Kodak DirectView DR Systems

DICOM Conformance Statement

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Revision C

Note: Publication of a DICOM Conformance Statement does not indicate product availability in all countries. Please contact your Kodak representative, or Kodak in your country, for information on availability of a specific product.

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Revision History

Date	Rev	MIMS/ W	Editor	Comments
09/24/2001	A	3.5.x	K. Mantooth	Initial release of document.
07/11/2002	B	5.0	Trac Tran	Update to reflect MIM5.0
09/16/2002	C	5.0	Trac Tran	Change note about Hawk Product, add note to Imager Area Dose Product, Implementation Class UID to be same as other 5.0s

0 Introduction

0.1 Executive Overview

This document covers the following *Kodak DirectView* DR Systems products:

- Kodak DirectView DR 5100 System
- Kodak DirectView DR 7100 System
- Kodak DirectView DR 5000 System Console Upgrade
- Kodak DirectView DR 9000 System Console Upgrade.

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, SCP
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	SCU
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	SCU
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	SCU

0.2 Scope and Field of Application

This document describes the DICOM functionality of the *Kodak DirectView* DR Systems. The *Kodak DirectView* DR Systems are capable of performing projection radiographic examinations and producing a digital image. Throughout the remainder of this document the term DR shall refer to the *Kodak DirectView* DR Systems.

The DR Systems act as a DICOM Service Class User (SCU). The DR Systems perform transactions over a TCP/IP network via the DICOM messages exchange protocol. The DR Systems use *Kodak* PACS Link Medical Image Manager V5.0 software as the application software to capture and distribute images and data.

0.3 Important Considerations for the Reader

This DICOM Conformance Statement by itself is not sufficient to guarantee successful connectivity between the DR Systems 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 cutlines) 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 DirectView* DR Systems 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.

0.4 Accessing this Conformance Statement on the World Wide Web

As the DR Systems product change, changes to this DICOM Conformance Statement are inevitable. To obtain the most recent revision of this DICOM Conformance Statement, access the following URL:

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

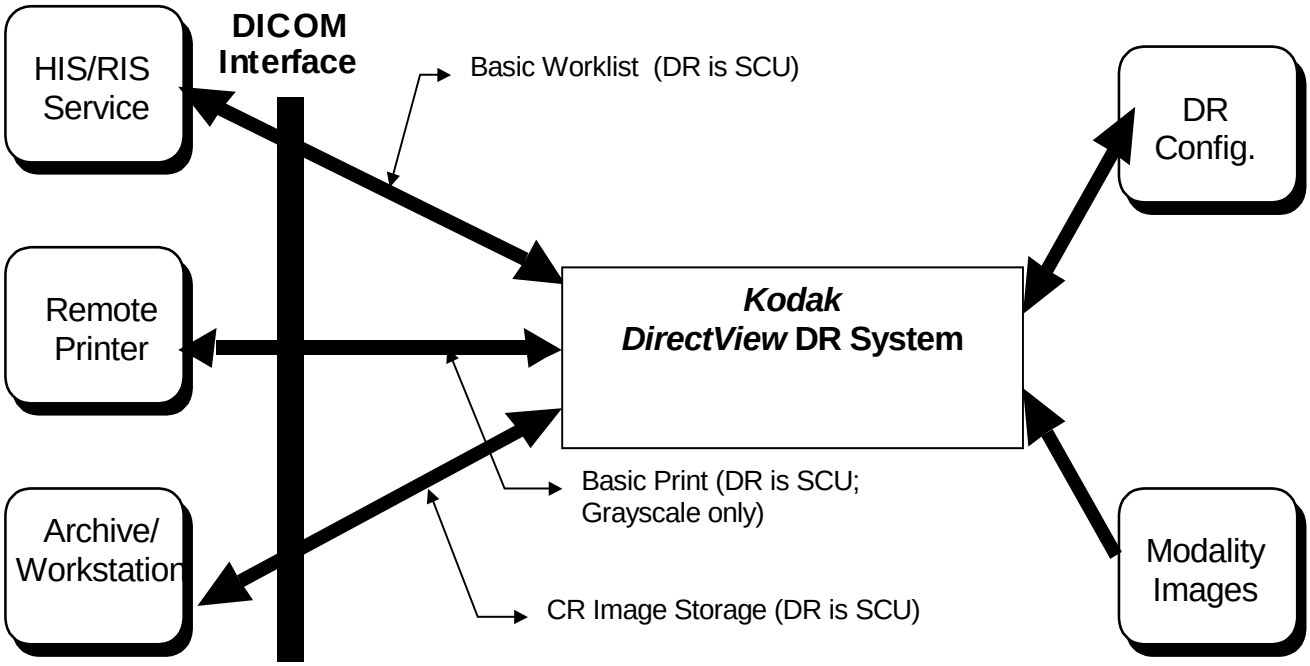
0.5 Definitions, Acronyms, Abbreviations

The following symbols and abbreviations are used in this document.

