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DICOM Conformance Statement

DRYSTAR AXYS, sw. versions 5.x and 6.x

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Document Information

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Conformance Statement Overview

This product, DRYSTAR AXYS, implements the necessary DICOM services to facilitate the Print (SCP) Imaging Management in the healthcare departments, managing Print imaging over a network on Medical Imaging Systems. It enables the capabilities to capture images at any networked DICOM modality and then print them anywhere they're needed in the medical facility.

Table 1.1-1 provides an overview of the network services supported by DRYSTAR AXYS medical printer.

Table 1.1-1: Network Services Supported

SOP Classes		User of Service (SCU)	Provider of Service (SCP)
Name	UID		
Print Management			
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	No	Yes
> Basic Film Session	1.2.840.10008.5.1.1.1	No	Yes
> Basic Film Box	1.2.840.10008.5.1.1.2	No	Yes
> Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	No	Yes
> Printer	1.2.840.10008.5.1.1.16	No	Yes
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	No	Yes
> Basic Film Session	1.2.840.10008.5.1.1.1	No	Yes
> Basic Film Box	1.2.840.10008.5.1.1.2	No	Yes
> Basic Color Image Box	1.2.840.10008.5.1.1.4.1	No	Yes
> Printer	1.2.840.10008.5.1.1.16	No	Yes
Print Job	1.2.840.10008.5.1.1.14	No	Yes
Basic Annotation Box	1.2.840.10008.5.1.1.15	No	Yes
Presentation LUT	1.2.840.10008.5.1.1.23	No	Yes
Print Queue Management	1.2.840.10008.5.1.1.26	No	Yes

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1   INTRODUCTION

1.1   Revision Record

Revision Number	Date	Reason for Change
1.0	31st March, 2007	Initial Revision
1.1	24th November, 2009	Update document for AXYS software version 2.0
1.2	27th February, 2013	Update document for AXYS software version 2.x
1.3	02nd December, 2014	Update document for AXYS software version 3.x Update table 2.2-25: Printer Status Information – supply empty description
8	01st August, 2016	Update document for AXYS software version 4.x and 5.x Update revision number to be consistent with Livelink version
9-10	21st September to 09th October, 2020	Corrections in table 2.2-10 and table 2.4-4

1.2   Purpose and Intended Audience of this Document

This document is a DICOM Conformance Statement for the DICOM Services of the DRYSTAR AXYS product.

The user of this document is involved with system integration and/or software design. We assume that the reader is familiar with the terminology and concepts that are used in the DICOM 3.0 standard and the IHE Technical Framework.

Readers not familiar with DICOM 3.0 terminology should first read the appropriate parts of the DICOM standard itself, prior to reading this conformance statement.

Although the use of this conformance statement in conjunction with the DICOM 3.0 standard is intended to facilitate communication with Agfa HealthCare equipment and non-Agfa equipment, it is not sufficient to guarantee, by itself, the inter-operation of the connection. The following issues need to be considered:

1.3   General Remarks

1.3.1   Integration and Validation Activities

The integration of any device into a system of interconnected devices goes beyond the scope of the DICOM 3.0 standard and this conformance statement when *interoperability* is desired. The responsibility for analyzing the applications requirements and developing a solution that integrates the Agfa equipment with other vendors' systems is the user's responsibility and should not be underestimated.

In some circumstances it might be necessary to perform a validation to make sure that functional interoperability between the Agfa equipment and non-Agfa devices works as expected. The user should ensure that any non-Agfa provider accepts responsibility for any validation required for their connection with the Agfa equipment.

1.3.2   Future Evolution

As the DICOM 3.0 standard evolves to meet the user's growing requirements and to incorporate new features and technologies, Agfa will follow the evolution of the standard. This evolution of the standard may require changes to devices that have implemented DICOM 3.0. The user should ensure that any non-Agfa provider, who connects with Agfa

devices, also plans for future evolution of the DICOM standard. A refusal to do so may result in the loss of functionality and/or connectivity between the different products.

1.4 Acronyms and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard. Abbreviations and terms are as follows:

ADPM	Agfa DICOM Print Module
AE	DICOM Application Entity
AET	Application Entity Title
CLVL	Conformance Level
CPU	Central Processing Unit
DICOM	Digital Imaging and Communications in Medicine
DIMSE	Dicom Message Service Element
GSDF	Grayscale Standard Display Function
IE	Information Entity
IOD	(DICOM) Information Object Definition
PDU	DICOM Protocol Data Unit
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
VR	Value Representation

1.5 Related Documents

➢ ACR-NEMA Digital Imaging and Communications in Medicine (DICOM) V3.0.

National Electrical Manufacturers Association (NEMA)
Publication Sales 1300 N. 17th Street, Suite 1847
Rosslyn, Virginia. 22209, United States of America
Internet: http://medical nema.org/

Note that at any point in time the official standard consists of the most recent yearly edition of the base standard (currently 2020c) plus all the supplements and correction items that have been approved as Final Text.

➢ IHE Radiology Technical Framework.

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2   NETWORKING

2.1   Implementation Model

2.1.1   Application Data Flow Diagram

DRYSTAR AXYS

Local : Remote

Print Composer (SCU) sends Images and Print Management Information

Receives images and presentation data and prepares Images for printing

ADPM

Remote Application Entity sends Connectivity Verification

DICOM Standard Interface

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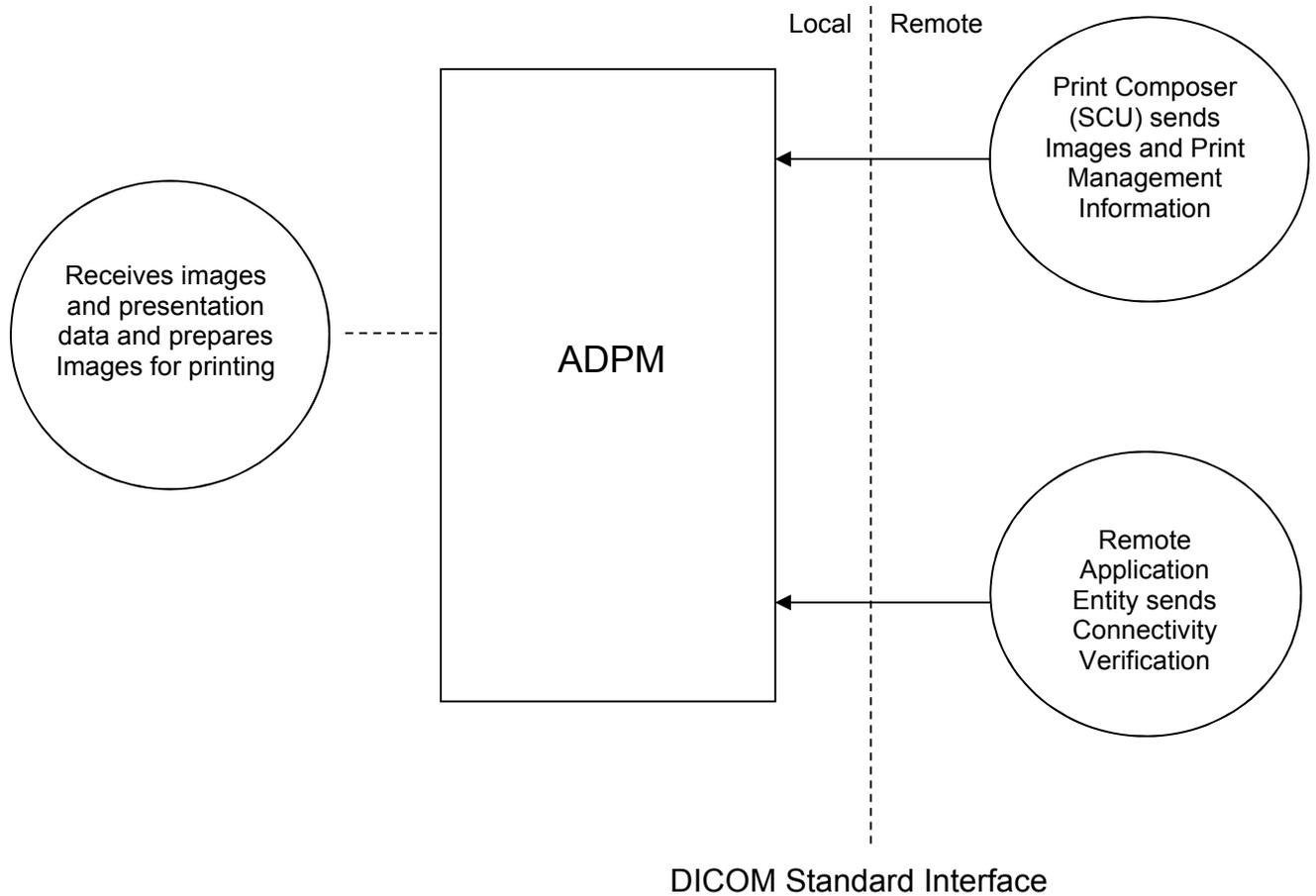
2.1.2   Functional Definitions of AE

This part contains a functional definition for ADPM (Agfa DICOM Print Module) as Application Entity.

2.1.2.1   Functional Capability of ADPM (SCP) Application Entity

When printing to the DRYSTAR AXYS is requested by a Service Class User (SCU), the Agfa ADPM AE will make use of the DICOM SOP Classes defined for Print Management which allow the definition of a Film Session with one or more Film Boxes, which may contain one or more Image Boxes. The SCU controls the printing by manipulating the Print Management SOP Classes by means of DIMSE services.

The Print Management SOP Classes are managed by the ADPM acting only as a SCP. The ADPM waits for a DICOM Print Management Service application SCU to connect. The ADPM will accept Associations with Presentation Context for the Print Management Service Class.

2.1.3   Sequencing of Real World Activities

Not applicable for Real World Activities.

However, a Film Session has to be created before one or more subordinate Film Boxes can be created. Also, the Film Box has to be created before one or more subordinate Image Boxes can be created.

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2.2   AE Specifications

2.2.1   ADPM (Print SCP) AE Specification

2.2.1.1   SOP Classes Supported

This Application Entity provides Standard Conformance to the following SOP Classes:

Table 2.2-1: SOP Classes for ADPM AE

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Print Management			
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	No	Yes
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	No	Yes
Print Job SOP Class	1.2.840.10008.5.1.1.14	No	Yes
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	No	Yes
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	No	Yes
Print Queue Management SOP Class	1.2.840.10008.5.1.1.26	No	Yes

2.2.1.2   Association Establishment Policies

2.2.1.2.1   General

The maximum PDU length which can be received by the ADPM (as SCP) is 65542 bytes. This means that the maximum value for a PDU-length field is 65542 bytes.

Table 2.2-2: DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

2.2.1.2.2   Number of Associations

Table 2.2-3: Number of Associations as an Association Initiator for ADPM AE

Maximum number of simultaneous associations initiated	0

Table 2.2-4: Number of Associations as an Association Acceptor for ADPM AE

Maximum number of simultaneous associations accepted	(See note 1)

Note 1:

The maximum number of supported associations as a SCP is determined out of the amount of system resources (CPU and memory). Moreover the maximum allowed associations is set by default to 10.

