AGFA HEALTHCARE
DICOM Conformance Statement

DRYSTAR 5301

Document Number: 001538 - Revision 1.0
Livelink NodeID: 54647484

When printed, this is NOT a controlled copy

Document Information

Service-related contact information worldwide	All service-related contact information is available on this URL→	http://www.agfahealthcare.com/global/en/main/contact/index.jsp

Issued by:
Agfa HealthCare
SIV Connectivity
Septestraat 27
B-2640 Mortsel
Belgium

tel: +32 3 444 7588
email: connectivity@agfa.com

Conformance Statement Overview

This product, DRYSTAR 5301, 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 5302 medical printer.

Table 1.1-1: Network Services Supported

SOP Classes		User of Service (SCU)	Provider of Service (SCP)
Name	**UID**		
Verification SOP Class	1.2.840.10008.1.1	No	Yes
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

Table of Contents

1 INTRODUCTION

1.1 Revision Record

Revision Number	Date	Reason for Change
1.0	2016-04-28	Initial version for DRYSTAR 5301

1.2 Purpose and Intended Audience of this Document

This document is a DICOM Conformance Statement for the DICOM Services of the DRYSTAR 5301 medical printer.

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
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
GSDF	Grayscale Standard Display Function
GSPS	Grayscale Softcopy Presentation State
IE	Information Entity
IOD	(DICOM) Information Object Definition
ISO	International Standard Organizatio
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. 2016b.
- IHE Radiology Technical Framework Revision 14.0 – Final Text, July 24, 2015

2 NETWORKING

2.1 Implementation Model

2.1.1 Application Data Flow Diagram

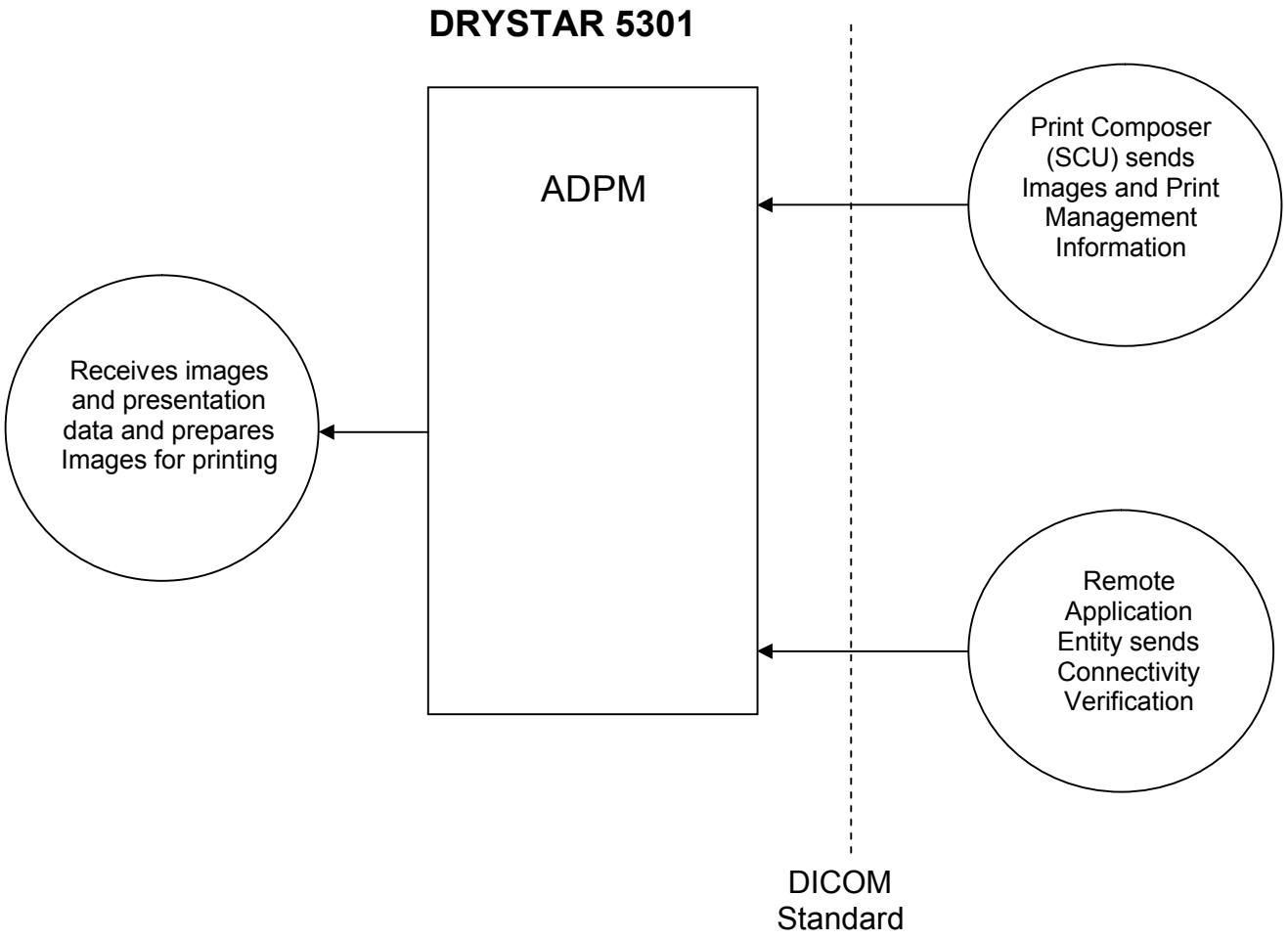


Figure 2.1-1: Functional Overview – Application Data Flow

2.1.2 Functional Definitions of AE's

2.1.2.1 Functional Capability of ADPM (SCP) Application Entity

When printing to the DRYSTAR 5301 is requested by a Service Class User (SCU), the ADPM Application Entity 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.

