

**KODAK PACS Link 9410 Acquisition System**

**DICOM Basic Print SCU  
Conformance Statement**

**Version 2.0**

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## 1. Introduction

This document provides the conformance statement for KODAK PACS Link 9410 Acquisition System product that serves as DICOM Basic Print SCU.

The intent of KODAK PACS Link 9410 Acquisition System is to provide an interface to Print Management Service Class Providers (SCPs) for medical imaging modalities that do not have such capabilities. KODAK PACS Link 9410 Acquisition System essentially provides a way to break the direct-connect print chain so print-ready images can be sent to one or more alternate printers, or stored for reprint/reroute on a network

The following summarizes the major functions provided by KODAK PACS Link 9410 Acquisition System:

- Interact with user via the KODAK IMS Keypad. Maintain a list of available printers. Control display of appropriate laser imager (destination) functionality based upon the currently selected destination printer type and state.
- Alternatively, allow a modality Host Control implementation to provide the commands.
- Acquire print-ready images from the attached modality (either KODAK digital or video).
- Buffer and manage images, and pages as needed.
- Print to a local or networked laser imager via DICOM Print Management Service Class User messaging protocol.
- Support a priority print feature.
- Display printer status and error messages for the currently selected print destination to the user at the keypad.

### 1.1 Definitions, Acronyms, abbreviations

ACR-NEMA	American College of Radiology - National Electrical Manufacturers Association.
AE	Application Entity
ANSI	American National Standards Institute.
CR	Computed Radiography
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DICOM Message Service Element-Composite
DIMSE-N	DICOM Message Service Element-Normalized
HIS	Hospital Information System
IOD	Information Object Definition
KESPR	KODAK EKTASCAN Storage Phosphor Reader
LUT	Look-up Table
NEMA	National Electrical Manufacturers Association
OSI	Open Systems Interconnection
PACS	Picture Archive and Communication System
PDU	Protocol Data Unit
QCW	KODAK DIGITAL SCIENCE Computed Radiography Quality Control Workstation.
RIS	Radiology Information System

SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
VR	Value Representation

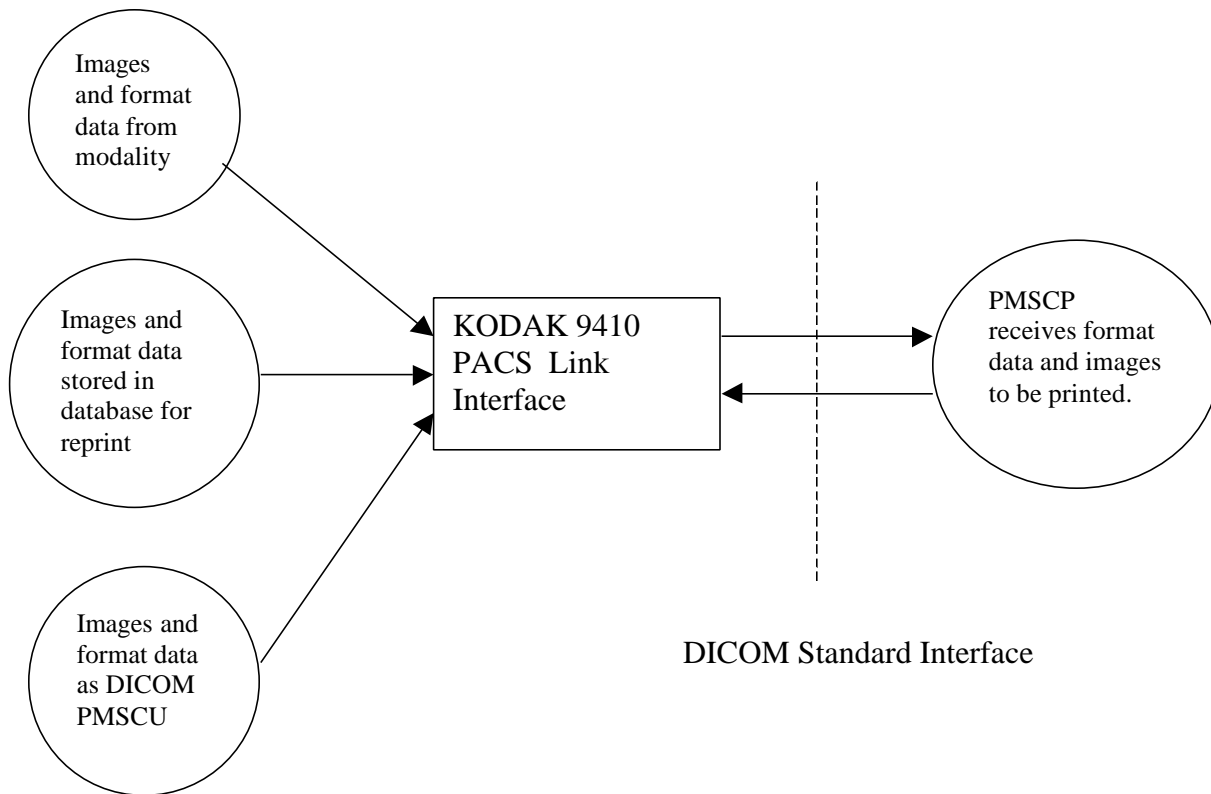
## 2. Implementation Model

KODAK PACS Link 9410 Acquisition System is a single Application Entity that plays the role of Print Management Service Class User (SCU). Within the constraints defined in this document, KODAK PACS Link 9410 Acquisition System has the potential of interaction with any SCP.

KODAK PACS Link 9410 Acquisition System is configurable to the capabilities of specific SCPs. This is accomplished by using a database which stores information to describe the values of each of the attributes the target SCP can accept. The content of the configuration database is outlined in Appendix A.

### 2.1 KODAK PACS Link 9410 Acquisition System Data Flow Diagram

KODAK PACS Link 9410 Acquisition System sends images and formats information to a DICOM Print Management Service Class Provider for printing.



## 2.2 Functional Definition of KODAK PACS Link 9410 Acquisition System

KODAK PACS Link 9410 Acquisition System provides the DICOM Print Management Service Class support required to interface with a SCP. Therefore, KODAK PACS Link 9410 Acquisition System plays the role of SCU. KODAK PACS Link 9410 Acquisition System is structured to accommodate SCPs with a variety of capabilities. This involves the following functionality:

- Image acquisition and buffering
- DICOM association management
- Configurability to conform to the capabilities of the target SCP
- Image data reformatting to the extent required by the target SCP
- Printer Status Tracking
- Print Job Recovery for pending jobs
- Print Job Status Tracking

## 2.3 Sequencing of Real World Activities

Real World Activities are sequenced as required to meet the definition of the Print Management Service Class. No additional sequencing activity is needed. After receiving all images and control information for one or more printed pages from the modality, KODAK PACS Link 9410 Acquisition System sends all necessary DICOM Print Management SCU commands to the selected Print Management SCP.

## 3. KODAK PACS Link 9410 Acquisition System AE Specification

This Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as a SCU:

- Basic Greyscale Print Management Meta-SOP:
  - Basic Film Session SOP Class
  - Basic Film Box SOP Class
  - Basic Greyscale Image Box SOP Class
  - Printer SOP Class
- Basic Annotation Box SOP Class
- Print Job SOP Class

### **3.1 Association Establishment Policies**

#### **3.1.1 General**

KODAK PACS Link 9410 Acquisition System requests an association from a SCP. If the requests for specific SOP classes are accepted, an association is established. The association is terminated after printing or status tracking.

#### **3.1.2 Number of Associations**

KODAK PACS Link 9410 Acquisition System will have at most two active associations per printer. A second association will only be utilized for printer or print job status tracking.

#### **3.1.3 Asynchronous Nature**

The SCP is not required to support multiple outstanding transactions. KODAK PACS Link 9410 Acquisition System, therefore, will only have a single operation outstanding on an Association at any one time. Therefore, KODAK PACS Link 9410 Acquisition System will not perform asynchronous operations window negotiation.

#### **3.1.4 Implementation Identifying Information**

KODAK PACS Link 9410 Acquisition System will provide a default implementation version name of "9410". This is configurable on an installation-specific basis.

KODAK PACS Link 9410 Acquisition System Implementation Class UID is "1.2.840.113720.1.9410.1".

### **3.2 Association Initiation**

KODAK PACS Link 9410 Acquisition System always initiates an association with a SCP. KODAK PACS Link 9410 Acquisition System will use the maximum PDU size as returned by the SCP during negotiation.

### **3.3 Association Acceptance Policy**

KODAK PACS Link 9410 Acquisition System as SCU never accepts an association negotiation.