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2.2.1.2.3 Asynchronous Nature

Table 2.2-5: Asynchronous Nature as an Association Initiator for ADPM

Maximum number of outstanding asynchronous transactions	None

DICOM Print AE allows a single outstanding operation on any association. Therefore it does not support asynchronous operations, with the exception of sending N-EVENT-REPORT DIMSE messages as defined in the supported SOP Classes.

2.2.1.2.4 Implementation Identifying Information

Table 2.2-6: DICOM implementation Class and Version for ADPM

Implementation Class UID	1.3.51.0.1.3
Implementation Version Name	AGFA DTF1.0.90 (or higher)

2.2.1.3 Association Initiation Policies

Not applicable for the Print Server Management component, because ADPM (SCP) cannot initiate an association. The ADPM as SCU is not implemented.

2.2.1.4 Association Acceptance Policies

Minimum one or more 'AETitle's' (logical DICOM print SCP servers) is configurable in the ADPM. The number is unlimited. Though, in practice each configured SCP server consumes resources.

The ADPM accepts only associations if the 'called AETitle(s)' matches the ADPM 'AETitle(s)'. All associations must use the same TCP/IP ip-address and port number.

It is not requested that the 'calling AETitle' (AE-Title of the modality) is known by the ADPM application.
However, the 'calling AETitle' is an important parameter for the selection of a DICOM Host Profile (2.4 - Configuration).

2.2.1.4.1 Activity – Print Server Management

2.2.1.4.1.1 Description and Sequencing of Activity

When printing is invoked by the DICOM Print SCU, it will make use of the SOP Classes defined for Print Management which allow the definition of a Film Session with one or more subordinate Film Boxes, which in turn contain one or more subordinate Image Boxes. The SCU controls the printing by manipulating the Print Management SOP Classes by means of DIMSE Services.

Next Figure is representative of a simple print job with one page (or Film Box) and one image (or Image Box).

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Figure 2.2-1: Sequencing of Activity – Print Server Management
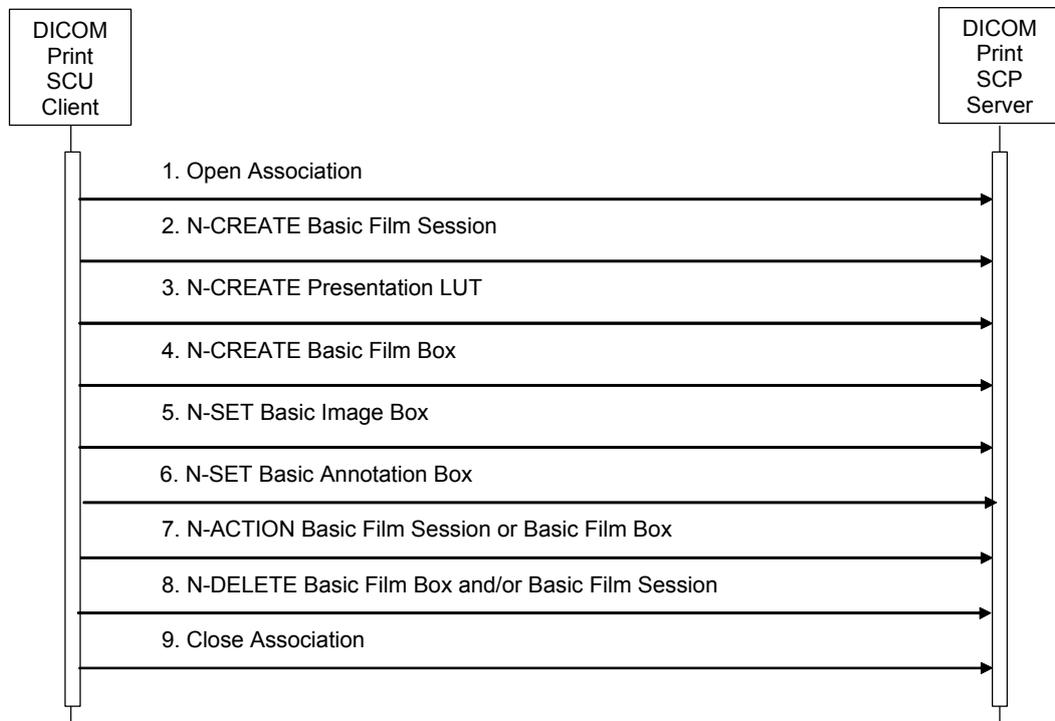
1. Before any SOP Class can be exchanged between SCU and SCP, an association stage takes place to negotiate and exchange the capabilities (supported syntax and services) of the AE's.

2. N-CREATE on the Film Session SOP Class creates a Film Session.

3. N-CREATE on the Presentation LUT SOP Class creates a Presentation LUT.

4. N-CREATE on the Film Box SOP Class creates a Film Box linked to the Film Session. A single Image Box will be created as the result of this operation.

5. N-SET on the Image Box SOP Class transfers the contents of the film sheet to the printer.

6. N-SET on the Annotation Box SOP Class to update the Annotation Box SOP Instance.

7. N-ACTION on the Film Session SOP Class instructs the printer to print the Film Session or N-ACTION on the Film Box SOP Class instructs the printer to print the Film Box.

8. N-DELETE on the Film Box SOP Class deletes the Film Box SOP Instance hierarchy and / or
N-DELETE on the Film Session SOP Class deletes the complete Film Session SOP Instance hierarchy.

9. Only the SCU shall release an association. The association may be aborted by the SCU or SCP.

At any time in the sequence the SCU can request for printer and print job information using the N-GET DIMSE as long that the association is active.

At any time in the sequence the SCP can send printer and print job information using the N-EVENT-REPORT DIMSE if configured to do so and as long as the association is active.

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2.2.1.4.1.2   Accepted Presentation Contexts

ADPM is capable of accepting the Presentation Contexts shown in the following table:

Table 2.2-7: Acceptable Presentation Contexts for ADPM

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Print Job	1.2.840.10008.5.1.1.14	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Basic Annotation Box	1.2.840.10008.5.1.1.15	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Presentation LUT	1.2.840.10008.5.1.1.23	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Print Queue Management	1.2.840.10008.5.1.1.26	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

Note:

A Presentation Context consists of an Abstract Syntax plus a list of acceptable Transfer Syntaxes. The Abstract Syntax identifies one SOP Class or Meta SOP Class (a collection of related SOP Classes identified by a single Abstract Syntax UID).

2.2.1.4.1.3   SOP Specific Conformance - Verification SOP Class

Standard conformance is provided to the DICOM Verification SOP Class as a SCP.
The status code for a C-ECHO response is summarized in following table:

Table 2.2-8: C-ECHO Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The C-ECHO request is accepted.

2.2.1.4.1.4   SOP Specific Conformance - Basic Grayscale Print Management Meta SOP Class

Standard conformance is provided to the DICOM Basic Grayscale Print Management Meta SOP Class.

The ADPM supports the following mandatory SOP classes as defined by the Basic Grayscale Print Management Meta SOP Class:

Table 2.2-9: SOP Classes for Basic Grayscale Print Management Meta SOP Class

SOP Class Name	SOP Class UID	Role
Basic Film Session	1.2.840.10008.5.1.1.1	SCP
Basic Film Box	1.2.840.10008.5.1.1.2	SCP
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	SCP
Printer	1.2.840.10008.5.1.1.16	SCP

2.2.1.4.1.4.1 Basic Film Session SOP Class (1.2.840.10008.5.1.1.1)

The ADPM provides support for the following DIMSE Services:

- N-CREATE   creates the film session
- N-SET   updates the film session
- N-ACTION   prints all film boxes, in the film session, collated copies
- N-DELETE   deletes the film session

N-CREATE is sent by the SCU AE, to create a Basic Film Session SOP Instance, after an Association has been established. The N-CREATE causes the Basic Film Session to be created and its attributes initialized. The Basic Film Session has to be created before the Basic Film Boxes are created. If "N-CREATE" fails, an error message will be returned by

ADPM (SCP).

ADPM only supports one Basic Film Session instance on an Association. No other concurrent Film Session shall be created on one Association. However, a sequential Film Session on the same Association is allowed after deleting the previous Film Session.

Table 2.2-10: Supported N-CREATE Attributes for a Basic Film Session

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(2000,0010)	Number of Copies	1-100	1	Warning (*) (0x0116 ; CLVL=1)
(2000,0020)	Print Priority	• HIGH, • LOW, • (MED=LOW)	LOW	Warning (*) (0x0116 ; CLVL=1)
(2000,0030)	Medium Type See section: 2.4.2.2.1-Behavior for supported / unsupported films (size, medium, application)	• BLUE FILM • CLEAR FILM • MAMMO BLUE FILM • MAMMO CLEAR FILM		Warning (*) (0x0116 ; CLVL=1)
(2000,0040)	Film Destination	PROCESSOR	PROCESSOR	Warning (*) (0x0116 ; CLVL=1)
(2000,0050)	Film Session Label			
(2000,0060)	Memory Allocation			
(2100,0160)	Owner ID			
(2130,00A0)	Proposed Study Sequence			
(0010,0010)	> Patient's Name			
(0010,0020)	> Patient ID			
(0010,0030)	> Patient's Birth Date			
(0010,0032)	> Patient's Birth Time			
(0010,0040)	> Patient's Sex			
(0010,1000)	> Other Patient ID			
(0010,1001)	> Other Patient Names			
(0010,1010)	> Patient's Age			
(0010,1020)	> Patient's Size			
(0010,1030)	> Patient Weight			
(0010,2160)	> Ethnic Group			
(0010,2180)	> Occupation			
(0010,21B0)	> Add. Patient's History			
(0010,4000)	> Patient Comments			

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Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(0020,0010)	> Study ID			
(0020,0011)	> Series Number			
(0020,000D)	> Study Instance UID			Failure (0x0117 ; CLVL=0 or 1)
(0008,0020)	> Study Date			
(0008,0030)	> Study Time			
(0008,0050)	> Accession Number			
(0008,0090)	> Ref. Physician's Name			
(0008,1030)	> Study Description			
(0008,1060)	> Name of Physician Reading Study			
(0008,1080)	> Admitting Diagnosis Description			
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings (or CLVL=1).				

The ADPM will return one of the following status codes:

Table 2.2-11: N-CREATE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has completed the operation successfully.
Warning (*)	Attribute Value Out Of Range	0x0116	The N-CREATE operation is considered successful but the status meaning is logged. Additional information in the Response identifying the attributes out of range will be logged.
Failure	Invalid Attribute Value	0x0106	A data set is returned of all invalid attributes/values
Failure	Invalid Object Instance	0x0117	Instance UID given had incorrect syntax
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Resource Limitation	0x0213	Film Session cannot be opened.
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings.			

N-SET is to update a Basic Film Session SOP Instance.