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	1.2.840.10008.5.1.1.1	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
Basic Annotation Box SOP Class	1.2.840.10008.5.1.1.15	No	Yes
Print Job SOP Class	1.2.840.10008.5.1.1.14	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 for the PDU's offered by the ADPM (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

Maximum number of simultaneous associations initiated	0

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

Maximum number of simultaneous associations accepted	(See note 1)

Note 1:

ADPM can accept any number of Associations, and is determined by the amount of system resources (CPU and memory) available. Moreover the maximum allowed associations is set by default to 10.

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	0

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 DTF1.0.64 (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

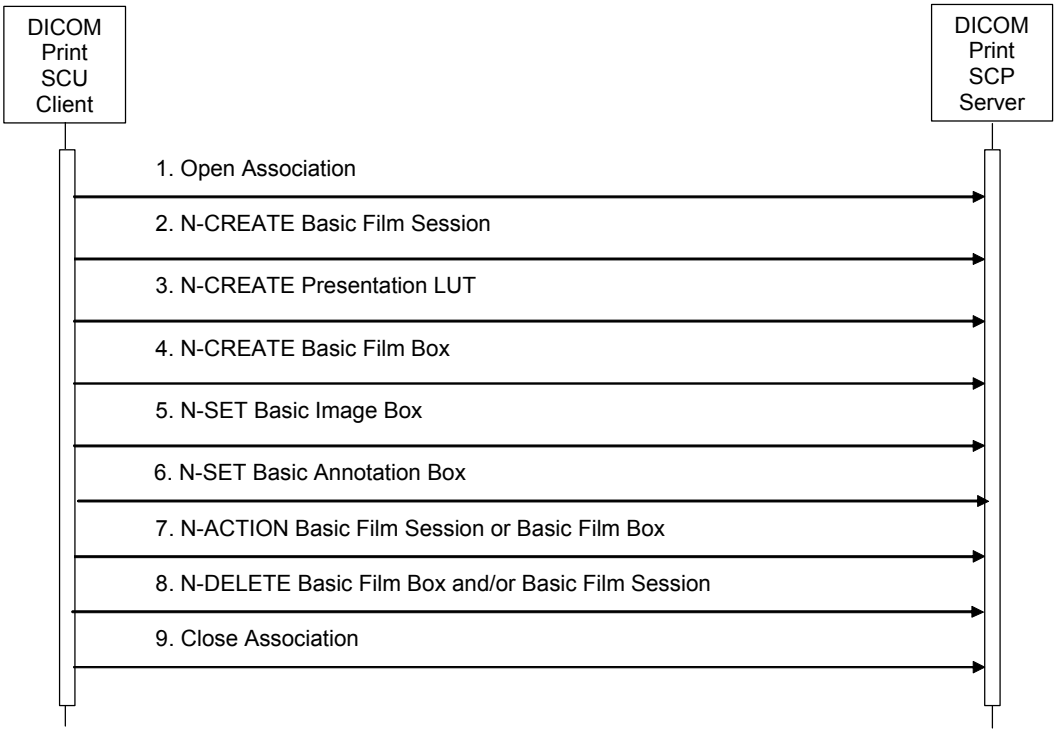
2.2.1.4.1 Activity - Print Server Management

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).

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.

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: Presentation Contexts Proposed by ADPM

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name**	**UID**		
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	SCP	None
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Basic Grayscale Print Management Meta	1.2.840.10008.1.1.9	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	SCP	None
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Basic Color Print Management Meta	1.2.840.10008.1.1.18	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	SCP	None
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
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	SCP	None
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Print Job	1.2.840.10008.5.1.1.14	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	SCP	None
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
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	SCP	None
		DICOM Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
Print Queue Management	1.2.840.10008.5.1.1.26	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	SCP	None
		DICOM Explicit VR Big Endian	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

2.2.1.4.1.3.1 Specific Conformance for Verification SOP Class

The ADPM provides standard conformance to the DICOM Verification Service Class as a SCP. The following status code is returned in response to a C-ECHO:

Table 2.2-8: C-ECHO Response Status

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

2.2.1.4.1.3.2 Specific Conformance to 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	SCU	SCP
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

2.2.1.4.1.3.2.1 Specific Conformance for Basic Film Session SOP Class

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

ADPM only supports one Basic Film Session per Association. However, a sequential Film Session on the same Association is allowed after deleting the previous Film Session.

2.2.1.4.1.3.2.2 Film Session SOP Class Operations for N-CREATE

The ADPM provides the following support for the Film Session attributes sent by the N-CREATE DIMSE service:

Table 2.2-10: Basic Film Session SOP Class N-CREATE Request Attributes

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received
Number of Copies	(2000,0010)	1 – 100	1
Print Priority	(2000,0020)	• LOW • HIGH • (MED=LOW)	LOW
Medium Type	(2000,0030)	• CLEAR FILM • BLUE FILM	See explanation below.
Film Destination	(2000,0040)	• PROCESSOR	PROCESSOR
Film Session Label	(2000,0050)	Up to 64 characters	
Memory Allocation	(2000,0060)		
Owner ID	(2100,0160)		
Proposed Study Seq.	(2130,00A0)		
>Patient's Name	(0010,0010)		
>Patient ID	(0010,0020)		
>Patient's Birth Date	(0010,0030)		
>Patient's Birth Time	(0010,0032)		
>Patient's Sex	(0010,0040)		
>Other Patient ID	(0010,1000)		
>Other Patient Names	(0010,1001)		
>Patient's Age	(0010,1010)		
>Patient's Size	(0010,1020)		
>Patient Weight	(0010,1030)		
>Ethnic Group	(0010,2160)		
>Occupation	(0010,2180)		
>Add. Patient's History	(0010,21B0)		
>Patient Comments	(0010,4000)		
>Study ID	(0020,0010)		
>Series Number	(0020,0011)		
>Study Instance UID	(0020,000D)		
>Study Date	(0008,0020)		
>Study Time	(0008,0030)		
>Accession Number	(0008,0050)		
>Ref. Physician's Name	(0008,0090)		
>Study Description	(0008,1030)		
>Name of Physician Reading Study	(0008,1060)		
>Admitting Diagnosis Description	(0008,1080)		

