Carestream

DICOM Conformance Statement

Product: TRIMAX TX55 Laser Imaging System

Aug 6, 2020

Document # 9J5585

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Revision History

Date	Revision	Comments
January 11, 2013	1.0	Initial Version
August 7, 2020	A	Update identifying information in section 2.1.4 for Windows and Linux based systems. Update image display format in section 2.3.2.1 for Windows and Linux based systems.

Introduction

0.1 Executive Overview

This document covers the TRIMAX TX55 Imager (referred to as "Imager" henceforth).

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	SCP
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	SCP
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	SCP
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	SCP
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	SCP

0.2 Scope and Field of Application

This document describes the DICOM functionality of the Imager. The Imager captures exam images from DICOM sources and prints the images. The Imager acts as a DICOM Service Class Provider (SCP). The Imager performs transactions over a TCP/IP network via the DICOM messages exchange protocol.

0.3 Important Considerations for the Reader

This DICOM Conformance Statement is written in such a way that assumes the reader has a basic understanding of DICOM. This DICOM Conformance Statement by itself is not sufficient to guarantee successful connectivity between the Imager and equipment from other vendors. The following considerations should be made:

- The integration of equipment from different vendors goes beyond the scope of the DICOM 3.0 standard and this Imager DICOM Conformance Statements. It is the responsibility of the user (or user's agent) to assess the application requirements and to design a solution that integrates this imager 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 is met.
- The user (or user's agent) should ensure that any equipment connected via DICOM to this imager also follows the future evolution of the DICOM 3.0 standard. Failure to do so may result in (partial) loss of connectivity.
- For all DICOM attributes of type M (shown in the column of SCP Usage), the SCU must send a valid value within the published range. We guarantee to support all published values. A missing

attribute would result in returning an error of Missing Attribute, an invalid value would result in returning an error of Invalid Value and an Out of Range value would result in returning an error of Out of Range. It is up to the SCU to retry with a new value or to abort the association.

- For all DICOM attributes of type U (shown in the column of SCP Usage), the Default Value or the Configured Value (if it exists) is used for all cases of Missing Attribute, Invalid Value or Out of Range. No error would be generated from this type. We will send back the corrected value (i.e. the value being used) to the SCU. It is up to the SCU to accept, to decline (abort) or to resend a new value at this point.
- Attributes received at the Image Box level will override the same attribute received at the Film Box level for a particular image with the exception of the Tonescaling method specified in configuration information. Only one Tonescaling method is supported in one film box (Curve Shape or Perception LUT), the image box Perception LUT cannot override the film Box Curve Shape.

0.4 Accessing this Conformance Statement on the World Wide Web

As the Imager 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.carestream.com

0.5 Definitions, Acronyms, Abbreviations

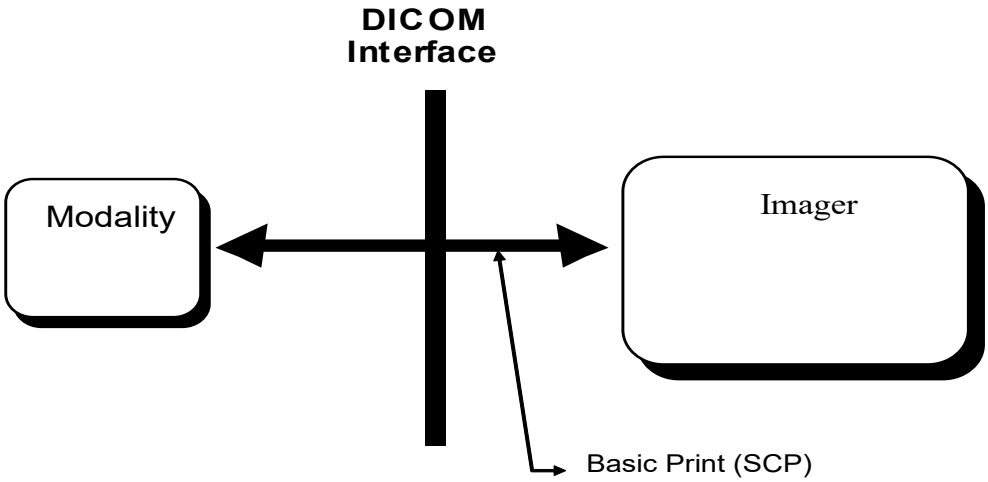
The following symbols and abbreviations are used in this document.

AE	Application Entity
ASCII	American Standard Code for Information Interchange
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
IOD	Information Object Definition.
ISO	International Standards Organization
LUT	Look-up Table
M	Indicate Mandatory when used in the SCP Usage columns.
MC	Indicate Mandatory with Conditions when used in the SCP Usage columns.
PDU	Protocol Data Unit
PLUT	Presentation Look-Up Table
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
TFT/ULUT	Transfer Function Table
U	Indicate User choice (Not Mandatory) when used in the SCP Usage columns.

UID Unique Identifier

1 Implementation Model

This implementation model uses the DICOM Basic Print Management Meta SOP Class to receive studies for the Imager. Associations from multiple SCUs are supported.



1.1 Functional Definitions

The Imager acquires images from the connected device(s), temporarily stores them on disk, and then formats and prints them to film.

1.2 Sequencing of Real-World Activities

The Imager prints images to film upon request from the SCU (i.e. N-ACTION-RQ). It operates as required to meet the definition of the Print Management Service Class.

2 Application Entity Specifications

The Imager provides Standard Conformance to the following SOP Classes as an SCP.

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

2.1 Association Establishment Policies

2.1.1 General

2.1.1.1 Delivery - Basic Grayscale/Color Print Management SCP

The Imager's maximum PDU size is 128 Kbytes.

The Imager is a Grayscale imager. Therefore, the Basic Color Print Management SCP will be rejected by default but may be enabled and supported via the Imager's User Interface. When enabled, the Imager will convert the color image(s) to grayscale.