The ADPM will return one of the following status codes:

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Table 2.2-12: N-SET Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has completed the operation successfully. Some attributes may have different values than what was requested.
Warning (*)	Attribute Value Out Of Range	0x0116	The N-CREATE operation is considered successful but the status meaning is logged. Additional information in the Response identifying the attributes out of range will be logged.
Failure	Invalid Attribute Value	0x0106	A data set is returned of all invalid attributes/values
Failure	Processing Failure	0x0110	Returned if no dataset is provided by the SCU for Basic Film Session SOP Class
Failure	Class Instance Conflict	0x0119	Returned if the SOP Class Instance UID is not defined for a given SOP Class
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Resource Limitation	0x0213	Film Session cannot be opened.
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings.			

N-ACTION is used to print all the films of a Basic Film Session.

The ADPM will return one of the following status codes:

Table 2.2-13: N-ACTION Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	Films in Film Session are accepted for printing.
Warning (*)	Empty Film Page	0xB602	Film Session SOP instance hierarchy does not contain Image Box SOP instances (empty page).
Failure	Processing Failure	0x0110	Returned if no dataset is provided by the SCU for Basic Film Session SOP Class
Failure	Invalid Argument Value	0x0115	Returned if the Action Type provided by the SCU is not recognized.
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Processing Failure	0xC600	Film Session SOP instance hierarchy does not contain Film Box SOP instances.
Failure	Out of Resources	0xC601	Unable to create Print Job SOP instance; print queue is full...
Failure	Wrong image size	0xC603	Image size is too large (cfr. Decimate and Crop)
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings.			

N-DELETE is used to delete the complete Basic Film Session SOP Instance.

The ADPM will return one of the following status codes:

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Table 2.2-14: N-DELETE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has completed the operation successfully. Film Session has been successfully deleted.
Failure	Processing Failure	0x0110	Returned if no dataset is provided by the SCU for Basic Film Session SOP Class
Failure	Class Instance Conflict	0x0119	Returned if the SOP Class Instance UID is not defined for a given SOP Class
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

2.2.1.4.1.4.2 Basic Film Box SOP Class (1.2.840.10008.5.1.1.2)

The Basic Film Box contains the presentation parameters common for all images on a given sheet of film.

The Basic Film Box SOP Instance refers to one or more Image Box SOP Instances, zero or more film related Annotation Box SOP Instances, and zero or one Presentation LUT SOP Instance.

The ADPM provides support for the following DIMSE Services:

- N-CREATE   creates the film box
- N-SET   updates the film box
- N-ACTION   prints the film box
- N-DELETE   deletes the film box

N-CREATE is sent by the SCU AE, to create a Basic Film Box, after a Film Session has been successfully created. If N-CREATE fails, an error message is returned by the ADPM (SCP). The creation of a Basic Film Box also causes the subordinate Basic Image Boxes to be created for each location in the film format.

Table 2.2-15: Supported N-CREATE Attributes for a Basic Film Box

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(2010,0010)	Image Display Format	• STANDARD\ • ROW\ • COL\ • SLIDE • SUPERSLIDE	Sending of the attribute by the SCU is mandatory.	Failure (0x0121 ; CLVL=0 or 1) (0x0106 ; CLVL=0 or 1)
(2010,0030)	Annotation Display Format ID See section: 2.4.6 -Annotations	**ANNOTATION** supported when the Annotation SOP Class is accepted during Association set-up	ANNOTATION	Warning (0x0116 ; CLVL=1)
(2010,0040)	Film Orientation	• PORTRAIT • LANDSCAPE	PORTRAIT	Warning (0x0116 ; CLVL=1)

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Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(2010,0050)	Film Size ID See section: 2.4.2.2.1-Behavior for supported / unsupported films (size, medium, application)	• 8INX10IN • 10INX12IN • 11INX14IN • 14INX14IN • 14INX17IN		Warning (0x0116 ; CLVL=1)
(2010,0060)	Magnification Type See section: 2.4.2.2.2-Kernel and Magnification	• REPLICATE • BILINEAR • CUBIC • NONE	CUBIC	Warning (0x0116 ; CLVL=1)
(2010,0080)	Smoothing Type See section: 2.4.2.2.2-Kernel and Magnification	0 / 100…199 / 200…299	143	Warning (0x0116 ; CLVL=1)
(2010,0100)	Border Density See section: 2.4.4-Densities	• BLACK • WHITE • i, where i represents the desired density in hundredths of OD	BLACK	Warning (0x0116 ; CLVL=1)
(2010,0110)	Empty Image Density See section: 2.4.4-Densities	• BLACK • WHITE • I, where i represents the desired density in hundredths of OD	BLACK	Warning (0x0116 ; CLVL=1)
(2010,0120)	Minimum Density See section: 2.4.4-Densities			Warning (0xB605 ; CLVL=1)
(2010,0130)	Maximum Density See section: 2.4.4-Densities		320	Warning (0xB605 ; CLVL=1)
(2010,0140)	Trim	YES, NO	NO	Warning (0x0116 ; CLVL=1)
(2010,0150)	Configuration Information See section: 2.4.5-Configuration Information		KANAMORI	Warning (0x0116 ; CLVL=1)
(2010,015E)	Illumination	1 … 10.000	2000	Warning (0x0116 ; CLVL=1)
(2010,0160)	Reflective Ambient Light	0 … 10.000	10	Warning (0x0116 ; CLVL=1)
(2010,0500)	Ref. Film Session Seq.			
(0008,1150)	> Ref. SOP Class UID			Failure (0x0120 ; CLVL=0 or 1) (0x0122 ; CLVL=0 or 1)
(0008,1155)	> Ref. SOP Instance UID			Failure (0x0119 ; CLVL=0 or 1) (0x0120 ; CLVL=0 or 1)
(2010,0510)	Ref. Image Box Seq.			

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Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(0008,1150)	> Ref. SOP Class UID			Failure (0x0122 ; CLVL=0 or 1)
(0008,1155)	> Ref. SOP Instance UID			Failure (0x0119 ; CLVL=0 or 1)
(2010,0520)	Ref. Basic Annotation Box Seq.			
(0008,1150)	> Ref. SOP Class UID			Failure (0x0122 ; CLVL=0 or 1)
(0008,1155)	> Ref. SOP Instance UID			Failure (0x0119 ; CLVL=0 or 1)
(2050,0500)	Ref. Presentation LUT Seq.			
(0008,1150)	> Ref. SOP Class UID			Failure (0x0122 ; CLVL=0 or 1)
(0008,1155)	> Ref. SOP Instance UID			Failure (0x0119 ; CLVL=0 or 1)
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings (or CLVL=1).				

The ADPM will return one of the following status codes:

Table 2.2-16: N-CREATE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has completed the operation successfully.
Warning (*)	Attribute Value Out Of Range	0x0116	The N-CREATE operation is considered successful but the status meaning is logged. Additional information in the Response identifying the attributes out of range will be logged.
Failure	Invalid Attribute Value	0x0106	A data set is returned of all invalid attributes/values.
Failure	Processing Failure	0x0110	Returned if no Data Set is provided by the SCU for the Basic Film Box SOP Class.
Failure	Invalid Object Instance	0x0117	Returned if a given instance UID has violated the UID construction rules.
Failure	Class Instance Conflict	0x0119	Returned if the SOP Class Instance UID is not defined for a given SOP Class
Failure	Missing Attribute	0x0120	Returned if mandatory attribute of data set, provided by the SCU AE, is missing
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Out of Resources	0xC602	Unable to create Print Job SOP instance; print queue is full...
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings.			

N-SET is to update a Basic Film Box SOP Instance.

The ADPM will return one of the following status codes:

Table 2.2-17: N-SET Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has completed the operation successfully. Some attributes may have different values than what was requested.
Warning (*)	Attribute Value Out Of Range	0x0116	Returned warning if an attribute value is out of range. The instance UID is created.
Failure	Requested Dmin or Dmax value Outside of Printer's operating range	0xB605	Returned warning if requested density value is out of range. The instance UID is created.
Failure	Invalid Attribute Value	0x0106	A data set is returned of all invalid attributes/values
Failure	Processing Failure	0x0110	Returned if no dataset is provided by the SCU for Basic Film Box SOP Class
Failure	Invalid Object Instance	0x0117	Returned if a given instance UID has violated the UID construction rules.
Failure	Class Instance Conflict	0x0119	Returned if the SOP Class Instance UID is not defined for a given SOP Class
Failure	Missing Attribute	0x0120	Returned if mandatory attribute of data set, provided by the SCU AE, is missing
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings.			

N-ACTION is used to print one or more copies of the last created instance of the Film Box.

The ADPM will return one of the following status codes:

Table 2.2-18: N-ACTION Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	Film accepted for printing.
Warning (*)	Empty Page	0xB603	Film Box SOP Instance hierarchy does not contain Image Box SOP Instances
Failure	Invalid Argument Value	0x0115	Returned if the Action Type provided by the SCU is not recognized.
Failure	Class Instance Conflict	0x0119	Returned if the SOP Class Instance UID is not defined for a given SOP Class
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Out of Resources	0xC602	Unable to create Print Job SOP instance; print queue is full...
Failure	Wrong image size	0xC603	Image size is too large (cfr. Decimate and Crop)
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings.			

N-DELETE is used to delete the complete Basic Film Box SOP Instance.

The ADPM will return one of the following status codes:

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Table 2.2-19: : N-DELETE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has completed the operation successfully. Film Box has been successfully deleted.
Failure	Processing Failure	0x0110	Returned if no dataset is provided by the SCU for Basic Film Box SOP Class
Failure	Class Instance Conflict	0x0119	Returned if the SOP Class Instance UID is not defined for a given SOP Class
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

2.2.1.4.1.4.3 Basic Grayscale Image Box SOP Class (1.2.840.10008.5.1.1.4)

The Basic Grayscale Image Box SOP instance is created by the ADPM at the time the N-CREATE of the Basic Film Box is processed. The Basic Grayscale Image Box contains the presentation parameters and image pixel data that apply to a single image of a sheet film.

The ADPM provides support for the following DIMSE Services:

- N-SET   Updates a Grayscale Image Box in a previously created film box.

N-SET
For each image in the Basic Film Box, the desired attributes of the Basic Image Box should be set. The SCU shall issue an N-SET for the Image Box. The SCP returns a status code. A print command can be issued by the SCU if at least one Basic Image Box is set. Empty image box positions are allowed. By using N-SET, the SCU can instruct the SCP to erase the image in the image position by setting a zero length and no value in the attribute 'Basic Grayscale Image Sequence'.