Medium Type Attribute:

Table 2.2-11: Medium Type

Requested 'Medium Type' Supported?	'Medium Type' Available?	Behavior
YES	YES	Requested Medium Type is used
YES	NO	Film is not printed, print job is queued
NO	NO	**Default**, this print job will be printed on the available 'Medium Type'. This behavior configurable. Refer to Section 2.4.

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

Table 2.2-12: N-CREATE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Warning (*)	Attribute Value Out of Range	0116H	Returned warning if an attribute value is out of range. The instance UID is created.
Failure	Invalid Attribute Value	0106H	Invalid Attribute Value
Failure	Invalid Object Instance	0117H	Returned if the instance UID has violated the UID construction rules.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Resource Limitation	0213H	Returned to indicate that the requested allocation can temporarily not be provided.
* Warnings are not returned by default. Enabling warnings is explained in Section 2.4.			

2.2.1.4.1.3.2.3 Film Session SOP Class Operations for N-SET Response Status

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

Table 2.2-13: N-SET Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Warning (*)	Attribute Value Out of Range	0116H	Returned warning if an attribute value is out of range. The instance UID is created.
Failure	Invalid Attribute Value	0106H	Invalid Attribute Value
Failure	Processing Failure	0110H	Returned if no data set is provided by the SCU for the Basic Film Session SOP Class.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Resource Limitation	0213H	Returned to indicate that the requested allocation can temporarily not be provided.
* Warnings are not returned by default. Enabling warnings is explained in 2.4.			

2.2.1.4.1.3.2.4 Film Session SOP Class Operations for N-ACTION

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

Table 2.2-14: N-ACTION Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Warning (*)		B602H	Film Session SOP Instance hierarchy does not contain Image Box SOP Instances (empty page).
Failure	Processing failure	0110H	Returned if no Data Set is provided by the SCU for the Basic Film Session SOP Class.
Failure	Invalid Argument Value	0115H	Returned if the Action Type provided by the SCU is not recognized.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure		C600H	Film Session SOP Instance hierarchy does not contain Film Box SOP Instances.
Failure		C601H	Returned if the support for the Print Job Class was negotiated and the creation of the Print Job Instance failed.
* Warnings are not returned by default. Enabling warnings is explained in Section 2.4.			

2.2.1.4.1.3.2.5 Film Session SOP Class Operations for N-DELETE

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

Table 2.2-15: N-DELETE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Failure	Processing failure	0110H	Returned if no Data Set is provided by the SCU for the Basic Film Session SOP Class.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

2.2.1.4.1.3.2.6 Specific Conformance for Basic Film Box SOP Class

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

The creation of a Basic Film Box also causes the subordinate Basic Image Boxes to be created. The Basic Film Box contains the presentation parameters common for all images on a given sheet of film.

2.2.1.4.1.3.2.7 Basic Film Box SOP Class Operations for N-CREATE

The ADPM provides the following support for the Basic Film Box attributes sent by the N-CREATE DIMSE service:

Table 2.2-16: Basic Film BOX SOP Class N-CREATE Request Attributes

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received
Image Display Format	(2010,0010)	• STANDARD\ • ROW\ • COL\ • SLIDE • SUPERSLIDE	
Annotation Display Format ID	(2010,0030)	• ANNOTATION (Supported if the Annotation SOP Class is accepted)	
Film Orientation	(2010,0040)	• PORTRAIT • LANDSCAPE	PORTRAIT
Film Size ID	(2010,0050)	• 8INX10IN • 10INX12IN • 11INX14IN • 14INX14IN • 14INX17IN	Refer to explanation below
Magnification Type	(2010,0060)	• REPLICATE • BILINEAR • CUBIC • NONE	CUBIC
Smoothing Type	(2010,0080)	• 0/100…199/200…299	143 (Refer to explanation below)
Border Density	(2010,0100)	• BLACK • WHITE • i, where i represents the desired density in hundredths of OD	BLACK
Empty Image Density	(2010,0110)	• BLACK • WHITE • i, where i represents the desired density in hundredths of OD	BLACK
Minimum Density	(2010,0120)	Refer to explanation below	
Maximum Density	(2010,0130)	Refer to explanation below	300
Trim	(2010,0140)	• YES • NO	No
Configuration Information	(2010,0150)	Refer to explanation below	PERCEPTION_LUT=KANAMORI
Illumination	(2010,015E)	• 1 … 10,000	2000
Reflective Ambient Light	(2010,0160)	• 0 … 10,000	10

Film Size ID Attribute:

Supported Film Sizes: The tray can handle multi-format films: 8INX10IN, 10INX12IN, 11INX14IN, 14INX14IN and 14INX17IN.

- **Pixel Size:** 79.375 Micron (320 dots/ inch)
- **Pixel Matrices**: Table 2.2-17 lists the diagnostic printable areas, without TRIM, that are valid. If TRIM is YES, then 6 pixels are used for this purpose on each edge of each image.