### 3.4 Associated Real-World Activity

When an association is established, KODAK PACS Link 9410 Acquisition System will instruct the SCP to print films at Film Box level for a session by requesting it to create a Film Session, Film Boxes, Image Boxes, and Images.

#### 3.4.1 Presentation Context

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name of SOP	UID	Name	UID		
Basic Greyscale Print Management Meta SOP	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Annotation Box SOP	1.2.840.10008.5.1.1.15				
Print Job SOP	1.2.840.10008.5.1.1.14				
Basic Greyscale Print Management Meta SOP	1.2.840.10008.5.1.1.9	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Basic Annotation Box SOP	1.2.840.10008.5.1.1.15				
Print Job SOP	1.2.840.10008.5.1.1.14				
Basic Greyscale Print Management Meta SOP	1.2.840.10008.5.1.1.9	DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
Basic Annotation Box SOP	1.2.840.10008.5.1.1.15				
Print Job SOP	1.2.840.10008.5.1.1.14				

The default behavior of KODAK PACS Link 9410 Acquisition System is to use the Implicit VR Little Endian.

#### 3.4.2 SOP Specific Conformance

KODAK PACS Link 9410 Acquisition System requires the use of a database defining the specific capabilities and limitations of a destination printer. This database effectively guarantees that KODAK PACS Link 9410 Acquisition System will only send attribute values that the printer supports.

##### 3.4.2.1 Basic Greyscale Print Management Meta SOP Class

The Basic Greyscale Print Management Meta SOP Class consists of the following SOP Classes:

- Basic Film Session SOP Class
- Basic Film Box SOP Class
- Basic Greyscale Image Box SOP Class
- Printer SOP Class

The specific SOP Conformance statement for the Basic Greyscale Print Management Meta SOP Class is described in the Conformance Statements for each of these SOP Class components.

**3.4.2.1.1 SOP Specific Conformance for Basic Film Session SOP Class**

Film Session Attribute Support:

Attribute	Tag	When Sent	Possible Value(s)
Number of Copies	(2000,0010)	Always	In the range from 1 to the maximum allowed by printer (from config).
Print Priority	(2000,0020)	Always	HIGH, MED, LOW
Medium Type	(2000,0030)	Always	CLEAR FILM, BLUE FILM, CURRENT
Film Destination	(2000,0040)	Always	MAGAZINE, PROCESSOR, CURRENT
Film Session Label	(2000,0050)	If supported	String up to 64 characters (may contain concatenation of MRN-PatientName-StudyName.)
Memory Allocation	(2000,0060)	Never	N/A

Behavior of all specific DIMSE service status codes for Basic Film Session:

KODAK PACS Link 9410 Acquisition System will process responses from a SCP using the following rules:

SCP returns a WARNING for an attribute - WARNING is ignored.

SCP returns a FAILURE for an attribute - session is aborted.

### 3.4.2.1.2 SOP Specific Conformance for Basic Film Box SOP Class

Film Box Attribute Support:

Attribute	Tag	When Sent	Possible Value(s)
Image Display Format	(2010,0010)	Always	STANDARD\C,R Supported column, row combinations are: Portrait: 1,1; 1,2; 2,2; 2,3; 3,3; 3,4; 3,5; 4,4; 4,5; 4,6. Landscape: 1,1; 2,1; 2,2; 3,2; 3,3; 4,3; 5,3; 4,4; 5,4.
Film Orientation	(2010,0040)	Always	PORTRAIT, LANDSCAPE. See Note 1.
Film Size Id	(2010,0050)	Always	14INX17IN, 11INX14IN, 8INX10IN
Magnification Type	(2010,0060)	Always	REPLICATE, BILINEAR, CUBIC, NONE
Smoothing Type	(2010,0080)	If supported and requested by operator.	An integer in the range 0-15. Its value is laser specific.
Min Density	(2010,0120)	Never	N/A
Max Density	(2010,0130)	Always	An integer in the range 170-350
Configuration Information	(2010,0150)	Always	LUT=m, n, where m is a string for lookup table name, n is an integer for contrast (0-15). The value of n is laser specific.
Annotation Display Format Id	(2010,0030)	Always to KODAK SCP only	LABEL, BOTTOM, COMBINED, NONE
Border Density	(2010,0100)	If supported	WHITE, BLACK.
Empty Image Density	(2010,0110)	Never	N/A
Trim	(2010,0140)	Always to KODAK SCP only	YES, NO

Note 1: When the keypad turns on Rotate for image in place rotation, KODAK PACS Link 9410 Acquisition System SCU will convert the print job's film orientation from PORTRAIT to LANDSCAPE and reposition images accordingly to maintain the same position as if images would be printed as PORTRAIT. Special case is applied to KODAK 8300Network model, where reposition images is not required.