ASCII	American Standard Code for Information Interchange
AE	Application Entity
CR	Computed Radiography
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DMI	Distributed Medical Imaging
DR	Digital Radiography
DX	Digital X-Ray
ECR	Electronic Character Recognition
HIS/RIS	Hospital Information System / Radiology Information System.
ISO	International Standards Organization
LUT	Look-up Table
MIM	*Kodak* PACS Link Medical Image Manager Software
MPPS	Modality Performed Procedure Step.
PDU	Protocol Data Unit
PLUT	Presentation Look-up Table
SCU	Service Class User
SCP	Service Class Provider
SOP	Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier

1 Implementation Model

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



1.1 Functional Definitions

The DR Systems acquire radiographic images and acquires demographics via manual entry or utilizing an optional connection to an Information System. Studies are temporarily stored on disk. The images are then sent to the selected destinations.

1.2 Sequencing of Real-World Activities

If a HIS/RIS service is present, the DR Systems establish an association when the DR Systems application is started to obtain a modality worklist. The worklist is used as a source of patient demographics. The DR Systems establish an association with a selected SCP when DR Systems have collected sufficient information to begin sending images.

2 Application Entity Specifications

The DR Systems provide 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
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1

The DR Systems provide Standard Conformance to the following SOP Classes as a SCP.

SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1

2.1 Association Establishment Policies

2.1.1 General

2.1.1.1 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 DR Systems will negotiate is 64Kbytes.

2.1.1.2 HIS/RIS

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

2.1.2 Number of Associations

2.1.2.1 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 DR Systems will not create two associations to the same device, even if there are multiple jobs queued for delivery.

2.1.2.2 HIS/RIS

Only one association will be initiated at a time. The DR Systems will close the association after receiving a C-FIND response.

2.1.3 Asynchronous Nature

The DR Systems allow up to 1 invoked and 1 performed operation on an Association (it is synchronous).

2.1.4 Implementation Identifying Information

The DR Systems provide the Implementation Class UID of "1.2.840.113564.3.1.5".

The implementation version name attribute is optional and is not used by the DR Systems.

The DR Systems establish an Association using its network node name for the calling DICOM Application Entity title. The network node name is configurable through the DR Systems Service Application.

The DR Systems store a called DICOM Application Entity Title and socket number for each DICOM compatible network destination it knows about.

2.2 Association Initiation Policy

2.2.1 Associated Real-World Activity

2.2.1.1 Delivery

The DR Systems initiate 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.

2.2.1.2 HIS/RIS

The DR Systems initiate Associations for the purpose of obtaining the current Modality Worklist IOD.

2.2.2 Presentation Context Table

The DR Systems propose the Presentation Contexts shown below.

Presentation Context Table

Abstract Syntax		Transfer Syntax			Ext.
Name	**UID**	**Name List**	**UID**	**Role**	**Negot**
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
Modality Worklist	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.3 SOP Specific Conformance

2.2.3.1 Verification

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

2.2.3.2 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.

2.2.3.3 HIS/RIS

The DR Systems will poll the HIS/RIS broker at a user configurable periodic rate. The default rate is once every 2 minutes.

2.3 Association Acceptance Policy

2.3.1 Associated Real-World Activity

2.3.2 Presentation Context Table

The DR Systems propose the Presentation Contexts shown below.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			**Ext.**
Name	**UID**	**Name List**	**UID**	**Role**	**Negot**
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

2.3.3 SOP Specific Conformance

2.3.3.1 Verification

The DR Systems provide standard conformance to the DICOM Verification Service Class. Upon receipt from an SCU of a verification of communication request, the DR Systems will issue confirmation.

2.4 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
Printer SOP Class	1.2.840.10008.5.1.1.16

2.4.1 Basic Film Session SOP Class

2.4.1.1 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
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

2.4.1.2 DIMSE Service N-Action

The DR Systems use the N-ACTION to instruct the SCP to print all films in the session. The DR Systems are 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 DR Systems 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 DR Systems expect that all film boxes will be collated when printed.