2.1.2 Number of Associations

Imager will accept by default a maximum of 4 simultaneous associations, but this is configurable and can be modified (up to a maximum of 6 associations). If an attempt is made to open more than the number of configured simultaneous associations, the Imager will reject the additional associations (A-ASSOCIATE-RJ). Note: The A-ASSOCIATE-RJ will be transient and not permanent…See 2.2.1.4 Association Rejection.

2.1.3 Asynchronous Nature

The Imager allows up to 1 invoked and 1 performed operation on an Association (it is synchronous, e.g. the SCU/SCP can send only 1 Request and must wait for the corresponding Response before sending the next Request).

2.1.4 Implementation Identifying Information

The identifying information is based on the TRIMAX TX55 being a Windows or Linux based system.

2.1.4.1 Windows Based Systems

The Imager provides the Implementation Class UID of "1.2.840.113564.3.3.3"

The implementation version name attribute is of the form of "**zzz……zzzv***xxxxx*" where *xxxxx* is the Version Number, and zzz….zzz is the product name of the imager and is configured during installation

with the configurable key. (i.e. **TX550**v1.0 stands for *TX55* software with 1.0 as the version). The maximum length of the implementation version name is limited to 16 characters.

2.1.4.2 Linux Based Systems

The Imager provides the Implementation Class UID of "1.2.840.113564.3.5.1"

The implementation version name attribute is of the form of "**zzz……zzzv***xxxxx*" where *xxxxx* is the Version Number, and zzz….zzz is the product name of the imager and is configured during installation with the configurable key. (i.e. TX55 Laserv3.0 stands for *Tx55 Laser Imager* software with 3.0 as the version). The maximum length of the implementation version name is limited to 16 characters.

The Called AE Title used by the Imager is configured during installation with the secure key.

2.2 Association Acceptance Policy

2.2.1 Associated Real-World Activity

2.2.1.1 Delivery - Basic Grayscale/Color Print Management SCP

The Imager accepts Associations for the purpose of acquiring images and printing them on a local printer.

When an association has been established:

The SCU can request the Imager to create or set Film Sessions, Film Boxes, set Image boxes, Annotation boxes, Presentation LUT and request Printer Status

The SCU can request to change the attributes that are allowed for these boxes.

The port number is configurable, and the default setting is 5040.

2.2.1.2 Application Entity Titles (AE_TITLE)

The Called AE Title may be used to select behavior, which is unique to the Imager:

- Suffix "/C" option of the AE Title

  Curve shape tone scaling values are usually interpreted in standard 0-999 range. However, the Imager's Print Server can be configured to accept the curve shape in the 0-690 range. If the Called AE Title contains a suffix "/C", the 0-690 range shall be used.

  Note:

  - NER_ option of the AE Title will not provide status changes in the Imager as they occur. It is necessary to turn on the N-Event-Report from the Imager's User Interface.
  - Suffix "/1..n" option of the AE Title will all send to the default and only output bin.

2.2.1.3 Association Negotiation

If the association is accepted, the list of requested Presentation Context items is returned with each item marked as accepted or rejected with the Result/Reason field containing the values specified in PS 3.8 Table 9-18 of the DICOM Standard, Release 03 Oct 2003.

2.2.1.4 Association Rejection

If the association is rejected, the Result, Source, and Reason/Diagnostic fields in the response message contain the values show below:

Condition	Result	Source	Reason/Diagnostic
Limit on simultaneous associations exceeded	2 – Rejected Transient	3 - DICOM UL Service Provider (Presentation)	3 – local limit exceeded
The IP Connection could not be established.	2 – Rejected Transient	3 – DICOM UL Service Provider (Presentation)	1 – temporary congestion
The destination printer is recognized, but not installed.	1 - Rejected Permanent	1 - DICOM UL Service User	1 – no reason given
No Implementation UID	1 - Rejected Permanent	2 – DICOM UL Service Provider (ACSE)	1 – no reason given
No Application Context Name	1 – Rejected Permanent	2 – DICOM UL Service Provider (ACSE)	1 – no reason given
DICOM protocol version is not supported	1 – Rejected Permanent	2 – DICOM UL Service Provider (ACSE)	2 – protocol version not supported
No Presentation Context items given.	1 – Rejected Permanent	2 – DICOM UL Service provider (ACSE)	1 – no reason given
No presentation context items accepted	1 – Rejected Permanent	1 - DICOM UL Service User	1 – no reason given

2.2.2 Presentation Context Table

The Imager accepts the Presentation Contexts shown below.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext.**
Name	**UID**	**Name List**	**UID**		**Negot**
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
Basic Grayscale Print Management	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
Basic Color Print Management	1.2.840.10008.5.1.1.18	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
Basic Annotation Box	1.2.840.10008.5.1.1.15	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		
Presentation LUT	1.2.840.10008.5.1.1.23	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		

2.2.3 SOP Specific Conformance

2.2.3.1 Verification

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

2.2.3.2 Delivery- Basic Print Management SCP

The Imager provides standard SCP conformance to the DICOM Basic Print Management SOP Class. Association attempts will be rejected if more than the maximum number of simultaneous delivery SCP associations is attempted.

2.3 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

SCUs should not mix color and grayscale images in the film session. They should create separate color and grayscale film sessions in succession.

Note: In the sections below, in addition to the Service user interface, the customer user interface also provides the ability to configure some of the attributes and default values.

2.3.1 Basic Film Session SOP Class

2.3.1.1 DIMSE Service N-CREATE

Attribute	SCP Usage	Tag	Possible Values	Default Values
Number of Copies	U	(2000,0010)	1-99	1
Print Priority	U	(2000,0020)	HIGH, MED, LOW	MED, Configurable from the Imager's User Interface.
Medium Type	U	(2000,0030)	BLUE FILM, CLEAR FILM, MAMMO BLUE FILM	BLUE FILM Configurable from the Imager's User Interface. However, if the Medium Type string requested is not a valid DICOM string then BLUE FILM is used. The Imager prints on the requested Medium only if an appropriate Secure Key is on the printer.

