Kodak DirectView CR 500 Systems

DICOM Conformance Statement

CR System

Software Version 3.6x.xx

September 26, 2003

Document # 3E1420

Revision U

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Revision History

Date	Rev	MIMS/W	Editor	Comments
07/14/1999		3.2.x	K. Mantooth	Initial release of document for Gate 1.5.
10/07/1999	A	3.2.x	K. Mantooth	Incorporate comments and clean-up.
03/27/2000	B	3.2.b9	K. Mantooth	Add support for Imation parameters. Remove Annotation Box SOP class. Fix product name.
07/26/2000	C	3.2.b25	K. Mantooth	Fix typos. Fix Configuration Information examples.
09/28/2000	D	3.2.b31	K. Mantooth	Clean up trademarks and logo.
01/17/2001	E	3.5.4	K. Mantooth	Add CR Image elements, Worklist elements, and Japanese Language character sets.
03/19/2001	F	3.5.4	K. Mantooth	Update document to reflect CR900 as well as CR800
06/20/2001	G	3.5.4	K. Mantooth	Clean up trademarks.
01/14/02	H	5.0	Trac Tran	Update to 5.0
04/30/02	I	5.0	Trac Tran	Revised for final release.
06/12/02	J	5.0	Trac Tran	Change Web site and Border Density value.
06/17/02	K	5.0	Trac Tran	Change for Giraffe CR system 3.2
10/29/2002	L	5.0	Trac Tran	Add Distance Source to Detector
1/16/2003	M	5.2	Trac Tran	Change Revision number, Implementation Class UID and CR System number.
1/29/2003	Q	5.2	Trac Tran	Clean up product name and branding terms.
4/17/03	T	5.2	Trac Tran	Remove Verification as SCP, change product naming to cover CR 850, add defaults to attributes to CR IOD, add Annex B: CR Patient/Exam Input Field/DICOM tag Cross Reference.
9/26/2003	U	5.2	J. Petrucci	Changes for CR500 3.6x s/w

0 Introduction

0.1 Executive Overview

This document covers the following *Kodak DirectView* CR system Products:

> *Kodak DirectView* CR 500 System

This document applies to all *Kodak DirectView* CR products utilizing the version 3.6x.xx software.

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
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
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	SCU

0.2 Scope and Field of Application

This document describes the DICOM functionality of the *Kodak DirectView* CR Systems. The CR Systems covered by this document are a family of laser scanners capable of reading the latent image formed on a storage phosphor imaging plate and producing a digital image. While the various products making up this family of scanners may vary in performance or other specific user features, the information in this document applies to all unless otherwise stated. Throughout the rest of this document the term *DirectView* CR system applies to all members of the CR product family. The *DirectView* CR system acts as a DICOM Service Class User (SCU). The *DirectView* CR system performs transactions over a TCP/IP network via the DICOM messages exchange protocol. The *DirectView* CR system uses *Kodak* PACS Link Medical Image Manager V5.2 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 *DirectView* CR system 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* CR System 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 *DirectView* CR system 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:

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
HIS/RIS	Hospital Information System / Radiology Information System.
ISO	International Standards Organization
LUT	Look-up Table
MIM	*Kodak* PACS Link Medical Image Manager Software
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.
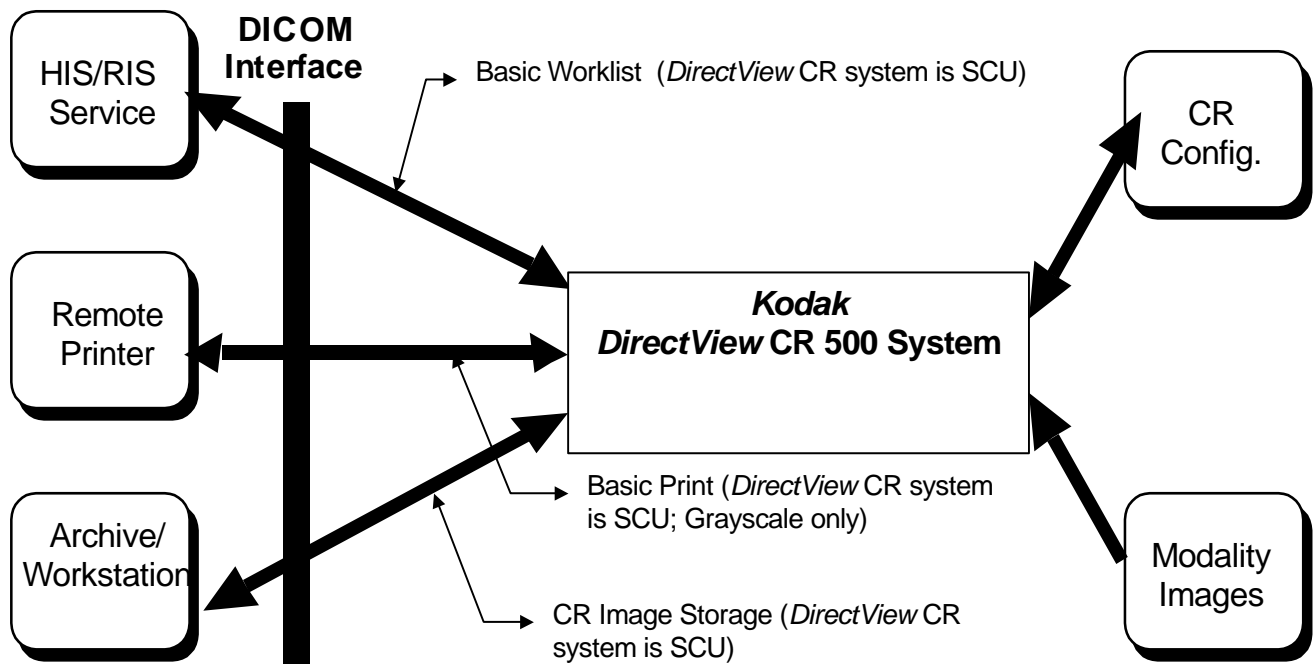
1.1 Functional Definitions

The *DirectView* CR system acquires images with the laser scanner and acquires demographics via manual entry at a *Kodak* Remote Operations Panel 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 *DirectView* CR system establishes an association when the *DirectView* CR system application is started to obtain a modality worklist. The worklist is used as a source of patient demographics. The *DirectView* CR system establishes an association with a selected SCP when *DirectView* CR system has collected sufficient information to begin sending images.

2   Application Entity Specifications

The *DirectView* CR system 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
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
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15

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 *DirectView* CR system will negotiate is 64Kbytes.

2.1.1.2 HIS/RIS

An Association for Basic Worklist will be attempted when the *DirectView* CR system 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 *DirectView* CR system 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 *DirectView* CR system will close the association after receiving a C-FIND response.

2.1.3 Asynchronous Nature

The *DirectView* CR system allows up to 1 invoked and 1 performed operation on an Association (it is synchronous).

2.1.4 Implementation Identifying Information

The *DirectView* CR system provides the Implementation Class UID of "1.2.840.113564.3.1.6".

The implementation version name attribute is optional and is not used by the *DirectView* CR system.

The *DirectView* CR system establishes an Association using its network node name for the calling DICOM Application Entity title. The network node name is configurable through the *DirectView* CR system Service Application.

The *DirectView* CR system stores 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 *DirectView* CR system 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 and 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 *DirectView* CR system initiates Associations for the purpose of obtaining the current Modality Worklist IOD.

2.2.2 Presentation Context Table

The *DirectView* CR system proposes 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
Basic Annotation Box	1.2.840.10008.5.1.1.15	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 *DirectView* CR system provides standard conformance to the DICOM Verification Service Class. When prompted by a user, the *DirectView* CR system 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 *DirectView* CR system may be configured to poll the HIS/RIS broker at periodic intervals and/or asynchronously on demand from the user.

2.3   Association Acceptance Policy

None.

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 *DirectView* CR system uses the N-ACTION to instruct the SCP to print all films in the session. The *DirectView* CR system 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 *DirectView* CR system 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 *DirectView* CR system expects 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)	With no annotation being present, these formats may be used: STANDARD\C,R For LANDSCAPE Film Orientation, (C,R) may = (1,1), (1,2), (2,1), (2,2) For PORTRAIT Film Orientation, (C,R) may = (1,1), (1,2), (2,1), (2,2) With annotation, the ROW Symmetric format is being used as following: With Image annotations alone: ROW\n,m,.., (n,m..) may = (1,1), (1,1,1,1), (2,2), (2,2,2,2) With Page annotations alone: ROW\n,m,.., (n,m..) may = (1,1), (1,1,1,1), (2,2), (2,2,2,2) With Image and Page annotation combined: ROW\n,m,.., (n,m..) may = (1,1,1), (1,1,1,1,1), (2,2,1), (2,2,2,2,1)
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)	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 = 0 to 15) 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 *DirectView* CR system uses 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.
			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 *DirectView* CR system will process the indication of the N-EVENT-REPORT operation.
Any string sent by the SCP is accepted and displayed on the *DirectView* CR system user
interface. In this translation, all characters that are not space characters or in the ASCII range
"A" - "Z" are stripped.