2.4.1.3 DIMSE Service N-SET

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

2.4.1.4 DIMSE Service N-DELETE

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

2.4.2 Basic Film Box SOP Class

2.4.2.1 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) For PORTRAIT Film Orientation, (C,R) may = (1,1)
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)	8INX10IN 11INX14IN 14INX14IN 14INX17IN
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)	*Kodak* Curve Shape (CS): 000 to 999 *Kodak* Contrast Values (CN): -1 to -5 Lower contrast 0 Normal +1 to +5 Higher contrast *Kodak* Pivot Density (PD): 0 to 2.4 in increments of 0.2 Perception LUT Selection (LUT): LUT = m, n (m=string, n = 0 to 15) *Kodak* Text Macros (TM): %PRNTDAT%, %TIM%, %FOF%, %$TIME$%, %SES% Perception LUT cannot be used with Curve Shape, Contrast or Pivot Density. See Annex A for description
Annotation Display Format ID	U	(2010,0030)	Not used
Smoothing Type	U	(2010,0080)	NORMAL (minimum cubic convolution error) ENHANCED ENHANCED1 Valid only for Magnification Type CUBIC. 0-15
Border Density	U	(2010,0100)	BLACK
Empty Image Density	U	(2010,0110)	Not used
Min Density	U	(2010,0120)	0-399 (Value must be less than Max Density (2010,0130))
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 and NO

2.4.2.2 DIMSE Service N-ACTION

The DR Systems use the N-ACTION to instruct the SCP to print the current film in the session.

2.4.2.3 DIMSE Service N-SET

This service is not used.

2.4.2.4 DIMSE Service N-DELETE

This service is not used.

2.4.3 Basic Image Box SOP Class

2.4.3.1 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)	MONOCHROME1, MONOCHROME2
>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) **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		16
>Bits Stored	M	(0028,0101)	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 Valid only for Magnification Type CUBIC. 0-15 Must be the same as the Smoothing Type specified for the Film Box.

Configuration Information	U	(2010,0150)	Setting these values will override film box settings for this image position. *Kodak* Curve Shape (CS): 000 to 999 Perception LUT Selection (LUT): LUT = m, n (m=string, n = 0 to 15) Curve Shape and Perception LUT are mutually exclusive. See Annex A for description
Requested Image Size	U	(2020,0030)	Row length in mm up to the size of the printable image, which is a function of Image Display Format and Film Size ID.

2.4.4 Printer SOP Class

2.4.4.1 DIMSE Service N-EVENT-REPORT

The DR Systems will process the indication of the N-EVENT-REPORT operation. Any string sent by the SCP is accepted and displayed on the DR Systems user interface. In this translation, all characters that are not space characters or in the ASCII range “A” - “Z” are stripped.

The DR Systems translate Attributes as described in the following table. Other strings are not translated but may be displayed on a DR Systems user interface.

Attribute	SCU Usage	Tag	Expected Values
Printer Status	U	(2110,0010)	NORMAL WARNING FAILURE
Printer Status Info	U	(2110,0020)	for NORMAL conditions: “NORMAL” for WARNING conditions: “RECEIVER FULL”, “FILM JAM”, “PRINTER NOT RDY”, “PROCESSOR DOWN”, “CHECK PROCESSOR”, “PROC NOT READY”, “NO RECEIVE MGZ”, “NO SUPPLY MGZ”, “NO TONER”, “NO STATE”, “CHECK RIBBON”, “PRINTER BUSY”, “OFFLINE”, “PRINTER STOPPED”, “CHECK SUPPLY MAG”, “COVER OPEN”, “PRINTER OFFLINE”, “EXPOSURE FAILURE”, “CHECK R MAG”, “PROC NOT RDY”, “STATE UNKNOWN”, "CHECK INK CART", "INK OUT", "QUEUED", "SUPPLY EMPTY", "SUPPLY LOW", "BAD RECEIVE MGZ", "BAD SUPPLY MGZ", "FILM TRANSP ERR", "CHECK CHEMISTRY", "CHECK SORTER", "CHEMICALS LOW", "CHEMICALS EMPTY",