Attribute	SCP Usage	Tag	Possible Values	Default Values
Film Destination	U	(2000,0040)	MAGAZINE, PROCESSOR, BIN_n This value must be selected at the printer for some models. MAGAZINE and PROCESSOR are converted to BIN_1. The imager has only one output bin.	BIN_1
Film Session Label	U	(2000,0050)	Up to 64 characters may be provided	Null String
Memory Allocation	U	(2000,0060)	Not used	Not used

2.3.1.2 Film Session N-Create Status Code

Code	Status	Action/Meaning
0000H	Success	Film session created. Some attributes may have different values than those that were requested. The changed attributes will be returned with the values that were used. (DICOM PS 3.7 Annex C.1.1)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)
0210H	Failure	A film session already exists. Another is not created. (DICOM PS 3.7 Annex C.5.9)

2.3.1.3 DIMSE Service N-Action

The Imager uses N-ACTION to accept print commands from the SCU. Once a print command is received, the Imager prints all films in the session. The Imager conforms to the N-ACTION specification in PS 3.4 Annex H.4.1.2.4 of the DICOM standard, and the Imager collates all film boxes when printed.

2.3.1.4 Film Session N-Action Status Code

Code	Status	Action/Meaning
0000H	Success	All images in the session are printed as specified. (DICOM PS 3.7 Annex C.1.1)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)
0112H	Failure	The SOP Instance UID of the requested film session is returned. (DICOM PS 3.7 Annex C.5.19)
B602H	Warning	Nothing is printed. (DICOM PS 3.4 Annex H.4.1.2.4.2)
C600H	Failure	Nothing is printed. (DICOM PS 3.4 Annex H.4.1.2.4.2)

2.3.1.5 DIMSE Service N-SET

The Imager uses N-SET to update the Film Session values as supplied by the SCU.

2.3.1.6 Film Session N-Set Status Code

Code	Status	Action/Meaning
0000H	Success	Film session data is set. Some attributes may have different values than those that were requested. The changed attributes will be returned with the values that were used. (DICOM PS 3.7 Annex C.1.1)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)
0112H	Failure	The SOP Instance UID of the requested film session is returned. (DICOM PS 3.7 Annex C.5.19)

2.3.1.7 Film Session N-Delete Status Code

Code	Status	Action/Meaning
0000H	Success	The Film session is deleted. (DICOM PS 3.7 Annex C.1.1)
0112H	Failure	The SOP Instance UID of the specified film session was not found. (DICOM PS 3.7 Annex C.5.19)

2.3.2 Basic Film Box SOP Class

2.3.2.1 DIMSE Service N-CREATE

Attribute	SCP Usage	Tag	Possible Values	Default Values
Image Display Format	M	(2010,0010)	STANDARD\C,R For both PORTRAIT and LANDSCAPE Film Orientation Windows Based Systems: Any combination of C,R values with ranges C=1-9 and R=1-9 (i.e. support 1-up, 2-up, 3-up, …, thru 81-up standard formats) Linux Based Systems: Any combination of C,R values with ranges C=1-10 and R=1-10 (i.e. support 1-up, 2-up, 3-up, …, thru 100-up standard formats) ROW\r1,r2,r3…where r1, r2, r3…is the number of images in each row. The rows are limited to 10 and the number of images in each row is limited to 10. CUSTOM\I I = 101, 102 Only valid for PORTRAIT Film Orientation (2010,0040). Notes: See Annex B for description	None. SCU must provide.
Referenced Film Session Sequence	M	(2010,0500)		None. SCU must provide.
>Referenced SOP Class UID	M	(0008,1150)		None. SCU must provide.
>Referenced SOP Instance UID	M	(0008,1155)		None. SCU must provide.
Referenced Basic Image Box Sequence	M	(2010,0510)		None. SCU must provide.
Referenced Basic Annotation Box Sequence	MC	(2010,0520)		None.
Film Orientation	U	(2010,0040)	PORTRAIT, LANDSCAPE	PORTRAIT

Attribute	SCP Usage	Tag	Possible Values	Default Values
Film Size ID	U	(2010,0050)	8INX10IN 10INX12IN 11INX14IN 14INX14IN 14INX17IN See Annex C for detailed explanation	14INX17IN or The largest film size supported by the printer. Configurable from the Imager's User Interface.
Magnification Type	U	(2010,0060)	REPLICATE, BILINEAR, CUBIC, NONE	CUBIC Configurable from the Imager's User Interface.
Image Max Density	U	(2010,0130)	BLUE FILM : Blue Dmin -Blue Dmax CLEAR FILM: Clear Dmin -Clear Dmax MAMMO BLUE FILM: Mammo Dmin - Mammo Dmax	Default Density Configurable from the Imager's User Interface. A received value greater than the maximum for the medium will be set to the high end of the range for that medium type. A received value less that the minimum for the medium will be set to the low end of the range for that medium type. The Imager prints at the requested density only if an appropriate Secure Key is on the printer. The Dmin and Dmax of each film type are defined in the secure key.

Attribute	SCP Usage	Tag	Possible Values	Default Values
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) For TFT n = 1 to 15 For ULUT n = 1 to 12 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	1.2 *LUT*=Ver693c0.w87,6 None
Referenced Presentation LUT Sequence	MC	(2050,0500)	If the PLUT is received, the tonescaling data from the above Configuration Information will be ignored.	None
>SOP Class UID	MC	(0008,1150)		None
>SOP Instance UID	MC	(0008,1155)		None
Annotation Display Format ID	U	(2010,0030)	0 - No annotation 1 - Text centered at bottom of film 6 – Six annotation positions on two lines, centered at bottom of film. NONE – No annotation LABEL – Annotation at bottom of film. BOTTOM – Text at bottom of images. COMBINED – 1 line at the bottom of the page and 1 line under each image. See Basic Annotation Box SOP (section 2.4) for valid values for Annotation Position (2030,0010) for each of these formats.	0 (No annotation)
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.)	5 Configurable from the Imager's User Interface.