Table 2.2-17: Pixel Matrices

DRYSTAR 5301							
		NO annotations		WITH annotations			
		Portr.&Landsc.		Portrait		Landscape	
Modality Type	Film Size	Width & Height		Width	Height	Width	Height
all	8INX10IN	2376	3070	2376	2705	3070	2011
	10INX12IN	3070	3653	3070	3288	3653	2705
	11INX14IN	3348	4358	3348	3993	4358	2983
	14INX14IN	4358	4303	4358	3938	4303	3993
	14INX17IN	4358	5232	4358	4867	5232	3993

- **Film Sizes**: With respect to Film Size ID, the following rules are applicable:

Table 2.2-18: 'Supported' and 'Not Supported' Film Sizes.

Requested 'Film Size ID' Supported?	Requested 'Film Size' Available?	Behavior
YES	YES	The film is printed.
YES	NO	The film is not printed, and print job is queued.
NO	NO	The film is printed on the available film. This behavior can be configured differently. See Section: 2.4.

Smoothing Type Attribute:

- For Magnification type: "CUBIC", following Smoothing Type values are supported:

Table 2.2-19: Smoothing Type Values.

Value	Meaning
0	Cubic B (very smooth), but less smooth than LINEAR
100-199	Cubic High Resolution (100= Sharp, 199= Smooth) Remark: For this interpolation type, the value which usually gives the best interpolation result is 143 (=default).
200-299	Cubic Bell (200= Sharp, 299=Smooth) Remark: For this interpolation type, the value which usually gives the best interpolation result is 245 (=default).

- If the Magnification Type is "CUBIC" and no Smoothing Type attribute is defined, the default Smoothing Type value is used.

Density Attributes:

The following rules are applicable for 'Border Density' (2010,0100), 'Empty Image Density' (2010,0110), 'Minimum Density' (2010,0120) (Dbmin) and 'Maximum Density' (2010,0130) (Dbmax):

- If a value is sent, and within the range for the film, then the sent value is used.
- If the attribute is not sent or no attribute value is sent (""), then the default values are used.
- If a Minimum Density value is sent, but outside the range of the film, then the default value is used.
- If a Maximum Density value is sent, but outside the range of the film, then the default value is used.

Configuration Information Attribute:

This attribute is used to request a LUT and / or define the contents of the Annotation Boxes. The parameters are separated by the "\" (BACKSLASH) character.

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

- **Requested LUT**: The following text strings are supported:

PERCEPTION_LUT=LINEAR (Linear LUT)
PERCEPTION_LUT=KANAMORI (Kanamori LUT)
PERCEPTION_LUT=OEMxxx (Custom OEM LUT installed on printer)
PERCEPTION_LUT=n: 'n' is defined in the range 75 to 220 as follows

Table 2.2-20: LUT values.

N	Kanamori Like LUT meaning
75…100	Hyper-Kanamori Curve
100	Exact Kanamori Curve (same as "PERCEPTION_LUT=KANAMORI")
101…199	Curve between Kanamori and Linear
200	Exact Linear Curve (same as "PERCEPTION_LUT=LINEAR")
200…220	Hypo-Linear Curve

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

The contents of a TIFF formatted file:
This is used to print a logo, symbol or icon in the annotation box. This 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/'**

Example: ANNOTATION2=AGFA.TIF

Note:

A 'logo' has to be in a separate annotation box. It cannot be combined with other annotation information.

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

Variable demographic data: is used to print one of the attribute values as provided in the N-CREATE Film Session SOP under "Proposed Study Sequence".
Example: ANNOTATION2=%PATIENTNAME%
The following values are defined:

Table 2.2-21: 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)

Fixed text: Any text that's needed to be printed on the film.
Example: ANNOTATION4= Medical Center Radiology Department

System variable attribute: Used to print any of the following system variables:

%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.

Any combination of 'fixed text'' with 'variable demographic data' and/or 'system variables':

Example: ANNOTATION3=Patient ID: %patientid% Patient Name: %patientname%
ANNOTATION4=Registration: %accessionnr%
ANNOTATION5=Film nr. %modalitypagenumber%

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

Table 2.2-22: N-CREATE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Warning (*)	Attribute Value Out of Range	0116H	Returned if an attribute value is out of range. The instance UID is created.
Warning (*)	Density Value outside printers range	B605H	Returned if Dmin or Dmax value is outside of printers operating range
Failure	Invalid Attribute Value	0106H	Invalid Attribute Value

Service Status	Further Meaning	Error Code	Reason
Failure	Processing Failure	0110H	Returned if no Data Set is sent by the SCU for the Basic Film Box SOP Class.
Failure	Invalid Object Instance	0117H	Returned if the instance UID has violated the UID construction rules.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	Missing Attribute	0120H	Returned if a mandatory attribute of the Data Set is missing.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Creation of Print Job failed	C602H	Print Job SOP Class was negotiated but failed to create the Print Job instance.
Failure	Print Queue is Halted	C651H	New jobs are not accepted.
* Warnings are not returned by default. Enabling warnings is explained in Section 2.4			

2.2.1.4.1.3.2.8 Basic Film Box SOP Class Operations for N-SET

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

Table 2.2-23: N-SET Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Warning (*)	Attribute Value Out of Range	0116H	Returned warning if an attribute value is out of range. The instance UID is created.
Warning (*)	Density Value outside printers range	B605H	Returned if Dmin or Dmax value is outside of printers operating range
Failure	Invalid Attribute Value	0106H	Invalid Attribute Value
Failure	Processing Failure	0110H	Returned if no Data Set is sent by the SCU for the Basic Film Box SOP Class.
Failure	Invalid Object Instance	0117H	Returned if the instance UID has violated the UID construction rules.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	Missing Attribute	0120H	
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
* Warnings are not returned by default. Enabling warnings is explained in Section 2.4.			