Behavior of all specific DIMSE service status codes for Basic Film Box:

KODAK PACS Link 9410 Acquisition System will process responses from a SCP using the following rules:

SCP returns a WARNING for an attribute - WARNING is ignored.

SCP returns a FAILURE for an attribute - session is aborted.

### 3.4.2.1.3 SOP Specific Conformance for Basic Greyscale Image Box SOP Class

Image Box Attribute Support:

Attribute	Tag	When Sent	Possible Value(s)
Image Position	(2020,0010)	Always	1 – 24 (Max images in format.)
Samples Per Pixel	(0028,0002)	Always	1
Photometric Interpretation	(0028,0004)	Always	MONOCHROME1, MONOCHROME2
Rows	(0028,0010)	Always	1 - Maximum rows for film size.
Columns	(0028,0011)	Always	1 - Maximum columns for film size.
Pixel Aspect Ratio	(0028,0034)	Always	Pair of positive values configured per modality specs. Usually 1,1.
Bits Allocated	(0028,0100)	Always	8 or 16 See Note 1.
Bits Stored	(0028,0101)	Always	8 or 12 See Note 1.
High Bit	(0028,0102)	Always	7 or 11 See Note 1.
Pixel Representation	(0028,0103)	Always	0 = unsigned 1 = 2's complement
Polarity	(2020,0020)	Always	NORMAL or REVERSE
Magnification Type	(2010,0060)	Always if requested by operator	REPLICATE, BILINEAR, CUBIC, NONE
Smoothing Type	(2010,0080)	Always if requested by operator	An integer in the range 0-15.
Requested Image Size	(2020,0030)	Never	N/A
Configuration Information	(2010,0150)	Always	LUT=m, n, where m is a string for lookup table name, n is an integer for contrast (0-15).

Note 1: Using the standard settings for each of the attributes Bits Allocated, Bits Stored, and High Bit, there are only two combinations for these values allowed.

Bits Allocated = 8, Bits Stored = 8, High Bit = 7 -or-

Bits Allocated = 16, Bits Stored = 12, High Bit = 11

Behavior of all specific DIMSE service status codes for Basic Image Box:

KODAK PACS Link 9410 Acquisition System will process responses from a SCP using the following rules:

SCP returns a WARNING for an attribute - WARNING is ignored.

SCP returns a FAILURE for an attribute - session is aborted.

### 3.4.2.1.4 SOP Specific Conformance for Printer SOP Class

KODAK PACS Link 9410 Acquisition System will request the Printer SOP using N-GET, although it will not be able to interpret values beyond the standard values listed below. KODAK PACS Link 9410 Acquisition System ignores the asynchronous N-EVENT-REPORT service.

The values will be forwarded to the keypad for display to the user.

Printer SOP Attribute Support:

Attribute	Tag	Values Interpreted
Printer Status	(2110,0010)	NORMAL WARNING FAILURE
Printer Status Info	(2110,0020)	If WARNING: - SUPPLY EMPTY - SUPPLY LOW - RECEIVER FULL - FILM JAM - NO RECEIVE MGZ - BAD SUPPLY MGZ - PRINTER INIT - NO SUPPLY MGZ - COVER OPEN - CALIBRATION ERR - PROC INIT - CHECK CHEMISTRY - PROC OVERFLOW HI - CHEMICALS LOW If FAILURE: - PRINTER DOWN - PROC DOWN - PROC OVERFLOW FL - CHEMICALS EMPTY - ELEC CONFIG ERR - ELEC SW ERROR - ELEC DOWN
Printer Name	(2110,0030)	Not interpreted.
Manufacturer	(0008,0070)	Not interpreted.
Manufacturer Model Name	(0008,1090)	Not interpreted.
Software Version	(0018,1020)	Not interpreted.

Note: These attributes are received from the SCP.