Attribute	SCP Usage	Tag	Possible Values	Default Values
Border Density	U	(2010,0100)	BLACK, WHITE, i where i may = 0 - 415	Image Max Density Configurable from the Imager's User Interface.
Min Density	U	(2010,0120)	0-Default Density (Value must be less than Max Density [2010,0130]) This value is used only when PLUT or Curve Shape is applied to the images on the page. When PLUT or Curve Shape is applied, actual minimum density will be the greater of the user requested value and the Dmin of the film.	DMin of the Film The Imager prints at the requested minimum density only if an appropriate Secure Key is on the printer.
Illumination	MC	(2010,015E)	Positive integer in units of cd/m^2	2000 Configurable from the Imager's User Interface.
Reflective Ambient Light	MC	(2010,0160)	Positive integer in units of cd/m^2	10 Configurable from the Imager's User Interface.
Trim	U	(2010,0140)	YES, NO	NO

2.3.2.2 Film Box N-Create Status Code

Code	Status	Action/Meaning
0000H	Success	Film box created. Some attributes may have different values than those that were requested. The changed attributes will be returned with the values that were used. (DICOM PS 3.7 Annex C.1.1)
0106H	Failure	The invalid attribute value is returned in the response data set. (DICOM PS 3.7 Annex C.5.11)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)
0112H	Failure	The film session requested to contain this film box does not exist. (DICOM PS 3.7 Annex C.5.19)
0213H	Failure	Page limit is exceeded. (DICOM PS 3.7 Annex C.5.22)
0120H	Failure	The attribute tag of the missing required attribute is returned. (DICOM PS 3.7 Annex C.5.13)
0121H	Failure	The film box is not created. The required attribute was present, but contained no value. (DICOM PS 3.7 Annex C.5.13)

2.3.2.3 DIMSE Service N-ACTION

The Imager uses the N-ACTION to accept print instruction from the SCU. When such an instruction is received, the Imager prints the current film box in the session.

2.3.2.4 FilmBox N-Action Status Code

Code	Status	Action/Meaning
0000H	Success	All images in the film box are printed as specified. (DICOM PS 3.7 Annex C.1.1)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)
0112H	Failure	The film box does not exist. (DICOM PS 3.7 Annex C.5.19)
B603H	Warning	Nothing is printed (DICOM PS 3.4 Annex H.4.1.2.42)
C600H	Failure	Nothing is printed. (DICOM PS 3.4 Annex H.4.1.2.4.2)

2.3.2.5 DIMSE Service N-SET

The Imager uses N-SET to update the Basic Film Box values as supplied by the SCU. The following attributes may be updated:

Attribute	SCP Usage	Tag
Magnification Type	U	(2010,0060)
Max Density	U	(2010,0130)
Configuration Information	U	(2010,0150)
Smoothing Type	U	(2010,0080)
Border Density	U	(2010,0100)
Min Density	U	(2010,0120)
Illumination	MC	(2010,015E)
Reflective Ambient Light	MC	(2010,0160)
Trim	U	(2010,0140)

2.3.2.6 FilmBox N-Set Status Code

Code	Status	Action/Meaning
0000H	Success	Film box data is set. Some attributes may have different values than those that were requested. The changed attributes will be returned with the values that were used. (DICOM PS 3.7 Annex C.1.1)
0106H	Failure	The invalid attribute value is returned in the response data set. (DICOM PS 3.7 Annex C.5.11)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)
0112H	Failure	The specified film box does not exist. (DICOM PS 3.7 Annex C.5.19)
0120H	Failure	The attribute tag of the missing required attribute is returned. (DICOM PS 3.7 Annex C.5.13)
0121H	Failure	The required attribute was present, but contained no value. (DICOM PS 3.7 Annex C.5.13)
0213H	Failure	Page limit is exceeded. (DICOM PS 3.7 Annex C.5.22)

2.3.2.7 DIMSE Service N-DELETE

Upon receipt of an N-DELETE from the SCU, the Imager removes the individual image boxes from the session.

2.3.2.8 FilmBox N-Delete Status Code

Code	Status	Action/Meaning
0000H	Success	The film box is deleted. (DICOM PS 3.7 Annex C.1.1)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)
0112H	Failure	The SOP Instance UID of the specified film session is returned. (DICOM PS 3.7 Annex C.5.19)

2.3.3 Basic Grayscale Image Box SOP Class

2.3.3.1 DIMSE Service N-SET

Attribute & Usage	SCP Usage	Tag	Supported Values	Default Values
Image Position	M	(2020,0010)	All values within the range of Image Display Format	None. SCU must provide.
Preformatted Grayscale Image Sequence	M	(2020,0110)		None. SCU must provide.
>Samples Per Pixel	U	(0028,0002)	1	1
>Photometric Interpretation	U	(0028,0004)	MONOCHROME1, MONOCHROME2	MONOCHROME2
>Rows	M	(0028,0010)	Maximum Values: Depends on film size. The aspect ratio is used with the printer's page extents, display format, etc. to calculate this value. See Annex D.	None. SCU must provide.
>Columns	M	(0028,0011)	Maximum Values: Depends on film size. The aspect ratio is used with the printer's page extents, display format, etc. to calculate this value. See Annex D.	None. SCU must provide.
>Pixel Aspect Ratio	MC	(0028,0034)	R\C R, C = 1 to 9999 (Integer)	1\1
>Bits Allocated	M	(0028,0100)	8, 16	None. SCU must provide.
>Bits Stored	M	(0028,0101)	8, 10, 12, 14	None. SCU must provide.
>High Bit	M	(0028,0102)	Bits Stored -1	None. SCU must provide.