2.2.1.4.1.3.2.9 Basic Film Box SOP Class Operations for N-ACTION

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

Table 2.2-24: N-ACTION Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Warning (*)	Empty page	B603H	Film Session SOP Instance hierarchy does not contain Image Box SOP Instances (empty page).
Failure	Invalid Argument Value	0115H	Returned if the Action Type provided by the SCU is not recognized.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure		C602H	Returned if the support for the Print Job Class was negotiated and the creation of the Print Job Instance failed.
* Warnings are not returned by default. Enabling warnings is explained in Section 2.4.			

2.2.1.4.1.3.2.10 Basic Film Box SOP Class Operations for N-DELETE

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

Table 2.2-25: N-DELETE Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Failure	Processing failure	0110H	Returned if no Data Set is provided by the SCU for the Basic Film Session SOP Class.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

2.2.1.4.1.3.2.11 Specific Conformance for Basic Grayscale Image Box SOP Class

The Basic Grayscale Image Box SOP instance is created by the ADPM when 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.

The ADPM provides support for the following DIMSE Services:

- N-SET

2.2.1.4.1.3.2.12 Basic Grayscale Image Box SOP Class Operations for N-SET

The ADPM provides the following support for the Basic Grayscale Image Box attributes sent by the N-SET DIMSE service:

Table 2.2-26: Basic Grayscale Image Box SOP Class N-SET Request Attributes

Attribute	Tag	Valid Range	Default Value If not sent by SCU or invalid value received
Magnification Type	(2010,0060)	Refer to Section 2.2.1.4.1.3.2.2.1	
Smoothing Type	(2010,0080)	Refer to Section 2.2.1.4.1.3.2.2.1	
Minimum Density	(2010,0120)	Refer to Section 2.2.1.4.1.3.2.2.1	
Maximum Density	(2010,0130)	Refer to Section 2.2.1.4.1.3.2.2.1	
Image Position	(2020,0010)	1 - x (depending layout)	
Polarity	(2020,0020)	• NORMAL • REVERSE	NORMAL
Requested Image Size	(2020,0030)		No default
Basic Grayscale Image Sequence	(2020,0110)		
>Samples Per Pixel	(0028,0002)	1	
>Photometric Interpretation	(0028,0004)	• MONOCHROME1 • MONOCHROME2	
>Rows	(0028,0010)	> 0	
>Columns	(0028,0011)	> 0	
>Pixel Aspect Ratio	(0028,0034)		1\1
>Bits Allocated	(0028,0100)	8 to 16	
>Bits Stored	(0028,0101)	8 to 12	
>High Bit	(0028,0102)	7 to 15	
>Pixel Representation	(0028,0103)	0, 1	0
>Pixel Data	(7FE0,0010)		
Ref. Presentation LUT Seq.	(2050,0500)		
>Ref. SOP Class UID	(0008,1150)		
>Ref. SOP Instance UID	(0008,1155)		

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

Table 2.2-27: N-SET Response Status BIB

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Warning (*)	Attribute out of range	0116H	Returned if an attribute is out of range. The instance UID is created.
Warning (*)	Requested density outside printers range	B605H	The printer will use its respective minimum or maximum density value instead.
Failure	Invalid attribute value	0106H	
Failure	Processing failure	0110H	Returned if no Data Set is provided by the SCU for the Basic Image Box SOP Class.
Failure	Invalid Object Instance	0117H	Returned if a given instance UID has violated the UID construction rules.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.

Service Status	Further Meaning	Error Code	Reason
Failure	Missing Attribute	0120H	Returned if a mandatory attribute of the Data Set, provided by the SCU AE, is missing.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Insufficient memory in printer to store images	C605H	
* Warnings are not returned by default. Enabling warnings is explained in Section 2.4.			

2.2.1.4.1.3.2.13 Specific Conformance for Basic Color Printer SOP Class

The ADPM provides support for the following DIMSE Services:

- N-EVENT-REPORT
- N-GET

2.2.1.4.1.3.2.14 Printer SOP Class Operations for N-EVENT-REPORT

At any time during the Association, ADPM may send an N-EVENT-REPORT to the SCU to report the printer status. Sending an N-EVENT-REPORT is disabled by default. See Section 2.4. It is also possible to configure ADPM so that the printer status attribute “WARNING” is sent along with more detailed Printer Status Information. Sending “WARNINGS” is disabled by default. See Section 2.4.

The ADPM provides the following support for the Printer attributes sent by the N-EVENT-REPORT DIMSE service:

Table 2.2-28: Printer SOP Class N-EVENT-REPORT Request Attributes

Printer Status (2110,0010)	Printer Status Info (2110,0020)	Meaning
NORMAL	NORMAL	Normal printer operation.
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, …)
WARNING (*)	BAD SUPPLY MGZ	Film supply tray open
WARNING (*)	COVER OPEN	The printer top cover is open.
WARNING (*)	SUPPLY EMPTY	The printer film tray is empty. Spooling of print jobs is still possible.
WARNING (*)	FILM JAM	Film jam.
* Warnings are not returned by default. Enabling warnings is explained in Section 2.4.		

2.2.1.4.1.3.2.15 Printer SOP Class Operations for N-GET

At any time during the Association, ADPM application may receive an N-GET request asking for the printer status. It is also possible to configure ADPM so that the printer status attribute “WARNING” is sent along with more detailed Printer Status Information. The sending of “WARNINGS” is disabled by default. See Section 2.4.