Printer Status Info (continued from previous page)			"FINISHER EMPTY", "FINISHER ERROR", "FINISHER LOW", "CHECK PROC", “PRINTER BUSY”, "PROC DOWN", "PROC INIT", "PROC OVERFLOW FL", "PROC OVERFLOW HI", "PRINTER DOWN", "PRINTER INIT", "CALIBRATING", "CALIBRATION ERR", "ELEC CONFIG ERR", "ELEC DOWN", "ELEC SW ERROR", "EXPOSURE FAILURE", "REQ MED NOT INST", "REQ MED NOT AVAI", "RIBBON ERROR", "NO RIBBON", "UNKNOWN" for FAILURE conditions: "FATAL”, "INVALID PAGE DES", "INSUFFIC MEMORY", “FATAL ERROR”, “CHECK PRINTER”, “PRINTER DOWN”, “NO RESPONSE”, “RIBBON MISMATCH”, “TIME OUT”, “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

2.5 Basic Annotation Box SOP Class

2.5.1 DIMSE Service N-SET

The Basic Annotation Box SOP Instance is created at the time of 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.

A single box is sent with text at position 0.

Attribute & Usage	SCU Usage	Tag	Supported Values
Annotation Position	M	(2030,0010)	0
Text String	M	(2030,0020)	Up to 64 characters

2.6 Store Service Class

Computed Radiography Images are sent to the CR Storage SCP.

2.6.1 Computed Radiography IOD

The IOD sent from the DR Systems minimally contains the following attributes:

Attribute Name	Tag	DICOM Type	DR Type
Patient Module			
Patient Name	(0010,0010)	2	2
Patient ID	(0010,0020)	2	2
Patient Birth Date	(0010,0030)	2	2
Patient Sex	(0010,0040)	2	2
Patient Birth Time	(0010,0032)	3	3
Other Patient IDs	(0010,1000)	3	3
Other Patient Names	(0010,1001)	3	3
Ethnic Group	(0010,2160)	3	3
Patient Comments	(0010,4000)	3	3
General Study			
Study Instance UID	(0020,000D)	1	1
Study Date	(0008,0020)	2	2
Study Time	(0008,0030)	2	2
Referring Physician Name	(0008,0090)	2	2
Study ID	(0020,0010)	2	2
Accession Number	(0008,0050)	2	2
Study Description	(0008,1030)	3	3
Patient Study			
Admitting Diagnoses Description	(0008,1080)	3	3
Patient's Age	(0010,1010)	3	3
Patient's Size	(0010,1020)	3	3
Patient's Weight	(0010,1030)	3	3
Occupation	(0010,2180)	3	3
Additional Patient's History	(0010,21B0)	3	3

General Series			
Modality	(0008,0060)	1	1
Series Instance UID	(0020,000E)	1	1
Series Number	(0020,0011)	2	2
Laterality	(0020,0060)	2C	2C
Series Date	(0008,0021)	3	3
Series Time	(0008,0031)	3	3
Series Description	(0008,103E)	3	3
Operator Name	(0008,1070)	3	3
Patient Position	(0018,5100)	2C	2C
CR Series			
Body Part Examined	(0018,0015)	2	2
View Position	(0018,5101)	2	2
General Equipment			
Manufacturer	(0008,0070)	2	2
Institution Name	(0008,0080)	3	3
Institution Address	(0008,0081)	3	3
Station Name	(0008,1010)	3	3
Institutional Department Name	(0008,1040)	3	3
Manufacturer Model Name	(0008,1090)	3	3
Device Serial Number	(0018,1000)	3	3
Software Versions	(0018,1020)	3	3
General Image			
Image Number	(0020,0013)	2	2
Patient Orientation	(0020,0020)	2C	2
Image Type	(0008,0008)	3	3
Image Date	(0008,0023)	2C	2C
Image Time	(0008,0033)	2C	2C

Acquisition Date	(0008,0022)	3	3
Acquisition Time	(0008,0032)	3	3
Derivation Description	(0008,2111)	3	3
Acquisition Number	(0020, 0012)	3	3
Images In Acquisition	(0020,1002)	3	3
Image Comments	(0020,4000)	3	3
Image Plane *			
Pixel Spacing *	(0028,0030)	3	3
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
Pixel Representation	(0028,0103)	1	1
Smallest Image Pixel Value	(0028,0106)	1	1
Largest Image Pixel Value	(0028,0107)	1	1
Pixel Data	(7FE0,0010)	1	1
CR Image			
KVP	(0018,0060)	3	3
Plate ID	(0018,1004)	3	3
Distance Source to Patient	(0018,1111)	3	3
Exposure	(0018,1152)	3	3
Imager Area Dose Product *	(0018,115E)	3	3
Imager Pixel Spacing	(0018,1164)	3	3
Cassette Orientation	(0018,1402)	3	3
Cassette Size	(0018,1403)	3	3
Relative X-Ray Exposure	(0018,1405)	3	3
Contrast/Bolus			
Contrast/Bolus Agent	(0018,0010)	2	2
Modality LUT			