Attribute & Usage	SCP Usage	Tag	Supported Values	Default Values
>Pixel Representation	M	(0028,0103)	0000H (unsigned integer)	0000H
>Pixel Data	M	(7FE0,0010)	All values consistent with Bits Stored	None. SCU must provide.
Polarity	U	(2020,0020)	NORMAL, REVERSE	NORMAL
Magnification Type	U	(2010,0060)	REPLICATE, BILINEAR, CUBIC, NONE	CUBIC The Film Box Magnification Type is configurable from the Imager's User Interface.
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.)	5
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. Note that m can be 0. See Annex A for description	. *LUT*=Ver693c0.w87,6 The Film Box Perception Lut Selection is configurable from the Imager's User Interface.
Requested Image Size	U	(2020,0030)	Width of Image Box in millimeters (fractional millimeters supported) 0.00 indicates "Maximize film utilization while maintaining Image aspect ratio". If this value exceeds the available dimensions of the Image Box, it will be accepted only if the Requested Decimate/Crop Behavior value is NOT set to FAIL. An icon will be added to the page indicating that the Requested Image Size was not achieved. A maximum minification factor of 0.01 and maximum magnification factor of 20 is imposed to achieve the requested image size.	0.00
Requested Decimate/Crop Behavior	U	(2020,0040)	DECIMATE/CROP/FAIL DECIMATE: If the Image Size exceeds the printable area, the Image Size will be reduced while	DECIMATE Configurable from the Imager's User Interface.

Attribute & Usage	SCP Usage	Tag	Supported Values	Default Values
			preserving the full view of the Image. CROP: If the Image Size exceeds the printable area, the Image will be center cropped by removing pixels that fall outside the printable area. An icon will be added to the page indicating that the Image has been cropped. FAIL: If the Image Size exceeds the printable area, the Image will be rejected.	
Referenced Presentation LUT Sequence	U	(2050,0500)	If the PLUT is received, the tonescaling data from the above Configuration Information will be ignored	

2.3.3.2 ImageBox N-Set Status Code

Code	Status	Action/Meaning
0000H	Success	Image box data is set. Some attributes may have different values than those that were requested. The changed attributes will be returned with the values that were used. (DICOM PS 3.7 Annex C.1.1)
0106H	Failure	The invalid attribute value is returned in the response data set. (DICOM PS 3.7 Annex C.5.11)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)
0112H	Failure	The specified film box does not exist. (DICOM PS 3.7 Annex C.5.19)
0120H	Failure	The attribute tag of the missing required attribute is returned. (DICOM PS 3.7 Annex C.5.13)
0121H	Failure	The required attribute was present, but contained no value. (DICOM PS 3.7 Annex C.5.13)
0213H	Failure	Page limit is exceeded. (DICOM PS 3.7 Annex C.5.22)
C603H	Failure	Image Size cannot be achieved with the requested decimate crop behavior.

2.3.4 Basic Color Image Box SOP Class

2.3.4.1 DIMSE Service N-SET

Attribute & Usage	SCP Usage	Tag	Supported Values	Default Values
Image Position	M	(2020,0010)	All values within the range of Image Display Format	None. SCU must provide.
Basic Color Image Sequence	M	(2020,0111)		
>Samples Per Pixel	U	(0028,0002)	3	3

Attribute & Usage	SCP Usage	Tag	Supported Values	Default Values
>Photometric Interpretation	U	(0028,0004)	RGB	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	None. SCU must provide.
>Rows	M	(0028,0010)	See Annex D for behavior depending on the printed image size.	None. SCU must provide.
>Columns	M	(0028,0011)	See Annex D for behavior depending on the printed image size.	None. SCU must provide.
>Pixel Aspect Ratio	MC	(0028,0034)	R\C R, C = 1 to 9999 (Integer)	1\1
>Bits Allocated	U	(0028,0100)	8	8
>Bits Stored	U	(0028,0101)	8	8
>High Bit	U	(0028,0102)	7	7
>Pixel Representation	M	(0028,0103)	0000H (unsigned integer)	0000H
>Pixel Data	M	(7FE0,0010)	All values consistent with Bits Stored	None. SCU must provide.
Polarity	U	(2020,0020)	NORMAL, REVERSE	NORMAL
Magnification Type	U	(2010,0060)	REPLICATE, BILINEAR, CUBIC, NONE All values are used only when the printer can not print color. When the printer prints color, REPLICATE is always used.	CUBIC Configurable from the Imager's User Interface.
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.) Smoothing Type is used only when the printer can not print color.	5

Attribute & Usage	SCP Usage	Tag	Supported Values	Default Values
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. Curve Shape or Perception LUT is used only when the printer cannot print color. Note that m can be 0. See Annex A for description	Configurable from the Imager's User Interface. Configurable from the Imager's User Interface. *LUT*=Ver693c0.w87,6
Requested Image Size	U	(2020,0030)	Width of Image Box in millimeters (fractional millimeters supported) 0.00 indicates "Maximize film utilization while maintaining Image aspect ratio". If this value exceeds the available dimensions of the Image Box, it will be accepted only if the Requested Decimate/Crop Behavior value is NOT set to FAIL. An icon will be added to the page indicating that the Requested Image Size was not achieved. A maximum minification factor of 0.01 and maximum magnification factor of 20 is imposed to achieve the requested image size.	0.00
Requested Decimate/Crop Behavior	U	(2020,0040)	DECIMATE/CROP/FAIL DECIMATE: If the Image Size exceeds the printable area, the Image Size will be reduced while preserving the full view of the Image. CROP: If the Image Size exceeds the printable area, the Image will be center cropped by removing pixels that fall outside the printable area. An icon will be added to the page indicating that the Image has been cropped FAIL: If the Image Size exceeds the printable area, the Image will be rejected.	DECIMATE Configurable from the Imager's User Interface.
Color Profile	U	(2011,0160)	DEFAULT1, DEFAULT2, DEFAULT3, DEFAULT4, DEFAULT5, DEFAULT6	None.