ADPM sends the following attributes in response to an N-GET request:

Table 2.2-29: Printer SOP Class N-GET Request Attributes

Attribute	Tag	Valid Range
Printer Status	(2110,0010)	• NORMAL • FAILURE • WARNING (See 2.4)
Printer Status Info	(2110,0020)	• NORMAL • PRINTER DOWN
Printer Name	(2110,0030)	Drystar
Manufacturer	(0008,0070)	AGFA
Manufacturer Model Name	(0008,1090)	5301
Device Serial Number	(0018,1000)	*Serial number*
Software Versions	(0018,1020)	*Software version*
Date Last Calibration	(0018,1200)	*Last cal. date*
Time Last Calibration	(0018,1201)	*Last cal. time*

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

Table 2.2-30: N-GET Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Failure	Processing failure	0110H	Returned if no Data Set is provided by the SCU for the Basic Film Session SOP Class.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

2.2.1.4.1.3.3 Specific Conformance to 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 2.2-31: SOP Classes for Basic Color Print Management Meta SOP Class

SOP Class Name	SOP Class UID	SCU	SCP
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

2.2.1.4.1.3.3.1 Specific Conformance for Basic Film Session SOP Class

Refer to the ‘Basic Film Session SOP Class’ for ‘Basic Grayscale Print Management’.

2.2.1.4.1.3.3.2 Specific Conformance for Basic Film Box SOP Class

Refer to the ‘Basic Film Box SOP Class’ for ‘Basic Grayscale Print Management’.

2.2.1.4.1.3.3.3 Specific Conformance for Basic Color Image Box SOP Class

The ADPM provides support for the following DIMSE Services:

- N-SET

2.2.1.4.1.3.3.4 Basic Color Image Box SOP Class Operations for N-SET

The ADPM provides the following support for the Basic Color Image Box attributes sent by the N-SET DIMSE service:

Table 2.2-32: Basic Color Image Box SOP Class N-SET Request Attributes

Attribute	Tag	Valid Range
Magnification Type	(2010,0060)	Refer to Section 2.2.1.4.1.3.2.2.1
Smoothing Type	(2010,0080)	Refer to Section 2.2.1.4.1.3.2.2.1
Minimum Density	(2010,0120)	Refer to Section 2.2.1.4.1.3.2.2.1
Maximum Density	(2010,0130)	Refer to Section 2.2.1.4.1.3.2.2.1
Image Position	(2020,0010)	1 - x (depending layout)
Polarity	(2020,0020)	• NORMAL • REVERSE
Requested Image Size	(2020,0030)	
Basic Color Image Sequence	(2020,0111)	
>Samples Per Pixel	(0028,0002)	3
>Photometric Interpretation	(0028,0004)	RGB
>Planar Configuration	(0028,0006)	0001 (frame interleave)
>Rows	(0028,0010)	> 0
>Columns	(0028,0011)	> 0
>Pixel Aspect Ratio	(0028,0034)	
>Bits Allocated	(0028,0100)	8
>Bits Stored	(0028,0101)	8
>High Bit	(0028,0102)	7
>Pixel Representation	(0028,0103)	0
>Pixel Data	(7FE0,0010)	

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

Table 2.2-33: N-SET Response Status

Service Status	Further Meaning	Error Code	Reason
Success	Success	0000H	Operation successfully completed.
Warning (*)	Attribute out of range	0116H	Returned if an attribute is out of the range. The instance UID is created.
Warning (*)	Requested density outside printers range	B605H	The printer will use its respective minimum or maximum density value instead.
Failure	Invalid attribute value	0106H	
Failure	Processing failure	0110H	Returned if no Data Set is provided by the SCU for the Basic Film Session SOP Class.
Failure	Invalid Object Instance	0117H	Returned if a given instance UID has violated the UID construction rules.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.

Service Status	Further Meaning	Error Code	Reason
Failure	Missing Attribute	0120H	Returned if a mandatory attribute of the Data Set, provided by the SCU AE, is missing.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
Failure	Insufficient memory in printer to store images	C605H	
* Warnings are not returned by default. Enabling warnings is explained in Section 2.4.			

2.2.1.4.1.3.3.5 Specific Conformance for Basic Color Printer SOP Class

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

2.2.1.4.1.3.4 Specific Conformance to Basic Annotation Box SOP Class

ADPM provides standard conformance to the DICOM Basic Annotation Box SOP Class.

If the DICOM Basic Annotation Box Service Class is supported by the SCU, the annotation data is provided via Basic Annotation Box Instance. This data is ignored if the 'Configuration Information' attribute (2010,0150) contains annotation data.

The Basic Annotation Box SOP Instance is created by an N-CREATE of the Film Box SOP Class, if the 'Annotation Display Format ID' attribute (2010,0030) has the value "ANNOTATION".

The following DIMSE service is supported:

- N-SET

All other DIMSE services return status code 0211H.

2.2.1.4.1.3.4.1 Basic Annotation Box SOP Class Operations for N-SET

The ADPM provides the following support for the Basic Annotation Box attributes sent by the N-SET DIMSE service:

Table 2.2-34: Basic Annotation Box SOP Class N-SET Request Attributes

Attribute	Tag	Valid Range
Annotation Position	(2030,0010)	1-6 (One for each Annotation Box)
Text String	(2030,0020)	Refer to explanation below

Each Annotation box can contain the following text strings:

2.2.1.4.1.3.4.1.1 The contents of a TIFF formatted file:

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

Example: ANNOTATION2=AGFA.TIF

Note:

A 'logo' has to be in a separate annotation box. It cannot be combined with other annotation information.