Modality LUT Sequence	(0028,3000)	3	3
>LUT Descriptor	(0028,3002)	1C	1C
>Modality LUT Type	(0028,3004)	1C	1C
>LUT Data	(0028,3006)	1C	1C
VOI LUT			
Window Center	(0028,1050)	3	3
Window Width	(0028,1051)	1C	1C
SOP Common			
SOP Class UID	(0008,0016)	1	1
SOP Instance UID	(0008,0018)	1	1
Specific Character Set	(0008,0005)	1C	1C

* Please see note on Section 4: Extensions/Specializations/Privatizations.

2.7 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:

(0040,0001) Scheduled Station AE Title
(0040,0002) Scheduled Procedure Step Start Date
(0040,0003) Scheduled Procedure Step Start Time

(0040,0010) Scheduled Station Name
(0008,0050) Accession Number
(0010,0010) Patient's Name
(0010,0020) Patient ID
(0008,0060) Modality

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

2.7.1 Modality Worklist IOD

For additional information on the Modality Worklist Information Model, refer to the DICOM specification, Part 4, Table K.6-1. The DR Systems 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 Physicians Name	(0008,0090)
Patients Name	(0010,0010)
Patient ID	(0010,0020)
Patients Birth Date	(0010,0030)
Patients Birth Time	(0010,0032)
Patients Sex	(0010,0040)
Other Patient Ids	(0010,1000)
Other Patient Names	(0010,1001)
Patients Age	(0010,1010)
Patients Size	(0010,1020)
Patients Weight	(0010,1030)
Ethnic Group	(0010,2160)
Occupation	(0010,2180)
Study Instance UID	(0020,000D)
Requesting Service	(0032,1033)
Requested Procedure Description	(0032,1060)
Requested Procedure Code Sequence	(0032,1064)
> Code Value	(0008,0100)
Requested Contrast Agent	(0032,1070)
Visit Status ID	(0038,0008)
Patients Institution Residence	(0038,0400)
Scheduled Station AE Title	(0040,0001)
Scheduled Procedure Step Start Date	(0040,0002)
Scheduled Procedure Step Start Time	(0040,0003)
Scheduled Station Name	(0040,0010)
Requested Procedure ID	(0040,1001)
Requested Procedure Priority	(0040,1003)
Requested Procedure Location	(0040,1005)

3 Communication Profiles

3.1 Supported Communications Stacks

The DR Systems provide TCP/IP Network Communication Support as defined in Part 8 of the DICOM standard.

3.2 Physical Media

The DR Systems support Ethernet with the following physical connectors:

- Unshielded Twisted pair (10BaseT and 100BaseT).

4 Extensions/Specializations/Privatizations

The following extensions to DICOM Store Service Class are supported by DR Systems. The extensions are all optional attributes.

Computed Radiography IOD:

The Pixel Spacing (0028,0030) attribute is added to the Image Plane Module. This is done to support workstations which incorrectly use this field rather than Imager Pixel Spacing (0018,1164), as defined in the DICOM standard. If this field is used, the actual size of any objects displayed on the workstation (scales, etc.) may be in error.

The Image Area Dose Product is added to the CR Image Module as an interim solution to handle the dose area product information until the DX-IOD and MPPS are supported in the Kodak DirectView DR Systems.

5 Configuration

The following network attributes are configurable by a qualified service provider:

IP address
Subnet Mask
Local Network Host Name (DR Systems AE Title)
SCP DICOM Called Application Entity Title
Socket number
Router Address (Gateway)
DICOM Service(s) available
Film Sizes available
Other destination properties

6 Error Handling

The DR Systems have 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 which 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
Text Macros designated by the ASCII two-character key prefix: TM	M/M	%PRNTDAT% %TIM% %FOF% %$TIME$% %SES% (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	Date of Printing Time of Printing Film of Film Count Time of Printing Film Session Label	DD-MMM-YY HH:MM (HH=0-23) NN/MM HH:MM:SS AAAAAA	None

Examples

"CS333"
The curve shape is set to 1/3 of the printers 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 printers 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.