Table 2.2-20: Supported N-SET Attributes for a Basic Grayscale Image Box

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(2010,0060)	Magnification Type See section: 2.4.2.2.2-Kernel and Magnification	• REPLICATE • BILINEAR • CUBIC • NONE	CUBIC	Warning (0x0116 ; CLVL=1)
(2010,0080)	Smoothing Type See section: 2.4.2.2.2-Kernel and Magnification	0 / 100…199 / 200…299	143	Warning (0x0116 ; CLVL=1)
(2010,0120)	Minimum Density See section: 2.4.4-Densities			Warning (0xB605 ; CLVL=1)
(2010,0130)	Maximum Density See section: 2.4.4-Densities		320	Warning (0xB605 ; CLVL=1)

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(2020,0010)	Image Position (Based on Image Display Format 2010,0010)	1 - x (where x = # images)		Failure (0x0106 ; CLVL=0 or 1) (0x0120 ; CLVL=0 or 1)
(2020,0020)	Polarity	NORMAL REVERSE	NORMAL	Warning (0x0116 ; CLVL=1)
(2020,0030)	Requested Image Size (width, x-dimension, in mm)			Warning (0x0116 ; CLVL=1)
(2020,0040)	Requested Decimate/Crop Behavior See section: 2.4.2.2.3-Decimate and Crop behavior	• DECIMATE • CROP • FAIL		
(2020,0110)	Basic Grayscale Image Sequence			
(0028,0002)	> Samples Per Pixel	1		Failure (0x0106 ; CLVL=0 or 1)
(0028,0004)	> Photometric Interpretation	MONOCHROME1 MONOCHROME2		Failure (0x0106 ; CLVL=0 or 1)
(0028,0010)	> Rows	> 0		Failure (0x0106 ; CLVL=0 or 1)
(0028,0011)	> Columns	> 0		Failure (0x0106 ; CLVL=0 or 1)
(0028,0034)	> Pixel Aspect Ratio		1\1	Failure (0x0106 ; CLVL=0 or 1)
(0028,0100)	> Bits Allocated	8, 16		Failure (0x0106 ; CLVL=0 or 1)
(0028,0101)	> Bits Stored	<= 16		Failure (0x0106 ; CLVL=0 or 1)
(0028,0102)	> High Bit	>=15		Failure (0x0106 ; CLVL=0 or 1)
(0028,0103)	> Pixel Representation	0, 1	0	Failure (0x0106 ; CLVL=0 or 1)
(7FE0,0010)	> Pixel Data			
(2050,0500)	Ref. Presentation LUT Seq.			
(0008,1150)	> Ref. SOP Class UID			Failure (0x0122 ; CLVL=0 or 1)
(0008,1155)	> Ref. SOP Instance UID			Failure (0x0119 ; CLVL=0 or 1)

The ADPM will return one of the following status codes:

Table 2.2-21: N-SET Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has completed the operation successfully. Image successfully stored in Image Box.

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Warning (*)	Attribute Value Out Of Range	0x0116	Returned warning if an attribute value is out of range. The instance UID is created.
Failure	Requested Dmin or Dmax value Outside of Printer's operating range	0xB605	Returned warning if requested density value is out of range. The instance UID is created.
Failure	Invalid Attribute Value	0x0106	A data set is returned of all invalid attributes/values
Failure	Processing Failure	0x0110	Returned if no dataset is provided by the SCU for Basic Image Box SOP Class
Failure	Invalid Object Instance	0x0117	Returned if a given instance UID has violated the UID construction rules
Failure	Class Instance Conflict	0x0119	Returned if the SOP Class Instance UID is not defined for a given SOP Class
Failure	Missing Attribute	0x0120	Returned if mandatory attribute of data set, provided by the SCU AE, is missing
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings.			

2.2.1.4.1.4.4 Printer SOP Class (1.2.840.10008.5.1.1.16)

The Printer SOP Class is used to monitor the status of the printer.

The ADPM provides support for the following DIMSE Services:

- N-EVENT-REPORT
- N-GET

N-EVENT-REPORT

At any time during the Association, the SCU application may receive an N-EVENT-REPORT from the ADPM (SCP). It is used by the SCP to report the changes of the printer status in an asynchronous way. N-EVENT-REPORT is by default disabled.

The ADPM (SCP) invokes an N-EVENT-REPORT to send attributes of the Printer SOP Class.

Table 2.2-22: Supported N-EVENT-REPORT Attributes for Printer SOP Class

Tag	Name	Supported	Default
(2110,0010)	Printer Status	NORMAL WARNING FAILURE	
(2110,0020)	Printer Status Info	Refer to Table 2.2-24 and Table 2.2-25.	

N-GET

The SCU invokes an N-GET to retrieve attributes of the Printer SOP Class.

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Table 2.2-23: Supported N-GET Attributes for Printer SOP Class

Attribute	Tag	Valid Range	Default
(2110,0010)	Printer Status	NORMAL WARNING FAILURE	
(2110,0020)	Printer Status Info	Refer to Table 2.2-24 and Table 2.2-25.	
(2110,0030)	Printer Name		drystar
(0008,0070)	Manufacturer		AGFA
(0008,1090)	Manufacturer Model Name		AXYS
(0018,1000)	Device Serial Number		*serial number*
(0018,1020)	Software Versions		*software version*
(0018,1200)	Date Last Calibration		*last cal. date*
(0018,1201)	Time Last Calibration		*last cal. time*

The printer status will be returned as a combination of the Printer Status attribute (2110,0010) and the Printer Status Info attribute (2110,0020) of the Printer SOP Class.

The following printer status returns are possible for Conformance/Status Level = 0:

Table 2.2-24: Default Printer Status Information

Printer Status	Printer Status Info	Meaning
NORMAL	NORMAL	Printer OK
FAILURE	PRINTER DOWN	The printer is not able to print. This can have several reasons. (E.g. a mechanical or electrical problem, powering on or off, …) Spooling of print jobs to disk is not possible.

The following printer status returns are possible for Conformance/Status Level = 1:

Table 2.2-25: Printer Status Information for Conformance/Status Level = 1

Printer Status	Printer Status Info	Meaning
NORMAL	NORMAL	Printer OK
FAILURE	PRINTER DOWN	The printer is not able to print. This can have several reasons. (E.g. a mechanical or electrical problem, powering on or off, entering Service level, …) Spooling of print jobs to disk is not possible.

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Printer Status	Printer Status Info	Meaning
WARNING	SUPPLY EMPTY	One of the printer trays is empty. Spooling of print jobs is still possible.
WARNING	BAD SUPPLY MGZ	A film tray is not closed. Spooling of print jobs to disk is still possible.
WARNING	FILM JAM	A film jam occurred. An intervention is required. Spooling of print jobs to disk is still possible.
WARNING	COVER OPEN	One of the covers is open. Spooling of print jobs to disk is still possible.
WARNING	SUPPLY PROBLEM	RF-TAG Error. Spooling of print jobs to disk is still possible.
WARNING	PRINTER OFFLINE	Key-Operator is level entered to perform actions like: Show Settings, Print Image, Save config., Calibration, … Spooling of print jobs to disk is still possible.

Note:

Detailed information about 'Conformance/Status Level' and 'Printer Status/Printer Status Info' can be found in section 2.4.2.2.4 - DICOM 'Printer Status' and 'Printer Status Info' behavior.

The following status codes are returned in response to an N-GET:

Table 2.2-26: N-GET Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The request to get printer status information was successful.
Failure	Processing Failure	0x0110	Returned if no dataset is provided by the SCU for Basic Image Box SOP Class
Failure	Class Instance Conflict	0x0119	Returned if the SOP Class Instance UID is not defined for a given SOP Class
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

2.2.1.4.1.5   Specific Conformance for Basic Color Print Management Meta SOP Class

Standard conformance is provided to the DICOM Basic Color Print Management Meta SOP Class.

The ADPM supports the following mandatory SOP classes as defined by the Basic Color Print Management Meta SOP Class:

Table 2.2-27: SOP Classes for Basic Color Print Management Meta SOP Class

SOP Class Name	SOP Class UID	Role
Basic Film Session	1.2.840.10008.5.1.1.1	SCP

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Basic Film Box	1.2.840.10008.5.1.1.2	SCP
Basic Color Image Box	1.2.840.10008.5.1.1.4.1	SCP
Printer	1.2.840.10008.5.1.1.16	SCP

2.2.1.4.1.5.1 Basic Film Session SOP Class (1.2.840.10008.5.1.1.1)

Refer to 'Basic Film Session SOP Class' for 'Basic Grayscale Print Management Meta SOP Class'.

2.2.1.4.1.5.2 Basic Film Box SOP Class (1.2.840.10008.5.1.1.2)

Refer to 'Basic Film Box SOP Class' for 'Basic Grayscale Print Management Meta SOP Class'.

2.2.1.4.1.5.3 Basic Color Image Box SOP Class (1.2.840.10008.5.1.1.4.1)

The Basic Color Image Box SOP instance is created by the ADPM at the time the N-CREATE of the Basic Film Box is processed. The Basic Color Image Box contains the presentation parameters and image pixel data that apply to a single image of a sheet film.

The ADPM provides support for the following DIMSE Services:

- N-SET   Updates a Color Image Box in a previously created film box.

N-SET
For each image in the Basic Film Box, the desired attributes of the Basic Image Box should be set. The SCU shall issue an N-SET for the Image Box. The SCP returns a status code. A print command can be issued by the SCU if at least one Basic Image Box is set. Empty image box positions are allowed. By using N-SET, the SCU can instruct the SCP to erase the image in the image position by setting a zero length and no value in the attribute 'Basic Color Image Sequence'.

Table 2.2-28: Supported N-SET Attributes for a Basic Color Image Box

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(2010,0060)	Magnification Type See section: 2.4.2.2.2-Kernel and Magnification	• REPLICATE • BILINEAR • CUBIC • NONE	CUBIC	Warning (0x0116 ; CLVL=1)
(2010,0080)	Smoothing Type See section: 2.4.2.2.2-Kernel and Magnification	0 / 100…199 / 200…299	143	Warning (0x0116 ; CLVL=1)
(2010,0120)	Minimum Density See section: 2.4.4-Densities			Warning (0xB605 ; CLVL=1)

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Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(2010,0130)	Maximum Density See section: 2.4.4-Densities		320	Warning (0xB605 ; CLVL=1)
(2020,0010)	Image Position (Based on Image Display Format 2010,0010)	1 - x (where x = # images)		Failure (0x0106 ; CLVL=0 or 1) (0x0120 ; CLVL=0 or 1)
(2020,0020)	Polarity	NORMAL REVERSE	NORMAL	Warning (0x0116 ; CLVL=1)
(2020,0030)	Requested Image Size (width, x-dimension, in mm)			Warning (0x0116 ; CLVL=1)
(2020,0040)	Requested Decimate/Crop Behavior See section: 2.4.2.2.3-Decimate and Crop behavior	• DECIMATE • CROP • FAIL		
(2020,0111)	Basic Color Image Sequence			
(0028,0002)	> Samples Per Pixel	3		Failure (0x0106 ; CLVL=0 or 1)
(0028,0004)	> Photometric Interpretation	RGB PALETTE COLOR		Failure (0x0106 ; CLVL=0 or 1)
(0028,0006)	> Planar Configuration	0000,0001 (frame interleave)		Failure (0x0106 ; CLVL=0 or 1)
(0028,0010)	> Rows	> 0		Failure (0x0106 ; CLVL=0 or 1)
(0028,0011)	> Columns	> 0		Failure (0x0106 ; CLVL=0 or 1)
(0028,0034)	> Pixel Aspect Ratio		1\1	Failure (0x0106 ; CLVL=0 or 1)
(0028,0100)	> Bits Allocated	8		Failure (0x0106 ; CLVL=0 or 1)
(0028,0101)	> Bits Stored	8		Failure (0x0106 ; CLVL=0 or 1)
(0028,0102)	> High Bit	7		Failure (0x0106 ; CLVL=0 or 1)
(0028,0103)	> Pixel Representation	0, 1	0	Failure (0x0106 ; CLVL=0 or 1)
(7FE0,0010)	> Pixel Data			

The ADPM will return one of the following status codes:

Table 2.2-29: N-SET Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has completed the operation successfully. Image successfully stored in Image Box.