The *DirectView* CR system translates Attributes as described in the following table. Other
strings are not translated but may be displayed on a *DirectView* CR system 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 *DirectView* CR system minimally contains the following attributes:

Attribute Name	Tag	DICOM Type	*DirectView* CR Type	Supported Values
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	2	
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	CR
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	1	
View Position	(0018,5101)	2	2	
General Equipment				
Manufacturer	(0008,0070)	2	2	Kodak
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	1	CR XXX – where x is equal to the model number of the device. i.e. CR 500
Device Serial Number	(0018,1000)	3	3	
Software Versions	(0018,1020)	3	3	
General Image				
Image Number	(0020,0013)	2	1	
Patient Orientation	(0020,0020)	2C	2	

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Image Type	(0008,0008)	3	1	
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	1	
Image Comments	(0020,4000)	3	3	
Lossy Image Compression	(0028,2110)	3	1	*This specifies whether an image has undergone lossy compression. Enumerated values: 00 = Image has NOT been subjected to lossy compression. 01 = Image has been subjected to lossy compression. CR will use 00.*
Image Plane *				
Pixel Spacing *	(0028,0030)	3	3	"0.168\0.168" (35CMX43CM and 35CMX35CM) "0.115\0.115" (24CMX30CM) "0.097\0.097" (18CMX24CM)
Image Pixel				
Samples per Pixel	(0028,0002)	1	1	1
Photometric Interpretation	(0028,0004)	1	1	MONOCHOME1 MONOCHROME2
Rows	(0028,0010)	1	1	1792 2048 2392 2500
Columns	(0028,0011)	1	1	1792 2048 2392 2500
Bits Allocated	(0028,0100)	1	1	16
Bits Stored	(0028,0101)	1	1	12
High Bit	(0028,0102)	1	1	11
Pixel Representation	(0028,0103)	1	1	0

Smallest Image Pixel Value	(0028,0106)	1	1	0
Largest Image Pixel Value	(0028,0107)	1	1	4095
Pixel Data	(7FE0,0010)	1	1	
CR Image				
KVP	(0018,0060)	3	3	
Plate ID	(0018,1004)	3	3	
Distance Source to Detector	(0018,1110)	3	1C - If the image is part of a long length imaging exposure then this value will be sent.	
Distance Source to Patient	(0018,1111)	3	3	
Exposure	(0018,1152)	3	3	
Imager Pixel Spacing	(0018,1164)	3	1	0.168\0.168 (35CMX43CM and 35CMX35CM) 0.115\0.115 (24CMX30CM) 0.097\0.097 (18CMX24CM)
Cassette Orientation	(0018,1402)	3	3	LANDSCAPE PORTRAIT
Cassette Size	(0018,1403)	3	1	18CMX24CM 24CMX30CM 35CMX35CM 35CMX43CM *The term "COMPOSITE" will be used for the cassette size of a combined image.*
Relative X-Ray Exposure	(0018,1405)	3	3	0 to 4095
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	2048
Window Width	(0028,1051)	1C	1C	4096
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.

The system can be configured to send this request periodically at an interval of 1 to 720 minutes. The user may also issue a non-periodic C-FIND request to obtain information for a patient recently added by the site's information system.

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 CR 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)
Additional Patients History	(0010,21B0)
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 Priority	(0040,1003)
Requested Procedure Location	(0040,1005)

3 Communication Profiles

3.1 Supported Communications Stacks

The *DirectView* CR system provides TCP/IP Network Communication Support as defined in Part 8 of the DICOM standard.

3.2 Physical Media

The *DirectView* CR system supports 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 *DirectView* CR system. The extensions are all optional attributes.