2.3.4.2 Basic Color Image Box N-Set Status Code

Code	Status	Action/Meaning
0000H	Success	Image box data is set. Some attributes may have different values than those that were requested. The changed attributes will be returned with the values that were used. (DICOM PS 3.7 Annex C.1.1)
0106H	Failure	The invalid attribute value is returned in the response data set. (DICOM PS 3.7 Annex C.5.11)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)
0112H	Failure	The specified film box does not exist. (DICOM PS 3.7 Annex C.5.19)
0120H	Failure	The attribute tag of the missing required attribute is returned. (DICOM PS 3.7 Annex C.5.13)
0121H	Failure	The required attribute was present, but contained no value. (DICOM PS 3.7 Annex C.5.13)
0213H	Failure	Page limit is exceeded. (DICOM PS 3.7 Annex C.5.22)
C603H	Failure	Image Size cannot be achieved with the requested decimate crop behavior.

2.3.5 Printer SOP Class

2.3.5.1 DIMSE Service N-GET

Changes in printer status will be sent when they occur using N-EVENT-REPORT only if the SCU established the association using a called AE title beginning with “NER_”. Otherwise, the SCU can use the N-GET to retrieve an instance of the Printer SOP class.

Printer Status (2110,0010) and Printer Status Info (2110,0020) will be returned with all N-GET requests of the Printer SOP class.

Attribute	SCP Usage	Tag	Supported Values
Printer Status	M	(2110,0010)	NORMAL,WARNING, FAILURE
Printer Status Info	M	(2110,0020)	for Printer Status of NORMAL: NORMAL
			for Printer Status of WARNING: BAD SUPPLY MGZ CALIBRATION ERR CHECK PRINTER COVER OPEN EMPTY 8X10 BLUE EMPTY 8X10 CLR EMPTY 8X10 MAMMO EMPTY 10X12 BLUE EMPTY 10X12 CLR EMPTY 10X12 MAMMO EMPTY 11X14 BLUE EMPTY 11X14 CLR EMPTY 11X14 MAMMO EMPTY 14X14 BLUE EMPTY 14X14 CLR EMPTY 14X17 BLUE EMPTY 14X17 CLR FILM JAM FILM TRANS ERR PRINTER INIT PRINTER OFFLINE PROC INIT
			for Printer Status of FAILURE: ELEC DOWN PRINTER DOWN PROC DOWN
Printer Name	U	(2110,0030)	Any value up to 16 characters in length. Set during installation from the Secure Key.
Printer Manufacturer	U	(0008,0070)	Any value up to 16 characters in length, Set during installation from the Secure Key.
Model Name	U	(0008,1090)	Any value up to 16 characters in length. Set during installation from the Secure Key.
Printer Device Serial Number	U	(0018,1000)	AAAAAAAA (number up to 8 ASCII characters)
Software Version	U	(0018,1020)	The actual Imager software version (ID up to 6 ASCII characters) as X.y where X is the Imager Release number and y the version number.
Date of Last Calibration	U	(0018,1200)	Not supported
Time of Last Calibration	U	(0018,1201)	Not supported

2.3.5.2 Printer SOP N-Get Status Code

Code	Status	Action/Meaning
0000H	Success	Printer Status and Printer Status Info are always returned along with the requested attribute values. (DICOM PS 3.7 Annex C.1.1)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)

2.4 Basic Annotation Box SOP Class

2.4.1 DIMSE Service N-SET

The Basic Annotation Box SOP Instance is created by the SCP 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.

Attribute & Usage	SCP Usage	Tag	Supported Values	Default Values
Annotation Position	M	(2030,0010)	Annotations are placed in order from upper-left to lower-right. If the Annotation Display Format ID is 1, then value must be 1. The text will be printed on one line at the bottom of the film. If the Annotation Display Format ID is 6, then valid range is 1-6. The text will be printed within 2 lines at the bottom of the film, within 6 different positions. If the Annotation Display Format ID is LABEL, the valid range is 0-1. The text will be printed at the bottom of the film on two lines. If the Annotation Display Format ID is BOTTOM, then the valid range is 1 to the number of images in the Film Box. The text will be placed below the images. If the Annotation Display Format ID is COMBINED, then the valid range is 0 to the number of images in the Film Box. Position 0 will be printed at the bottom of the film. The other annotations will be printed below the images. Any annotation box with a position outside the valid range will be ignored.	None.
Text String	M	(2030,0020)	Up to 64 characters (see Note)	None.

Note: the number of characters displayed may be less than 64 characters depending on the size of the film, the page format, the annotation format and the characters used. This exception does not apply to Annotation Format IDs of LABEL or 1.

Note: If an image box is empty, then the corresponding image annotation is not displayed.

2.4.2 Annotation N-Set Status Code

Code	Status	Action/Meaning
0000H	Success	The annotation data is set.
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.1.1)
0112H	Failure	The annotation box does not exist. (DICOM PS 3.7 Annex C.5.21)
0116H	Warning	Invalid Position was specified. (DICOM PS 3.7 Annex C.5.19)
0213H	Failure	Page limit is exceeded. (DICOM PS 3.7 Annex C.5.22)

2.5 Presentation LUT SOP Class

2.5.1 DIMSE Service N-CREATE

The Presentation LUT SOP Instance is created by the SCP upon receipt of the N-CREATE action. The Print SCU may create Presentation LUT instance prior to being referenced by the Basic Film Box. 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 and the action will result in an error if neither or both are present. 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.

Attribute & Usage	SCP Usage	Tag	Supported Values	Default Values
Presentation LUT Sequence	M	(2050,0010)		None.
>LUT Descriptor	M	(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 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 14 inclusive.	None.