Warning (*)	Attribute Value Out Of Range	0x0116	Returned warning if an attribute value is out of range. The instance UID is created.
Failure	Requested Dmin or Dmax value Outside of Printer's operating range	0xB605	Returned warning if requested density value is out of range. The instance UID is created.
Failure	Invalid Attribute Value	0x0106	A data set is returned of all invalid attributes/values
Failure	Processing Failure	0x0110	Returned if no dataset is provided by the SCU for Basic Image Box SOP Class
Failure	Invalid Object Instance	0x0117	Returned if a given instance UID has violated the UID construction rules.
Failure	Class Instance Conflict	0x0119	Returned if the SOP Class Instance UID is not defined for a given SOP Class
Failure	Missing Attribute	0x0120	Returned if mandatory attribute of data set, provided by the SCU AE, is missing
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Out of Resources	0xC605	Insufficient memory in the printer to store images.
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings.			

2.2.1.4.1.5.4 Print SOP Class (1.2.840.10008.5.1.1.16)

Refer to 'Printer SOP Class' for 'Basic Grayscale Print Management Meta SOP Class'.

2.2.1.4.1.6   Specific Conformance for Print Job SOP Class

Standard conformance is provided to the DICOM Print Job Service Class (1.2.840.10008.5.1.1.14).

The Print Job SOP Instance is created by an "N-ACTION" of the Film Session SOP Class or an "N-ACTION" of the Film Box SOP Class. After printing all films or in case of an error, the Print Job Instance is deleted.

The SCP returns status code 0xC602 for the N-ACTION command in case the creation of the Print Job failed.

The ADPM provides support for the following DIMSE Services:

- ▪   N-EVENT-REPORT
- ▪   N-GET

N-EVENT-REPORT

N-EVENT-SUPPORT is used to report execution status changes to the SCU in an asynchronous way. N-EVENT-REPORT is by default disabled.

Following Event Type ID's are supported:

Table 2.2-30: Supported Event Types for Print Job SOP Class

Event Type Name	Event Type ID	Description
PENDING	1	the print job is pending
PRINTING	2	the print job is being printed
DONE	3	the print job is printed
FAILURE	4	the print job failed

Following attributes are supported:

Table 2.2-31: Supported Attributes Print Job SOP Class

Tag	Name	Supported
(2100,0030)	Execution Status Info	Refer to Table 2.2-32.
(2100,0010)	Print Job ID	
(2000,0050)	Film Session Label	
(2110,0030)	Printer Name	Drystar

Table 2.2-32: Execution Status Info

Execution Status	Execution Status Info	Meaning
PRINTING	NORMAL	
DONE	NORMAL	
FAILURE	INVALID PAGE DES	The specified page layout cannot be printed or other page description errors have been detected.
FAILURE	INSUFFIC MEMORY	There is not enough memory available to complete this.

N-GET

N-GET is used to retrieve an instance of the Print Job SOP Class.

Table 2.2-33: Supported Attributes

Tag	Name	Supported
(2100,0020)	Execution Status	• PENDING • PRINTING • DONE • FAILURE
(2100,0030)	Execution Status Info	Refer to Table 2.2-32.
(2000,0020)	Print Priority	HIGH, LOW
(2100,0040)	Creation Date	*date of print job creation*
(2100,0050)	Creation Time	*time of print job creation*
(2100,0070)	Originator	*calling AETitle*

Tag	Name	Supported
(2110,0030)	Printer Name	drystar

2.2.1.4.1.7   Specific Conformance for Basic Annotation Box SOP Class

Standard conformance is provided to the DICOM Basic Annotation Box SOP Class.

If the DICOM Basic Annotation Box Service Class is supported, the annotation data is provided via Basic Annotation Box Instance. This data is ignored if the 'Configuration Information' attribute (2010, 0150) contains annotation data. If this is not the case, the Basic Annotation Box data is used.

The Basic Annotation Box SOP Instance is created by N-CREATE of the Film Box SOP Class, and the attribute 'Annotation Display Format ID' has the value "ANNOTATION".

The ADPM provides support for the following DIMSE Service:

- N-SET   Updates an Annotation Box in a previously created film box.

N-SET

N-SET is used to update the Basic Annotation Box SOP Instance. Each Film Box has its own annotation boxes.

Table 2.2-34: Supported N-SET Attributes for a Basic Annotation Box SOP Class

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(2030,0010)	Annotation Position	1-6 (for each Film Box)		
(2030,0020)	Text String See section: 2.4.6 -Annotations			Warning (0x0116 ; CLVL=1)

For each Film Box, 6 annotation boxes are available. Each annotation box can be filled with following information (see section 2.4.6 -Annotations).

- The contents of a TIFF formatted file (see section 2.4.6 -Annotations)

- Variable demographic data (see section 2.4.6 -Annotations)

- Fixed text (see section 2.4.6 -Annotations)

- System variable attribute (see section 2.4.6 -Annotations)

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Table 2.2-35: N-SET Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has completed the operation successfully.
Warning (*)	Attribute Value Out Of Range	0x0116	Returned warning if an attribute value is out of range. The instance UID is created.
Failure	Processing Failure	0x0110	Returned if no dataset is provided by the SCU for Basic Film Box SOP Class
Failure	Class Instance Conflict	0x0119	Returned if the SOP Class Instance UID is not defined for a given SOP Class
Failure	Missing Attribute	0x0120	Returned if mandatory attribute of data set, provided by the SCU AE, is missing
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
* Warnings are not returned by default. See section 2.4.2.2.4 for enabling warnings.			

2.2.1.4.1.8   Specific Conformance for Presentation LUT SOP Class

Standard conformance is provided to the DICOM Presentation LUT SOP Class.

The ADPM provides support for the following DIMSE Service:

- ▪ N-CREATE   Creates the Presentation LUT Instance.
- ▪ N-DELETE   Deletes the Presentation LUT Instance.

N-CREATE

N-CREATE is used to create a Presentation LUT SOP Instance.

Table 2.2-36: Supported N-CREATE Attributes for a Presentation LUT SOP Class

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(2050,0010)	Presentation LUT sequence			

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Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(0028,3002)	> LUT Descriptor	The first value is the number of entries in the lookup table. The second value represents the first mapped value of the LUT. The third value shall be 10-16 (which represents the bit depth of each LUT entry).		Failure (0x0106 ; CLVL=0 or 1)
(0028,3003)	> LUT Explanation			
(0028,3006)	> LUT Data			
(2050,0020)	Presentation LUT Shape	IDENTITY, LIN OD		Failure (0x0106 ; CLVL=0 or 1

If both Presentation LUT Sequence and Presentation LUT Shape are specified, failure 0x0106 is returned, indicating the creation of the Presentation LUT has failed.

The ADPM will return one of the following status codes:

Table 2.2-37: N-CREATE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has completed successfully the creation of the Presentation LUT Instance.
Failure	Invalid Attribute Value	0x0106	A data set is returned of all invalid attributes/values
Failure	Invalid Object Instance	0x0117	Returned if a given instance UID has violated the UID construction rules.
Failure	Missing Attribute	0x0120	Returned if mandatory attribute of data set, provided by the SCU AE, is missing

N-DELETE

N-DELETE is used to delete a Presentation LUT SOP Instance.

The ADPM will return one of the following status codes:

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Table 2.2-38: N-DELETE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	The SCP has successfully deleted the Presentation LUT Instance.
Failure	Processing Failure	0x0110	Returned if no dataset is provided by the SCU for Basic Film Box SOP Class
Failure	Invalid Object Instance	0x0117	Returned if a given instance UID has violated the UID construction rules.

2.2.1.4.1.9 Specific Conformance for Print Queue Management SOP Class

Standard conformance is provided to the DICOM Print Queue Management SOP Class.

The Printer Queue Management SOP Class is used to monitor and manipulate the print queue of the printer. The Printer Queue Management SOP instance is created by the SCP during the start-up of the device and has a well-known SOP instance UID: **1.2.840.10008.5.1.1.25**.

The print queue is restored after power-on.

The ADPM provides support for the following DIMSE Service:

- N-EVENT-REPORT
- N-GET
- N-ACTION

N-EVENT-REPORT

N-EVENT-REPORT is used to report a status change in the print queue to the SCU in an asynchronous way. N-EVENT-REPORT is by default disabled.

Following Event Type ID's are supported:

Table 2.2-39: Supported Event Types

Event Type Name	Event Type ID	Description
HALTED	1	Queue operation is halted
FULL	2	Queue is full
NORMAL	3	Queue is operational

N-GET

The N-GET is used by the SCU to retrieve information about all the print jobs on the print queue and the print queue status itself. It does not return information about jobs that are deleted from the print queue (print job completed or deleted manually).

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Table 2.2-40: Supported N-GET Attributes for Print Queue Management SOP Class

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received	Response to invalid value
(2120,0010)	Queue Status	FULL HALTED NORMAL		
(2120,0050)	Print Job Description Sequence			
(2100,0010)	> Print Job ID			
(2100,0020)	> Execution Status	PENDING PRINTING DONE FAILURE		
(2100,0030)	> Execution Status Info	Refer to Table 2.2-44		
(2100,0040)	> Creation Date	*date of print job creation*		
(2100,0050)	> Creation Time	*time of print job creation*		
(2000,0020)	> Print Priority	Refer to Table 2.2-10: Supported N-CREATE Attributes for a Basic Film Session		
(2100,0070)	> Origin AE	*called AETitle*		
(2100,0140)	> Destination AE	*calling AETitle*		
(2110,0030)	> Printer Name	Refer to Table 2.2-23: Supported N-GET Attributes for Printer SOP Class		
(2000,0040)	> Film Destination	Refer to Table 2.2-10: Supported N-CREATE Attributes for a Basic Film Session		
(2000,0050)	> Film Session Label	Refer to Table 2.2-10: Supported N-CREATE Attributes for a Basic Film Session		
(2000,0030)	> Medium Type	Refer to Table 2.2-10: Supported N-CREATE Attributes for a Basic Film Session		
(2100,0170)	> Number Of Films			
(2120,0070)	>> Referenced Print Job Sequence			
(0008,1150)	>> Referenced SOP Class UID			
(0008,1155)	>>Referenced SOP Instance UID			

The ADPM will return one of the following status codes:

Table 2.2-41: N-GET Response Status

Service Status	Further Meaning	Error Code	Reason

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Success	Success	0x0000	The request to get printer status information was successful.
Failure	SOP Class Not Supported	0x0122	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

N-ACTION

N-ACTION is used by the SCU to change the priority level of a specified print job or deletes a specified print job.