**Private Tags:**

KODAK PACS Link 9410 Acquisition System SCU supports the following private tags:

DIMSE\_AT DIMSE\_PT\_SHEETSLEFT 0x10011000;

In case of SCP sends the above private tag with the correct private tag creator string

"KODAK1.2.840.113720.1.9410.2" in Printer SOP N-GET, KODAK PACS Link 9410 Acquisition System SCU will parse the sheets left tag and set this information accordingly.

**3.4.2.2 SOP Specific Conformance for Basic Annotation Box SOP Class**

Basic Annotation Box SOP Attribute Support:

Annotation Display Format Id and Annotation Text are supported by KODAK PACS Link 9410 Acquisition System. Annotation Text is an attribute with 64 characters in length. Annotation Display Format Id is described in section 3.4.2.1.2 SOP Specific Conformance for Basic Film Box SOP Class. The annotation formats supported are:

<b>Annotation Display Format Id</b>	<b>Format</b>
LABEL See note	Prints a text string at the top center of a film as a label. The Position ID for this label should be 0.
BOTTOM	Prints a text string at the bottom of each image. The Position ID for each annotation string should be the same as the corresponding Image Position.
COMBINED See note	Combines the above two annotation formats: Prints a text string at the bottom of each image (with Position ID matching the corresponding Image Position), and a label at the top of the film (its Position ID = 0).
NONE	No text will be printed at bottom of each image or at the top of a film.

Note: Annotation Display Format Id of LABEL and COMBINED may only be supported by KODAK's SCP because of Position ID = 0.

Behavior of all specific DIMSE service status codes for Basic Annotation Box:

KODAK PACS Link 9410 Acquisition System will process responses from a SCP using the following rules:

SCP returns a WARNING for an attribute - WARNING is ignored.

SCP returns a FAILURE for an attribute - session is aborted.

### 3.4.2.3 SOP Specific Conformance for Print Job SOP Class

KODAK PACS Link 9410 Acquisition System will request the Print Job SOP using N-GET, although it will not be able to interpret values beyond the standard values listed below. KODAK PACS Link 9410 Acquisition System ignores the asynchronous N-EVENT-REPORT service.

The values will be forwarded to the keypad for display to the user.

Print Job SOP Attribute Support:

<b>Attribute</b>	<b>Tag</b>	<b>Values Interpreted</b>
Execution Status	(2100,0020)	PENDING PRINTING DONE FAILURE

Execution Status Info	(2100,0030)	If PENDING: - CALIBRATION ERR - QUEUED - NO RECEIVE MGZ - NO SUPPLY MGZ - SUPPLY EMPTY - RECEIVER FULL - FILM JAM - SUPPLY EMPTY - SUPPLY LOW - BAD SUPPLY MGZ - PROC DOWN - PROC OVERFLOW FL - PROC OVERFLOW HI - CHEMICALS EMPTY - PROC INIT - CHECK CHEMISTRY - CHEMICALS LOW - ELEC DOWN - PRINTER INIT - PRINTER DOWN - COVER OPEN If FAILURE: - JOB CANCELED - INVALID PAGE DES - ELEC SW ERROR
Creation Date	(2100,0040)	Not interpreted.
Creation Time	(2100,0050)	Not interpreted.
Print Priority	(2000,0020)	Not interpreted.
Printer Name	(2110,0030)	Not interpreted.
Originator	(2100,0070)	Not interpreted.

Note: These attributes are received from the SCP.

## **4. Communication Profiles**

KODAK PACS Link 9410 Acquisition System provides the DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

KODAK PACS Link 9410 Acquisition System utilizes the TCP/IP stack from the Windows NT system from which it executes.

## **5. Configuration**

Configuration for KODAK PACS Link 9410 Acquisition System is handled in the form of a set of configuration tables in the database. Those tables hold the parameters to one or more SCPs. The SCPs that are defined in the database will be the only SCPs the user can select from the keypad after the system is booted. Each parameter defines the capability of the SCP in terms of the functionality that should be made available to KODAK PACS Link 9410 Acquisition System as a SCU. See Appendix A for a list of the parameters stored in the database tables.

### **5.1 AE Title/Presentation Address Mapping**

The host name and address of the SCPs that KODAK PACS Link 9410 Acquisition System will communicate with must be set up at installation time for registration and connectivity.

The AE title is configurable, and the default is "9410".



## **Appendix A - Functional Content of Configuration Tables in the Database**

### **1. DICOMPrintSCU Configuration**

Authorized personnel can review KODAK PACS Link 9410 Acquisition System DICOM Print SCU design document Appendix C for this section.