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

2.2.1.4.1.3.4.1.2 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%**
The following values are defined:

Table 2.2-35: 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)

2.2.1.4.1.3.4.2 Fixed text

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

2.2.1.4.1.3.4.3 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: %patientid% Patient Name: %patientname%

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

Table 2.2-36: N-SET Response Status

Service Status	Further Meaning	Error Code	Description
Success		0000H	Operation successfully completed.
Warning (*)	Attribute Value Out of Range	0116H	Returned warning if an attribute value is out of range. The instance UID is created.
Failure	Processing failure	0110H	Returned if no Data Set is provided by the SCU for the Basic Film Box SOP Class.
Failure	Class-Instance Conflict	0119H	Returned if the SOP Class Instance UID is not defined for the given SOP Class.
Failure	Missing Attribute	0120H	Returned if a mandatory attribute of the Data Set, provided by the SCU AE, is missing.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.
* Warnings are not returned by default. Enabling warnings is explained in Section 2.4.			

2.2.1.4.1.3.5 Specific Conformance to Print Job SOP Class

ADPM provides standard conformance to the DICOM Print Job Service Class.

The Print Job SOP Instance is created by an N-ACTION of the Film Session SOP Class or the N-ACTION of the Film Box SOP Class. The Print Job instance is deleted after all films are printed or in case of an error.

The SCP returns status code C602H for the N-ACTION command in case the creation of the Print Job failed.

The following DIMSE services are supported:

- N-EVENT-REPORT
- N-GET

All other DIMSE services return status code 0211H.

2.2.1.4.1.3.5.1 N-EVENT-REPORT

N-EVENT-REPORT is used to report execution status changes to the SCU in an asynchronous way. N-EVENT-REPORT is disabled by default. See section 2.4.

Following Event Types and ID's are supported:

Table 2.2.37: Supported Event Types.

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

ADPM sends the following attributes in an N-EVENT-REPORT:

Table 2.2.38: Supported Attributes.

Attribute	Tag	Valid Range
Execution Status Info	(2100,0030)	Refer to Table 2.2.39: Execution Status Info.
Print Job ID	(2100,0010)	
Film Session Label	(2000,0050)	
Printer Name	(2110,0030)	Drystar

The following values are supported for 'Execution Status Info' attribute:

Table 2.2.39: 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.

2.2.1.4.1.3.5.2 N-GET

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

Table 2.2.40: Supported Attributes.

Attribute	Tag	Valid Range
Execution Status	(2100,0020)	• PENDING • PRINTING • DONE • FAILURE
Execution Status Info	(2100,0030)	Refer to Table 2.2.39: Execution Status Info.
Print Priority	(2000,0020)	• HIGH • LOW
Creation Date	(2100,0040)	*Date of print job creation*
Creation Time	(2100,0050)	*Time of print job creation*
Originator	(2100,0070)	*Calling AE Title*
Printer Name	(2110,0030)	

2.2.1.4.1.3.6 Specific Conformance to Presentation LUT SOP Class

ADPM provides standard conformance to the DICOM Presentation LUT Service Class.
The following DIMSE services are supported:

- N-CREATE
- N-DELETE

2.2.1.4.1.3.6.1 N-CREATE

N-CREATE is used to create a Presentation LUT SOP Instance. The ADPM provides the following support for the Presentation LUT SOP Class attributes sent by the N-CREATE DIMSE service:

Table 2.2.41: Supported Attributes.

Attribute	Tag	Valid Range
Presentation LUT sequence	(2050,0010)	
>LUT Descriptor	(0028,3002)	
>LUT Explanation	(0028,3003)	
>LUT Data	(0028,3006)	
Presentation LUT Shape	(2050,0020)	• IDENTITY • LIN OD

If both Presentation LUT Sequence and Presentation LUT Shape are specified, failure 0106H is returned; indicating the creation of the Presentation LUT has failed.

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

Table 2.2-42: N-CREATE Response Status

Service Status	Further Meaning	Error Code	Description
Success	Success	0000H	Operation successfully completed.
Failure	Invalid Attribute Value	0106H	
Failure	Invalid Object Instance	0117H	Returned if a given instance UID has violated the UID construction rules.
Failure	Missing Attribute	0120H	Returned if a mandatory attribute of the Data Set, provided by the SCU AE, is missing.

2.2.1.4.1.3.6.2 N-DELETE

N-DELETE is used to delete a Presentation LUT SOP Instance.
The following status codes are returned in response to an N-DELETE:

Table 2.2-43: N-DELETE Response Status

Service Status	Further Meaning	Error Code	Description
Success	Success	0000H	Operation successfully completed.
Failure	Processing failure	0110H	Returned if no data is provided by the SCU
Failure	Invalid Object Instance	0117H	Returned if a given instance UID has violated the UID construction rules.

2.2.1.4.1.3.7 Specific Conformance to Print Queue Management SOP Class

ADPM provides standard conformance to the DICOM Queue Management Service 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 ADPM during the start-up of the device and has a SOP instance UID of: **1.2.840.10008.5.1.1.25**.

The print queue is restored after power-on. (5301 has a hard disk).

Deleting a job results in setting the number of pages to be printed to zero.

Changing the priority or deleting a job can be ignored when the job is already in print-status.

The following DIMSE services are supported:

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

2.2.1.4.1.3.7.1 N-EVENT-REPORT

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

The following Event Names and Event Type ID's are supported for N-EVENT-REPORT:

Table 2.2-44: Supported Attributes.

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

2.2.1.4.1.3.7.2 N-GET

N-GET is used by the SCU to retrieve an instance of the Print Queue Management SOP Class from ADPM. The ADPM provides the following support for the Print Queue Management SOP Class attributes sent by the N-GET DIMSE service:

Table 2.2-45: N-Get Supported Attributes.