Table 2.2-42: Supported Event Types Print Queue Management SOP Class

Event Type Name	Event Type ID	Description
PRIORITIZE	1	Change priority of a queue entry
DELETE	2	Delete queue entry

Following attributes are supported:

Table 2.2-43: Supported Attributes Print Queue Management SOP Class

Tag	Name	Supported
(2100,0010)	Print Job ID	
(2000,0020)	Print Priority	HIGH, LOW
(2100,0160)	Owner ID	

Table 2.2-44: Execution Status Info

Execution Status	Execution Status Info	Meaning
PRINTING	NORMAL	
DONE	NORMAL	
FAILURE	INVALID PAGE DES	The specified page layout cannot be printed or other page description errors have been detected.
FAILURE	INSUFFIC MEMORY	There is not enough memory available to complete this.

The ADPM will return one of the following status codes:

Table 2.2-45: N-ACTION Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0x0000	Operation successfully completed.
Failure	Print Queue is Halted	0xC651	New jobs are not accepted.
Failure	Mismatch of owner ID's	0xC652	Returned if a given instance UID has violated the UID construction rules.
Failure	Action failed	0xC653	Print job in process

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2.3   Network Interfaces

ADPM provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the DICOM Standard.

ADPM listens by default to port number 104, unless this is configured differently.

2.3.1   Physical Medium Support

ADPM supports a standard Ethernet interface for 1000Base-T, 100Base-T and 10Base-T connections. It is therefore capable of transmitting and receiving data at rates of 1000 Mbps, 100 Mbps or 10 Mbps. They are automatically configured via a detection mechanism and galvanically isolated for IEC601 compliance.

2.4   Configuration

2.4.1   AE Title/ Presentation Mapping

2.4.1.1   Local AE Titles

The DRYSTAR AXYS printer is capable of having an unlimited number of Called AE Titles. This will allow the user to configure another ADPM using a different set of print parameters or add a separate secure channel (SSL) for printing. Each AE Title requires a different port number assigned. The default port number for the second AE Title is 105 (2762 for SSL). Adding a second ADPM is useful for a PACS system wishing to print images from two different modalities (CR, CT …) with different print parameters.

Table 2.4-1: AE Title Configuration Table

Application Entity	Default AE Title	Default TCP/IP Port
ADPM #1	(Service configurable)	104 (Service configurable)
ADPM #2	(Service configurable)	105 (Service configurable)
ADPM #3 (SSL)	(Service configurable)	2762 (Service configurable)

2.4.2   DICOM Profile Configuration

2.4.2.1   DICOM Profile selection

ADPM uses 'DICOM Profiles' (Default or Host Profiles) to define the print parameters for a specific SCU (modality). If the SCU does not send print parameters then the parameters configured in the Default (Site) or Host Profile will be used. Parameters sent from an SCU may also be overridden by the Host Profile setting if desired.

Profile selection is based on next parameters:

- Calling AE-Title (AE-Title of the modality)

- SCP Server Name (local SCP that receives the print association)

- Mammo Modality (DICOM medium type MAMMO BLUE FILM or MAMMO CLEAR FILM)

For the selection for a matching AE-Title and SCP Server Name, following selection rules are used:

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Table 2.4-2: Profile selection

Is there a Mammo profile on the printer?	Is there a Genrad profile on the printer?	Is the requested Medium Type= MAMMO BLUE FILM or MAMMO CLEAR FILM?	Selected profile
No	No	No	Site profile
No	No	Yes	NO printing
No	Yes	No	Genrad profile
No	Yes	Yes	NO printing
Yes	No	No	Mammo profile
Yes	No	Yes	Mammo profile
Yes	Yes	No	Genrad profile
Yes	Yes	Yes	Mammo profile

Incoming requested Medium Type:

For the incoming requested Medium Type = MAMMO BLUE FILM or MAMMO CLEAR FILM, the ADPM applies Medium Type = BLUE FILM or CLEAR FILM and Application Type = Mammo.

Table 2.4-3: Incoming requested Medium Type to profile mapping

Requested Medium Type (2000,0030)	Profile Medium Type	Profile Application Type
Undefined	Undefined	Genrad (no Mammo profile) Mammo (Mammo profile)
BLUE FILM	BLUE FILM	Genrad
CLEAR FILM	CLEAR FILM	Genrad
MAMMO BLUE FILM	BLUE FILM	Mammo
MAMMO CLEAR FILM	CLEAR FILM	Mammo

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2.4.2.2   DICOM Profile parameters

Table 2.4-4: DICOM Profile parameters

Ov.	Field	Allowed BROWSER Values	Default Value	Unit	Supported Values	DICOM Attribute	Usage SCU/SCP	Details see …
Host information, 'Basic Parameter Profile' and SCP selection:								
	Nickname:	Any name. Limit = Keypad Display	""	--	# of characters < 21	--	--	--
	Use this profile only for incoming Calling AE Title	AE Title as configured in the host	""	--	as specified by DICOM 3.0	2100,0140	M/M	2.4.1
	Use this profile only for local SCP Server	All; Called AE Title as configured in the SCP Setup	"Default_SCP"	--	as configured in the SCP Setup	2100,0070	M/M	2.4.1
	Host Profile Type	As defined in the modality database	Generic-Generic	--	As defined in the modality database	--	--	--
DICOM Settings: General Settings								
☐	Number of Copies	1…100	1	copy(s)	1…100	2000,0010	U/M	--
☐	Print Priority	"HIGH"/"LOW"	"LOW"	--	HIGH/LOW	2000,0020	U/M	--
☐	Polarity	"NORMAL"/"REVERSE"	"NORMAL"	--	NORMAL, REVERSE	2020,0020	U/M	--
☐	Pixel Size	1…1000\1…1000	1/1 (Not Absolute)	- / mm	1…1000\1…1000	0028,0034	MC/M	--
☐	Film destination (Output Trays)		--	--	PROCESSOR	2000,0040	MC/M	--
DICOM Settings: Film Settings								
☐	Film Orientation	PORTRAIT/LANDSCAPE	"PORTRAIT"	--	PORTRAIT/LANDSCAPE	2010,0040	U/M	--
☐	Trim	YES/NO	"NO"	--	YES, NO	2010,0140	U/U	--
☐	Film Size ID	"" 8INX10IN 10INX12IN 11INX14IN 14INX14IN 14INX17IN	""	--	8INX10IN 10INX12IN 11INX14IN 14INX14IN 14INX17IN	2010,0050	U/M	2.4.2.2.1
☐	Medium Type	""/BLUE FILM/CLEAR FILM	""	--	BLUE FILM/CLEAR FILM/MAMMO BLUE FILM/ MAMMO CLEAR FILM	2000,0030	U/M	2.4.2.2.1
	PRINT if 'Film Size ID' and/or 'Medium Type' is not supported?	YES/NO	"YES"	--	--	--	--	2.4.2.2.1
	PRINT if Application Type' is not supported?	YES/NO	"NO"	--	--	--	--	2.4.2.2.1
☐	Initial allocated memory size per printjob			Mbytes		--	--	--
DICOM Settings: IMAGE QUALITY Settings								
☐	Kernel	"Site" "NearestNeighbour" "Bilinear" "CubicB" "CubicHres" "CubicBell"	"Site"	--	NONE/REPLICATE/BILINEAR/ CUBIC	2010,0060	U/M	2.4.2.2.2
	Smooth factor	0/-5….+4.9/0,1…+10		--	0/100…199/200…299	2010,0080	U/U	2.4.2.2.2
☐	Magnification	max/none/custom/true size	max	--	max/none/custom/true size	2010,0060 2020,0030	U/U U/U	2.4.2.2.2
☐	Decimate/Crop behavior	Disabled, Crop, Decimate and Failt	Disabled	--	Disabled, Crop, Decimate and Failt	2020,0040	U/U	2.4.2.2.3
DICOM Settings: Look Up Table								

Ov.	Field	Allowed BROWSER Values	Default Value	Unit	Supported Values	DICOM Attribute	Usage SCU/SCP	Details see …
☐	Perception LUT	LINEAR/KANAMORI/Kanamori_Like/CUSTOM	KANAMORI	--	LINEAR/KANAMORI/Kanamori_Like/	2010,0150	U/M	2.4.5
	Kanamori_Like value	75 …220	""	--	75 …120 …220	2010,0150	U/M	2.4.5
	CUSTOM value	OEMxxx (in c:\luts)	""	--	OEMxxx(001➔999)	2010,0150	U/M	2.4.5
	LR Like	off, low, medium, high	off	--	off, low, medium, high	--	--	--
DICOM Settings: Presentation LUT								
☐	Illumination	1 … 10.000	2000	cd/m^2	1 … 10.000	2010,015E	U/M	--
☐	Reflected Ambient Light	0 … 10.000	10	cd/m^2	0 ... 10.000	2010,0160	U/M	--
DICOM Settings: DENSITY Settings								
☐	Border Density	BLACK/WHITE/10…400	"BLACK"	ODx100	BLACK/WHITE/i(10…400)	2010,0100	U/U	2.4.4
☐	Empty Image Density	BLACK/WHITE/10…400	"BLACK"	ODx100	BLACK/WHITE/i(10…400)	2010,0110	U/U	2.4.4
☐	Minimum Density	""/0 … 150	""	ODx100		2010,0120	U/U	2.4.4
☐	Maximum Density	Site, custom (""/150…400)	"Site"	ODx100		2010,0130	U/M	2.4.4
DICOM Settings:ANNOTATION Settings								
☐	Header Annotation Contents	None, Site, Custom	"NONE"	--		--	--	2.4.6
	Header Annotation Font	Site, Custom	"Site"	--		--	--	2.4.6
☐	Footer Annotation Contents	None, Site, Custom	"NONE"	--		--	--	2.4.6
	Footer Annotation Font	Site, Custom	"Site"	--		--	--	2.4.6
PRINTER Settings:								
	Window	0…100		%	0…100	--	--	--
	Level	0…100		%	0…100	--	--	--
	Image Orientation	R0,R90,R180,R270 M0,M90,M180,M270	"R0"	--	R0,R90,R180,R270 M0,M90,M180,M270	--	--	--
	Conformance/Status Level	0,1	0	--	0,1	--	--	0
	nevent_enabled	0,1	0	--	ON, OFF	--	--	2.4.2.2.5
	Mammo modality	Site, Yes, No		--	Site, Yes, No			2.4.2.2.1
	Mammo CWR Rotations	Site, Yes, No		--	Site, Yes, No	--	--	--
PRINTER Settings:								
	association time_out	0....86.400	0	seconds	0....86.400	--	--	--
	Image time_out	0.....600	0	seconds	0.....600	--	--	--
	Allow IMPLICIT VR LITTLE ENDIAN	checked/unchecked	checked	--	checked/unchecked	--	--	--
	Allow EXPLICIT VR LITTLE ENDIAN	checked/unchecked	checked	--	checked/unchecked	--	--	--
	Allow EXPLICIT VR BIG ENDIAN	checked/unchecked	checked	--	checked/unchecked	--	--	--
	Resolution		--	dpi		--	--	--
	Supported SOP Classes		--	--		--	--	--
	Early processing allowed		on	--	on / off	--	--	--

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2.4.2.2.1   Behavior for supported / unsupported films (size, medium, application)

Medium Type' and 'Film Size ID': If no values were sent for 'Medium Type' and 'Film Size ID' (""), then the film in TRAY 1 is used. If TRAY 1 is EMPTY, then the film in TRAY 2 is used. If a value was sent for 'Medium Type' or 'Film Size ID', then this is an additional condition to decide which film to use.