Attribute & Usage	SCP Usage	Tag	Supported Values	Default Values
>LUT Explanation	U	(0028,3003)	Free form text explanation of the meaning of the LUT.	None.
>LUT Data	M	(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.	None.
Presentation LUT Shape	M	(2050,0020)	Enumerated values IDENTITY and LIN OD.	None.

2.5.2 Presentation LUT N-Create Status Code

Code	Status	Action/Meaning
0000H	Success	The Presentation LUT is created. Some attributes may have different values than those that were requested. The changed attributes will be returned with the values that were used. (DICOM PS 3.7 Annex C.1.1)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)

2.5.3 DIMSE Service N-DELETE

Upon receipt of an N-DELETE from the SCU, the Imager removes the Presentation LUT instance.

2.5.4 Presentation LUT N-Delete Status Code

Code	Status	Action/Meaning
0000H	Success	The Presentation LUT is deleted. (DICOM PS 3.7 Annex C.1.1)
0110H	Failure	The Error Comment field will contain the detailed description of the error. (DICOM PS 3.7 Annex C.5.21)

3 Communication Profiles

3.1 Supported Communications Stacks

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

3.2 Physical Media

The Imager supports *Ethernet* with the following physical connectors:

- Standard Twisted pair (10BaseT and 100BaseT)

4 Extensions/Specializations/Privatizations

There are not any extensions/specializations/privatizations.

5 Configuration

The following attributes are configurable by a qualified service provider:

IP address
DICOM Port number
Subnet Mask
Local Network Host Name (Imager's AE Title)
Router Address (Gateway)
Number of maximum associations
DICOM Service(s) available
Basic Color Print Management Association
N-Event-Report support (Default is Off)
Other configuration indicated in the SOP Class tables.
Other destination properties as indicated in this document.

6 Support of Extended Character Sets

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

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

The Imager 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) must be either:

a) "ISO_IR 6" (default repertoire)

b) "ISO_IR 100" (Latin 1),

c) "ISO_1R 13" (Katakana),

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

e) "ISO 2022 IR 159" (supplementary Kanji set)

f) "ISO 2022 IR 149" (Korean Hangu set)

g) "GB18030" (Chinese set)

h) or blank (ISO_IR6 is the default character set).

7 Error Handling

Warnings indicate that the operation/notification has been completed, but an error was detected. Under warning conditions, operations continue forward without additional actions.

Failures convey that the operation/notification failed and was not performed. Refer to the DICOM Specification PS 3.7, Annex C for the Status Types supported by the DIMSE services.

Annex A – Configuration Information

The Configuration Information attribute contains the list of 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

ATTRIBUTE	USAGE	DESCRIPTION	DEFAULT
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 set at Service User Interface)	m=0, n=0
Text Macros designated by the ASCII two-character key prefix: TM	M/M	%PRNTDAT% Capture Date* DD-MM-YYYY** %TIM% Capture Time* HH:MM AM/PM** (HH=0-12)** %FOF% Film of Film Count NN/MM %$TIME$% Time of Printing HH:MM:SS AM/PM %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

*** This is the receiving Date/Time of the first valid image of the first Film Box.**

** The format of the date and time is locale dependent. The formats noted are for en-US locale

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.

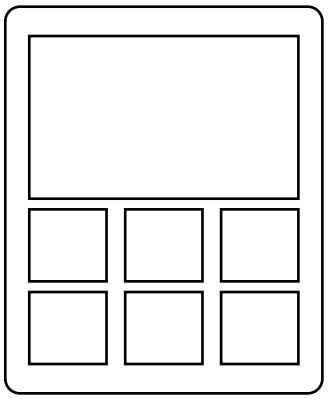
"PD2.0\CN4\CS333"
This is **invalid** because the attributes are out of order, curve shape must precede pivot density and contrast, and contrast must precede pivot density. It should be "CS333\CN4\PD2.0".

"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

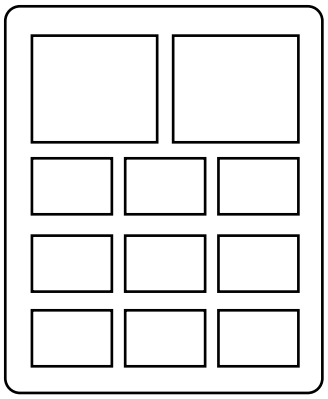
Format ID 101

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.



Annex C – Unsupported Film Types

The following table illustrates what happens when the Imager receives an unsupported Film Size ID [DICOM element (2010,0050)] or Medium Type ID (2000,0030) from an SCU. This section is added to clarify the Imager's behavior when these conditions occur.

The Imager initializes a list with the Media Type enumerations for known media and keeps a collection of media types that do not allow substitution. For the Type that allows substitution, this priority is followed:

1. The highest priority is placed on matching the media type property.
2. The next priority is granted to the Film Size ID (2010,0050). The Imager will attempt to match the film size to that requested in the N-CREATE Film Box.

Note: For best results, Print SCUs should either specify films that are installed in the imager or not specify these attributes.

The following tables list the details unique to specific printer model that recognizes the Medium Type currently installed.

Medium Type Supported	Medium Type Currently Installed	Film Size Supported	Film Size Currently Installed	Result
Yes	Yes	Yes	Yes	The page is printed on the specified film type.
Yes	Yes	Yes	No	The page is queued. User must change film magazines to appropriate size and base.
Yes	Yes	No	*	The SCU's Film Size is replaced with the next larger supported size of the specified film base. If no larger film size is available, then the next smaller supported film size is selected of the specified film base. In the Imager's response to the SCU, the Film Size ID (2010,0050) is modified so that it contains the new Film Size ID. The page is queued and printed when the film size and base is available.
Yes	No	Yes	Yes	The page is queued for the specified film size and film base.

