of a 2-up format.
Lower Section: 6 frames of a 12-up format.



Format ID 102

This format consists of 11 image positions, 2 large images in the upper section of the page and 9 smaller images in the lower section of the page. The size and positioning of the images are defined in terms of the standard formats 6 and 15.
Upper Section: 2 frames occupying top 1/3 of media.
Lower Section: 9 frames occupying bottom 2/3 of media.