If a value was sent for 'Film Size ID' or 'Medium Type', the following functionality applies:

Table 2.4-5: 'Film Size ID' and 'Medium Type' Functionality

Requested Film Size ID Medium Type Supported?	Requested Film Size ID Medium Type Available?	Printer Behavior
Yes	Yes	Printer **prints** on requested film size.
Yes	No	Film is not printed, print job is **queued**.
No	-	Depends on the setting for 'PRINT if 'Film Size ID' and/or 'Medium Type' is not supported?' If the sent value for 'Film Size ID' is not supported (ex. 10INX14IN), and '**print if 'Film Size ID' and/or 'Medium Type' is not supported? = YES' (=default)**, then the parameter value for 'Film Size ID' defines the behavior. Two cases are possible: Film size ID is configured: This film size is always used. Film size ID is not configured: "": A "BEST FIT" algorithm is applied, the chosen Film Size fits as close as possible to the sent value, taking into account the available Film Sizes. If the sent value is in between 2 film sizes, the bigger one has to be used. This functionality means that a Host can send a supported film size. But a Host can also send a non-supported Film Size. In this case, the image will be printed on a Film Size that is configured by setting the value of the parameter "Film Size ID". The 'OVERRULE FLAG' of this parameter may not be set. The same principle applies if a non-supported value for 'Medium Type' was sent (ex. PAPER) and '*print if 'Film Size ID' and/or 'Medium Type' is not supported? = YES'*. The parameter value for 'Medium Type' defines the behavior. Three settings are possible: **""**: Both "BLUE FILM" and "CLEAR FILM" can be used. **"BLUE FILM"**: BLUE FILM will always be used. **"CLEAR FILM"**: CLEAR FILM will always be used. If '**print if 'Film Size ID' and/or 'Medium Type' is not supported? = NO (no default) '**The printjob is **rejected** and status code 106 (Invalid Attribute Value) will be sent

Film Size ID / Medium Type:
The printer will always validate the DICOM requested Film size ID and Medium Type, according to the printer configuration. Medium Type is requested under the Film Session parameter set. Film Size ID is requested under the Film Box parameter set.

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In case the parameter "Print if Film Size and / or Medium Type is not supported" is NO, only complete mapping (=requested Size and requested Type is present) is applied.

If not complete mapping an Error is returned.
When the parameter "Print if Film Size and / or Medium Type are not supported" is YES, the printer does a best fit where preference is given to big size where it is not indicated. The best fit takes into account the settings of the User Profile.
User profile contents will be used where DICOM is not given a requested value, or the User Profile value is even overruling the DICOM value when the overruling flag is set.

Application (Mammo):

On top of Film Size ID and Medium Type a validation is done on the requested application. A special application (for example: Mammo) can be required via the indication in the User Profile. When the User Profile specifies Mammo as application, the printer will check for the presence of mammo film as indicated in the printer configuration. In case a conflict exists and the parameter "PRINT if Application Type' is not supported?" is NO, priority is given to the application above film size and Medium Type.

Overview Priority:

Table 2.4-6: Print Priority

Print Priority		
Prio.	**Parameter**	**Example**
1	Application	"Mammo"…
2	Film Size Id	14INX17IN"…
3	Medium Type	"Clear base"…

2.4.2.2.2   Kernel and Magnification

Kernel – Magnification: These parameters are the replacements for the DICOM attributes 'Magnification Type' and 'Smoothing Factor'. For valid translations, refer to Table 2.4-7.

Table 2.4-7: Valid Translations

Host Profile		DICOM Message	
KERNEL	**Magnification**	**Magnification Type** **(2010, 0060)**	**Smoothing Type** **(2010,0080)**
Magn. Type: not applicable *Smooth Factor:* not applicable	None	NONE	Not applicable
Magn. Type: "NearestNeighbour" *Smooth Factor:* not applicable	Max	REPLICATE	Not applicable
Magn. Type: "Bilinear" *Smooth Factor:* not applicable	Max	BILINEAR	Not applicable
Magn. Type: "CubicB" *Smooth Factor:* not applicable	Max	CUBIC	0
Magn. Type: "CubicHighRes" *Smooth Factor:* -0.7 (-5.0<value<+4.9)	Max	CUBIC	143 (100-199)
Magn. Type: "CubicBell" *Smooth Factor:* +0.9 (0,1<value<5,9)	Max	CUBIC	245 (200-299)

Choosing the correct interpolation type according to the type of application:
The default value is defined by the device software during printer start-up (DRYSTAR devices: CubicHighRes –0.7).
However, depending on the type of application, other interpolation settings can be preferred by the user.

For images with an image matrix which exactly matches the pixel matrix of the printable area (see also section 2.4.3-Pixel Matrices), in principle no interpolation is done. However, an exception is made with the interpolation setting CubicBell (with Smooth Factor <> 1). With these settings the images are processed in order to obtain a better perception of the image.

Custom scale factor:
The image is magnified to the number of times specified in the 'Custom scale factor' window.

True Size max deviation:
The 'True Size max deviation' parameter is ONLY applicable with magnification = 'True Size' in combination with the parameter 'Decimate/Crop behavior'.
The 'True Size max deviation' parameter defines the allowed percentage of **downwards scaling** before **cropping** an image.
Remark: the parameter does not allow negative values.

2.4.2.2.3   Decimate and Crop behavior

The requested Decimate/Crop is applied when the image size is larger than the image box.

Below Table 2.4-8 gives an overview of the Decimate/Crop Behavior and the requested magnification when configured via Host Profile or sent via DICOM Message.

The Requested Decimate / Crop behavior is determined from:

1. the parameter in the host profile with overrule flag on

2. the parameter in the print job

3. the parameter in the host or in the site profile with overrule flag off

The Requested magnification is determined from:

1. the parameter Magnification in the host profile with overrule flag on

2. the parameter Requested Image Size (~ Magnification = True size) in the print job

3. the parameter in the host profile or in the site profile with overrule flag off

Table 2.4-8: Decimate&Crop behavior and requested magnification

Host Profile		DICOM Message	Behavior when image size is larger than image box
Decimate Crop behavior	Magni-fication	Req. Dec./Crop Behavior Magnification Type and Request Image Size attributes	
CROP	Max	2020,0040=CROP 2010,0060=REPLICATE, BILINEAR or CUBIC	The image will be **CROPPED** to fit the image box
CROP	True size	2020,0040=CROP 2010,0060=REPLICATE, BILINEAR or CUBIC 2020,0030=width in mm	The image will be **CROPPED** to fit the image box (after applying true size max deviation).

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Host Profile		DICOM Message	Behavior when image size is larger than image box
Decimate Crop behavior	**Magni-fication**	**Req. Dec./Crop Behavior Magnification Type and Request Image Size attributes**	
CROP	None	2020,0040=CROP 2010,0060=NONE	The image will be **CROPPED** to fit the image box.
CROP	Custom	2020,0040=CROP 2010,0060=REPLICATE, BILINEAR or CUBIC	The image will be **CROPPED** to fit the image box (after applying the custom scaling)
DECIMATE	Max	2020,0040=DECIMATE 2010,0060=REPLICATE, BILINEAR or CUBIC	The image will be **DECIMATED** to fit the image box.
DECIMATE	True size	2020,0040=DECIMATE 2010,0060=REPLICATE, BILINEAR or CUBIC 2020,0030=width in mm	**FAIL** (after applying true size max deviation).
DECIMATE	None	2020,0040=DECIMATE 2010,0060=NONE	**FAIL**
DECIMATE	Custom	2020,0040=DECIMATE 2010,0060=REPLICATE, BILINEAR or CUBIC	**FAIL** (after applying true size max deviation).
FAIL	Max	2020,0040=FAIL 2010,0060=REPLICATE, BILINEAR or CUBIC	**FAIL**
FAIL	True size	2020,0040=FAIL 2010,0060=REPLICATE, BILINEAR or CUBIC 2020,0030=width in mm	**FAIL**
FAIL	None	2020,0040=FAIL 2010,0060=NONE	**FAIL**
FAIL	Custom	2020,0040=FAIL 2010,0060=REPLICATE, BILINEAR or CUBIC	**FAIL**
DISABLED	Max	2010,0060=REPLICATE, BILINEAR or CUBIC	The image will be scaled (**DECIMATED**) to fit the image box.
DISABLED	True size	2010,0060=REPLICATE, BILINEAR or CUBIC 2020,0030=width in mm	The image will be printed with requested magnification (=true size) and image size and the image will be **CROPPED** to fit the image box.
DISABLED	None	2010,0060=NONE	The image will be printed with requested magnification=NONE and the image will be **CROPPED** to fit the image box.
DISABLED	Custom	2010,0060=REPLICATE, BILINEAR or CUBIC	The image will be printed with magnification=custom and the image will be **CROPPED** to fit the image box

2.4.2.2.4   DICOM 'Printer Status' and 'Printer Status Info' behavior

Two printer status levels are defined:

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- Conformance / Status Level = 0 (default setting):
    The printer either returns NORMAL or FAILURE status to the host (SCU).