Medium Type Supported	Medium Type Currently Installed	Film Size Supported	Film Size Currently Installed	Result
Yes	No	No	*	The SCU's Film Size is replaced with the next larger supported size of the specified film base. If no larger film size is available, then the next smaller supported film size is selected of the specified film base. In the Imager's response to the SCU, the Film Size ID (2010,0050) is modified so that it contains the new Film Size ID. The page is queued and printed when the film size and base is available.
No	*	Yes	No	The SCU's Medium Type selection is replaced with the supported medium type of the selected film size. The page is queued.
No	*	No	*	The SCU's Film Size selection is replaced with the next larger supported size. If no larger film size is available, the next smaller supported film size is selected. The SCU's Medium Type will be replaced with the media type of the new film size. In the Imager's response to the SCU, the Film Size ID (2010,0050) is modified so that it contains the new Film Size ID. The page is queued and printed when the film size and base is available.

Annex D – Printer Specifications

The following tables list the details unique to specific the Imager.

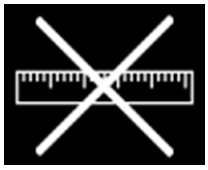
D.1 Film Size

This table shows the accepted film sizes. The maximum image size represents the largest image accepted with and without annotation printed on the bottom of the film.

If annotations are printed, some pixel space will be used for the text and the maximum image size will be reduced.

If the decimate or crop dicom behavior is selected, larger images may be printed but are resampled to a smaller image matrix in order to fit the images onto the page. An icon will be added to the bottom of the page as follows:

1. Scale Icon



Indicates that the requested image size specified by the user could not be achieved.

2. Crop Icon

Indicates that the original image sent by the user has been cropped.

Also, if the requested image size is smaller than the image size, then a DICOM requested Decimate Crop Behavior of "Decimate" is required to print the image.

Portrait Size Info:

Available Film Sizes	Max Width (Portrait) (Pixel Pitch - 20 / mm)		Max Height w/o Annotation (Portrait)	Max Height w/ Annotation (Portrait)
	Pixels	Mm		
8INX10IN	3848	192.40	4864	4812
10INX12IN	4864	243.20	5880	5828
11INX14IN	5372	268.60	6896	6844
14INX14IN	6896	344.80	6896	6844
14INX17IN	6896	344.80	8420	8314

Landscape Size Info:

Available Film Sizes	Max Width (Landscape) (Pixel Pitch - 20 / mm)		Max Height w/o Annotation (Landscape)	Max Height w/ Annotation (Landscape)
	Pixels	Mm		
8INX10IN	4864	243.20	3848	3796
10INX12IN	5880	294.00	4864	4812
11INX14IN	6896	344.80	5372	5320
14INX14IN	6896	344.80	6896	6844
14INX17IN	8420	421.00	6896	6844

The above tables implicitly lists the maximum image values of a 1Up given the DICOM Requested Decimate/Crop Behavior attribute set to FAIL. For all other formats the maximum image values follows these general rules:

- In any Row, the sum of all Image Widths plus all Horizontal Separations can not exceed the above Max Width values.
- In any Column, the sum of all Image Lengths plus all the Vertical Separations can not exceed the above Max Height values.

D.2 Printer Capabilities

The following table shows the Printable Max Area for Multiple Page Format when horizontal, vertical separations are set to zero and no trim lines are specified.

	8X10		10X12		11X14		14X14		14X17	
Format	Width	Height	Width	Height	Width	Height	Width	Height	Width	Height
1	3848	4864	4864	5880	5372	6896	6896	6896	6896	8420
2	3848	2432	4864	2940	5372	3448	6896	3448	6896	4210
4	1924	2432	2432	2940	2686	3448	3448	3448	3448	4210
6	1924	1621	2432	1960	2686	2298	3448	2298	3448	2806
8	1924	1216	2432	1470	2686	1724	3448	1724	3448	2105
9	1282	1621	1621	1960	1790	2298	2298	2298	2298	2806
12	1282	1216	1621	1470	1790	1724	2298	1724	2298	2105
15	1282	972	1621	1176	1790	1379	2298	1379	2298	1684
16	962	1216	1216	1470	1343	1724	1724	1724	1724	2105
20	962	972	1216	1176	1343	1379	1724	1379	1724	1684
24	962	810	1216	980	1343	1149	1724	1149	1724	1403
30	769	810	972	980	1074	1149	1379	1149	1379	1403
35	769	694	972	840	1074	985	1379	985	1379	1202
42	641	694	810	840	895	985	1149	985	1149	1202
48	641	608	810	735	895	862	1149	862	1149	1052
54	641	540	810	653	895	766	1149	766	1149	935
56	549	608	694	735	767	862	985	862	985	1052
63	549	540	694	653	767	766	985	766	985	935
64	481	608	608	735	671	862	862	862	862	1052
72	481	540	608	653	671	766	862	766	862	935
81	427	540	540	653	596	766	766	766	766	935

Note: This assumes no page annotation and in portrait mode. For landscape, the height and width would be reversed.

D.3 Mammography Justification

Mammography modalities sometimes prefer the image/image box to be justified on the page with a minimal border. There are 2 configurable options available for each modality as described below. If both options are configured, “Laterality Detection” is attempted first and if that fails then the image is left justified, if “Left Justification” is enabled. For either justification option, the following job details must be satisfied in order for the justification algorithm to be applied:

1. Image Display Format – STANDARD\1,1 or ROW\1.
2. Image Orientation - Portrait.
3. Medium Type - Mammo Blue Film.
4. Film Size ID – 8INX10IN or 10INX12IN.
5. Bits Allocated – 16.

D.3.1 Laterality Detection

The imager is capable of automatically detecting the chest-wall side of the mammography image and justifying the image on the page to the appropriate side. This feature must be enabled through the imager setup interface for each mammo modality (it is disabled by default).

D.3.2 Left Justification

The imager is also capable of left justifying the image on the page received from a modality. This feature must be enabled through the imager setup interface for each mammo modality (it is disabled by default).

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