Computed Radiography IOD:

The *DirectView* CR system optionally allows the Pixel Spacing (0028,0030) attribute to be used from the Image Plane Module. This is done to support workstations that 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.

5 Configuration

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

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

6 Support of Extended Character Sets

The *DirectView* CR system supports the ISO-IR 100 Latin 1 character set as well as the ISO-IR 6 default character set.

The *DirectView* CR system also supports the ISO-IR 87 character set. This is part of the JIS X 0208 code table for 2-byte Japanese character sets that supports Kanji (ideograph), Hiragana (phonetic), and Katakana (phonetic).

The *DirectView* CR system also supports the ISO-IR 13 character set. This is part of the JIS X 0201 code table for single-byte Japanese Katakana (phonetic) characters.

The value set in the tag Specific Character Set (0008,0005) will be either:

   a) "ISO_IR 100" (Latin 1),

   b) "ISO_1R 13" (Katakana),

   c) "ISO 2022 IR 13\ISO 2022 IR 87" (Katakana, Hiragana, Kanji),

   d) or blank (ISO-IR 6 is the default character set).

Note: The Extended Character Sets mentioned above does not apply to the WORKLIST.

7 Error Handling

The response of the *DirectView* CR system to communication errors will depend on the specific nature of the error. Errors that do not prevent the completion of the communication will be logged only while all other errors will result in an aborted session (A-ABORT sent).

If a communication error occurs during the transmission of an image the system will flag the event as failed delivery.   The user may then resend the image to the same or alternate destination.

The *DirectView* CR system 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
Text Macros designated by the ASCII two-character key prefix: TM	M/M	%PRNTDAT% Date of Printing DD-MMM-YY %TIM% Time of Printing HH:MM (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	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

Annex B - CR Patient/Exam Input Field/DICOM Tag Cross Reference

The following table describes the patient/exam information information flow through the product. The first two columns describe the patient/exam information fields supported by the product's user interface and the maximum number of characters that may be input via the interface. The third column indicates the worklist element that the system will use to populate the field if a DICOM WORKLIST SCP is present. The fourth column identifies the DICOM element containing the data in the system's output.

User Interface Input field Label	Maximum number of input characters from user interface	Associated DICOM Worklist IOD Element	Associated DICOM CR IOD Element
Patient First Name	30	Patient's Name (0010,0010)	Patient's Name (0010,0010)
Patient Last Name	30		
M.I. (middle initial)	1		
Exam Date & Time	N/A	Scheduled Procedure Step Start Date (0040,0002) Scheduled Procedure Step Start Time (0040,0003)	Study Date (0008,0020) Study Time (0008,0030)
Priority	N/A	Requested Procedure Priority (0040,1003)	N/A
Contrast/Bolus	32	Requested Contrast Agent (0032,1070)	Contrast/Bolus Agent (0018,0010)
Accession Number	16	Accession Number (0008,0050)	Accession Number (0008,0050)
Tech ID	16	NA	Operator's Name (0008,1070)
Date of Birth	8	Patient's Birth Date (0010,0030)	Patient's Birth Date (0010,0030)
Gender	N/A	Patient Sex (0010,0040)	Patient Sex (0010,0040)

Procedure	32	Requested Procedure Description (0032,1060)	Study Description (0008,1030)
Patient ID	16	Patient ID (0010,0020)	Patient ID (0010,0020)
Referring Physician	32	Referring Physician's Name (0008,0090)	Referring Physician's Name (0008,0090)
Department	32	Requesting Service (0032,1033)	Institutional Department Name(0008,1040)
Patient Location	32	Patients Institution Residence (0038,0400)	N/A
Cassette ID	10	NA	Plate ID (0018,1004)
Body Part	16	NA	Body Part Examined (0018,0015)
Projection	16	NA	View Position (0018,5101) Series Description (0008,103E)
Position	16	NA	Patient Position (0018,5100)
Orientation	N/A	NA	Cassette Orientation (0018,1402)
Comments	256	NA	Image Comments (0020,4000)
KVP	4	NA	KVP (0018,0060)
MAS	4	NA	Exposure (0018,1152)
Distance	4	NA	Source to Patient Distance (0018,1111)

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Distance		NA	Source to Image Distance (SID) (0018,1110)
Patient Comments	256	NA	Patient Comments (0010,4000)
Code Value	16	Requested procedure code sequence code value (0008,0100)	NA