- Conformance / Status Level = 1:
    The printer additionally returns WARNING status to the host (SCU)

The DICOM printer status behavior is as follows:

Table 2.4-9: DICOM 'Printer Status' and 'Printer Status Info' behavior

DRYSTAR AXYS			DICOM print message communication			
condition			Status Level 0		Status Level 1	
Status displayed	*Receive jobs?*	*Dicom Printing possible?*	*Printer Status*	*Printer Status Info*	*Printer Status*	*Printer Status Info*
Start-up (power on) Self Test	NO	NO	FAILURE	PRINTER DOWN	FAILURE	PRINTER DOWN
Ready	YES(**)	YES	NORMAL	NORMAL	NORMAL	NORMAL
Waiting	YES(**)	YES	NORMAL	NORMAL	NORMAL	NORMAL
Calculating	YES(**)	YES	NORMAL	NORMAL	NORMAL	NORMAL
Printing	YES(**)	YES	NORMAL	NORMAL	NORMAL	NORMAL
Warning	YES(**)	YES(***)	NORMAL	NORMAL	NORMAL	NORMAL
Incident						
- empty tray	YES(**)	YES(*)/NO	NORMAL	NORMAL	WARNING	SUPPLY EMPTY
- tray open	YES(**)	NO	NORMAL	NORMAL	WARNING	BAD SUPPLY MGZ
- film jam	YES(**)	NO	NORMAL	NORMAL	WARNING	FILM JAM
- cover open	YES(**)	NO	NORMAL	NORMAL	WARNING	COVER OPEN
- RF-TAG Error	YES(**)	YES(*)/NO	NORMAL	NORMAL	WARNING	SUPPLY PROBLEM
Error	NO	NO	FAILURE	PRINTER DOWN	FAILURE	PRINTER DOWN
Key Operator	YES	NO	NORMAL	NORMAL	WARNING	PRINTER OFFLINE
- Stop printing	NO	NO	FAILURE	PRINTER DOWN	FAILURE	PRINTER DOWN
- Show Settings	YES	NO	NORMAL	NORMAL	WARNING	PRINTER OFFLINE
- Change Settings	NO	NO	FAILURE	PRINTER DOWN	FAILURE	PRINTER DOWN
- Print Image	YES	NO	NORMAL	NORMAL	WARNING	PRINTER OFFLINE
- Save Config.	YES	NO	NORMAL	NORMAL	WARNING	PRINTER OFFLINE
- Restore Config	NO	NO	FAILURE	PRINTER DOWN	FAILURE	PRINTER DOWN
- Calibration (*film*)	YES	NO	NORMAL	NORMAL	WARNING	PRINTER OFFLINE
- Quality Control	YES	NO	NORMAL	NORMAL	WARNING	PRINTER OFFLINE
- Installation	NO	NO	FAILURE	PRINTER DOWN	FAILURE	PRINTER DOWN
Service	NO	NO	FAILURE	PRINTER DOWN	FAILURE	PRINTER DOWN
Shut down (power off)	NO	NO	FAILURE	PRINTER DOWN	FAILURE	PRINTER DOWN

(*)	printing from other tray might be possible
(**)	can receive image(s) until available print spooling memory is filled.
(***)	depending on warning / incident nature
Warning:	printer error condition, but still possible to print but most likely with less quality. E.g. temperature sensor fail
Incident:	error condition which can be corrected by the OPERATOR. E.g. open tray; empty tray; film jam; open cover; RF-TAG error
Error:	printer error which prevent printing. E.g. drum motor out of order.

2.4.2.2.5   N-EVENT-REPORT messages

By default, the asynchronous N-EVENT-REPORT messages are disabled for both 'Printer SOP Class' and 'Print Job SOP Class'.

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With a specific SCU configuration it is possible to enable asynchronous N-EVENT-REPORT messages.

2.4.3   Pixel Matrices

The following diagnostic areas without TRIM are valid for GENRAD printing per Film Size ID:

Table 2.4-10: Pixel Matrices GENRAD applications

| Film Size | NO annotations | | | | WITH annotations | | | |
| | Portr.&Landsc. | | | | Portrait | | Landscape | |
	Width & Height (Pixels)		Width & Height (Millimeters)		Width	Height	Width	Height
8INX10IN	3852	4880	192.6	244.0	3852	4300	4880	3272
10INX12IN	4880	5860	244.0	293.0	4880	5280	5860	4300
11INX14IN	5376	6922	268.8	346.1	5376	6342	6922	4796
14INX14IN	6882	6882	344.1	344.1	6882	6302	6882	6302
14INX17IN	6922	8368	346.1	418.4	6922	7788	8368	6342

The following diagnostic areas without TRIM are valid for MAMMO printing per Film Size ID:

Table 2.4-11: Pixel Matrices MAMMO applications

| Film Size | NO annotations | | | | WITH annotations | | | |
| | Portr.&Landsc. | | | | Portrait | | Landscape | |
	Width & Height (Pixels)		Width & Height (Millimeters)		Width	Height	Width	Height
8INX10IN	3828	4958	191.4	247.9	3828	4378	4958	3248
10INX12IN	4892	5810	244.6	290.5	4892	5230	5810	4312
11INX14IN	5376	6922	268.8	346.1	5376	6342	6922	4796

The Pixel Size is 50μm (micrometer). This yields 20 pixels/mm.

If a TRIM is applied, then 10 pixels are used for this purpose on each side of the image. This results in a printable area that has 20 pixels less rows and columns.

For the DRYSTAR AXYS printer the 'Modality Type' of a modality sending print jobs can be defined in a DICOM Host Profile. By default the DRYSTAR AXYS handles print jobs as 'No mammo' (or genrad), unless the modality was configured as 'mammo' modality in a DICOM Host Profile.

2.4.4   Densities

The following default behavior is applicable for attributes 'Border Density' (2010,0100), 'Empty Image Density' (2010,0110), 'Minimum Density' (2010,0120) (Db_{min}) and/or 'Maximum Density' (2010,0130) (Db_{max}):

- If the attribute is not sent or no attribute value ("") is sent, then the values are mapped to the Dmin and Dmax values that are valid for the corresponding film (Film

![AGFA logo]

Size ID and Medium Type) available in the trays. The values can change after a 'Film Calibration'.

- If a value is present, and the value is within the range for the corresponding film, then the sent value is applied.

- If a Dbmin or Dbmax value is present, but the value is outside the range for the corresponding film, then default behavior is that the value is mapped to the respective Dmin or Dmax value that is valid for the corresponding film type.

2.4.5   Configuration Information

This attribute can be used to define the Perception LUT and the contents of the Annotation Boxes. The individual parameters defined are separated by the "\"(BACKSLASH) character.

Example: "PERCEPTION_LUT=LINEAR\ANNOTATION1=PATIENTID\ANNOTATION2=AGFA.TIF"

Perception LUT: the following values are supported:

▪	PERCEPTION_LUT=LINEAR	Linear Perception LUT
▪	PERCEPTION_LUT=KANAMORI	Kanamori Perception LUT
▪	PERCEPTION_LUT=n	Kanamori Like Perception LUT
▪	PERCEPTION_LUT=OEMxxx	Custom OEM Perception LUT installed on the printer

When "PERCEPTION_LUT=n" is used, 'n' is defined in the range 75 to 220 as follows:

Table 2.4-12: Kanamori Like values

N	Kanamori Like Perception LUT meaning
< 100	Hyper-Kanamori Curve
100	Exact Kanamori Curve(same as "PERCEPTION_LUT=KANAMORI")
100…200	Curve between Kanamori and Linear
200	Exact Linear Curve (same as "PERCEPTION_LUT=LINEAR")
> 200	Hypo-Linear Curve

If Perception LUT is not defined by the SCU AE, the default Perception LUT value is used.

Annotation: each Annotation box can be initialized with the word 'ANNOTATION' followed by a number 1 to 6 an equal sign (=) and an information indication.

The information indication can be (see section 2.4.6 -Annotations):

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- The contents of a TIFF formatted file

- Variable demographic data

- Fixed text

- System variable attribute

2.4.6　　　　Annotations

When annotations are sent by the SCU AE or enabled on the printer using DICOM Profiles, the ADPM always applies two annotation boxes, i.e. header and footer annotations.
The height of each annotation is fixed, i.e. 12mm.

2.4.6.1　　　Annotation mapping rules

When the printers get input for 6 annotations, they are mapped to 2 (header and footer annotation). When more than 6 annotation items are presented to the printer, the extra items are ignored by the printer.

The mapping occurs as follows:

- If 1,3 and 4 are specified, all are left aligned in the Header annotation box

- If 2,5 and 6 are specified, all are left aligned in the Footer annotation box

- If 3 and 4 are specified, both are right aligned in the Header annotation box

- If 5 and 6 are specified, both are right aligned in the Footer annotation box

2.4.6.2　　　Annotation text strings

Each annotation box can contain following text strings:

2.4.6.2.1　　The contents of a TIFF formatted file

This is used to print a logo, symbol or icon in the annotation box.

The information cannot be combined with other annotation information and must be in an annotation box by itself.

The *.TIF file must first be installed in the printer.

<filename>.TIF	Is used to print a logo on a film.
	The annotation file '<filename>.TIF' has to be present on the hardcopy device at the following location: **'c:/logos/'**
%logo:<filename>.TIF%	An extension '.TIF' has to be added to each annotation filename.
	The annotation file '<filename>.TIF' has to be present on the hardcopy device at the following location: **'c:/logos/'**

e.g.: ANNOTATION3=%logo:/logos/agfa.TIF%

2.4.6.2.2　　Variable demographic data

This is used to print one of the attribute values that are provided in the N-CREATE Film Session SOP under "Proposed Study Sequence".

Example: %PATIENTNAME%

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The following values are defined:

Table 2.4-13: Annotation Field Names

Field Names	Attribute
%PATIENTNAME%	(0010,0010)
%PATIENTID%	(0010,0020)
%PATIENTBIRTHDATE%	(0010,0030)
%ACCESSIONNR%	(0008,0050)
%PATIENTBIRTHTIME%	(0010,0032)
%PATIENTSEX%	(0010,0040)
%PATIENTCOMMENTS%	(0010,4000)
%STUDYID%	(0020,0010)
%STUDYIUID%	(0020,000D)
%STUDYDATE%	(0008,0020)
%STUDYTIME%	(0008,0030)
%STUDYDESCRIPTION%	(0008,1030)
%READINGPHYSICIAN%	(0008,1060)
%REFERRINGPHYSICIAN%	(0008,0090)

2.4.6.2.3 Fixed text

Any required text to be printed on the film.
Example: **Medical Center Radiology Department**

2.4.6.2.4 System variable attribute

This is used to print any of the following system variables on the film:

%date%	The actual system date and time will be printed.
%nickname%	The modality nickname as specified in the system configuration will be printed.
%modalitypagenumber%	The actual page number within the film session will be printed.

Combining the fixed text' with variable demographic data and/or system variables is possible.
Example: ANNOTATION3=Patient ID: %date% %patientid% Patient Name: %patientname%

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3   MEDIA INTERCHANGE

ADPM does not support Media Interchange.

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4   SUPPORT FOR EXTENDED CHARACTER SETS

ADPM supports the following character sets:

• ISO-IR 100	Latin Alphabet No. 1
• ISO-IR 144	Latin/Cyrillic Alphabet supplementary set

5   SECURITY

Within the healthcare industry, several standardization efforts are ongoing as a response to Privacy and Security legislation and regulations. The purpose of this standardization for hospitals and vendors is to enable information sharing, interoperability and to support the workflow of hospitals in a multiple vendor environment.

In order to allow hospitals to comply with HIPAA regulations (Health Insurance Portability and Accountability Act) and to meet the IHE standards (Integrated Healthcare Enterprise) some security features are included in DRYSTAR AXYS (configurable via the web pages only: under 'Security tools').

5.1   Product Authentication

HIPAA supported products that communicate with DICOM use the Transport Layer Security (TLS) protocol. The TLS protocol uses public key certificates for client and server authentication (X.509).

5.2   Product Accountability

HIPAA supported products require some level of user and system activity to be recorded. As a consequence of these actions, audit records are to be sent to and observed at an Audit Record Repository (ARR).

5.3   Product User Authentication

'User Authentication' of HIPAA products involves password protection for access to User, Key operator, Service Security/ Administrator and other user interfaces that allow access to protected health information (PHI).

The last two functions are available when access to the Administrator is granted (i.e. when the Administrator password has been entered correctly).