Attribute	Tag	Valid Range
Queue Status	(2120,0010)	• FULL • HALTED • NORMAL
Print Job Description Sequence	(2120,0050)	
>Print Job ID	(2100,0010)	
>Execution Status	(2100,0020)	• PENDING • PRINTING • DONE • FAILURE
>Execution Status Info	(2100,0030)	Refer to Table 2.2.39: Execution Status Info.
>Creation Date	(2100,0040)	*Date of print job creation*
>Creation Time	(2100,0050)	*Time of print job creation*
>Print Priority	(2000,0020)	
>Origin AE	(2100,0070)	*Calling AETitle*
>Destination AE	(2100,0140)	*Called AETitle*
>Printer Name	(2110,0030)	

Attribute	Tag	Valid Range
>Film Destination	(2000,0040)	
>Film Session Label	(2000,0050)	
>Medium Type	(2000,0030)	
>Number Of Films	(2100,0170)	
>Referenced Print Job Sequence	(2120,0070)	
>>Referenced SOP Class UID	(0008,1150)	
>>Referenced SOP Instance UID	(0008,1155)	

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

Table 2.2-46: N-GET Response Status

Service Status	Further Meaning	Error Code	Description
Success		0000H	Operation successfully completed.
Failure	SOP Class Not Supported	0122H	Returned if the SOP Class specified in the DIMSE command does not match the SOP Class UID.

2.2.1.4.1.3.7.3 N-ACTION

N-ACTION is used by the SCU to manipulate the ADPM queue content.

- Following 'Event Types' are supported:

Table 2.2.47: Supported 'Event types'

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

The ADPM provides the following support for the Print Queue Management SOP Class attributes sent by the N-ACTION DIMSE service:

Table 2.2.48: Supported Attributes.

Attribute	Tag	Valid Range
Print Job ID	(2100,0010)	
Print Priority	(2000,0020)	• HIGH (=Emergency on display) • LOW (=normal on display) • (MED=LOW)
Owner ID	(2100,0160)	

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

Table 2.2-49: N-ACTION Response Status

Service Status	Further Meaning	Error Code	Description
Success		0000H	Operation successfully completed.
Failure	Invalid Attribute Value	0106H	
Failure	Processing failure	0110H	Returned if no Data Set is provided by the SCU
Failure	Missing Attribute	0120H	Returned if a mandatory attribute of the Data Set, provided by the SCU AE, is missing.
Failure	Print Queue is Halted	C651H	New jobs are not accepted.
Failure	Mismatch of owner ID's	C652H	
Failure	Action failed, Print Job in process	C653H	

2.3 Network Interfaces

DRYSTAR 5301 provides DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the DICOM Standard.

2.3.1 Physical Medium Support

ADPM supports 10BaseT and 100BaseT. They are automatically configured via a detection mechanism and are galvanically isolated for IEC601 compliance.

2.4 Configuration

2.4.1 AE Title/ Presentation Mapping

2.4.1.1 Local AE Titles

The DRYSTAR 5301 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 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 Configuration Parameters

2.4.2.1 DICOM Host Profiles

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

Host Profile selection is based on the incoming or 'Calling' AE title of the SCU. If no Host Profile is found for an SCU, then the default (site) Host Profile will be used.

Host Profiles are Service configurable via browser interface.

Table 2.4-2: Host Profile Parameter Table

Parameter	Configurable (Yes/No)	Default Value
General Parameters		
Number of SCP Print Servers (ADPM)	Yes	1
AE Specific Parameters		
Number of Simultaneous Associations	Yes	10
Annotation Boxes	Yes	2
Association timeout	Yes	0
Image timeout	Yes	0
Conformance Level or sending 'Warnings') (See below)	Yes	0 (no)
Print even if Film Size/ Medium type not supported	Yes	Yes
Sending N-EVENT-REPORT (See below)	Yes	OFF
Allow Implicit VR Little Endian	Yes	True
Allow Explicit VR Little Endian	Yes	True
Allow Explicit VR Big Endian	Yes	True
Allow Specific SOP Classes	Yes	All Enabled
Number of copies	Yes	1
Print Priority	Yes	Low
Medium Type	Yes	
Film Orientation	Yes	Portrait
Trim	Yes	No
Film Size	Yes	
Magnification	Yes	Max
LUT	Yes	Kanamori
Illumination	Yes	2000
Reflected Ambient light	Yes	10
Border density	Yes	Black
Empty image density	Yes	Black
Min density	Yes	
Max density	Yes	300

- N-EVENT-REPORTS

It is possible to configure ADPM so that ADPM will return N-EVENT-REPORTS. Sending N-EVENT-REPORTS is disabled (Off) by default.

- Conformance Level

It is possible to configure ADPM so that the 'Printer Status' attribute of "WARNING" and the more detailed 'Printer Status Information' attribute will be sent. Sending of 'WARNINGS' is disabled by default (Conformance Level= 0).

3 MEDIA INTERCHANGE

The ADPM does not support Media Interchange.

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

5.1 Security Profiles

The DRYSTAR 5301 printer supports the Authentication, Accountability, and User Authentication security profiles. The Security Administrator sets the configurations for Security Profiles.

5.1.1 Authentication

The DRYSTAR 5301 printer can be configured to communicate using Transport Layer Security (TLS). The default port for TLS is 2763 (Service configurable).

5.1.2 Accountability

The DRYSTAR 5301 printer can be configured to send audit records to an Audit Record Repository.

5.1.3 User Authentication

The DRYSTAR 5301 printer provides users different levels of user interfaces based on their needs.

Interface Type:	Passwords Required?	Level
Front Panel Display		
User	No	1 (Low)
Network (Browser)		
Key Operator	Yes	2
Service	Yes	3
Service Specialist	Yes	4
Security Administrator	Yes	5 (High)

The Security Administrator has the ability to change all passwords.