Technical
Publications

Direction 2191559-100
Revision 0

ADVANTAGE FILM DIGITIZER CONFORMANCE STATEMENT for DICOM V3.0

GE Medical Systems

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Revision History

Revision	Date	Author	Reason for Change
0	6/15/97	RHZ	Initial release

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CONTENTS

Table of Tables

1. Introduction

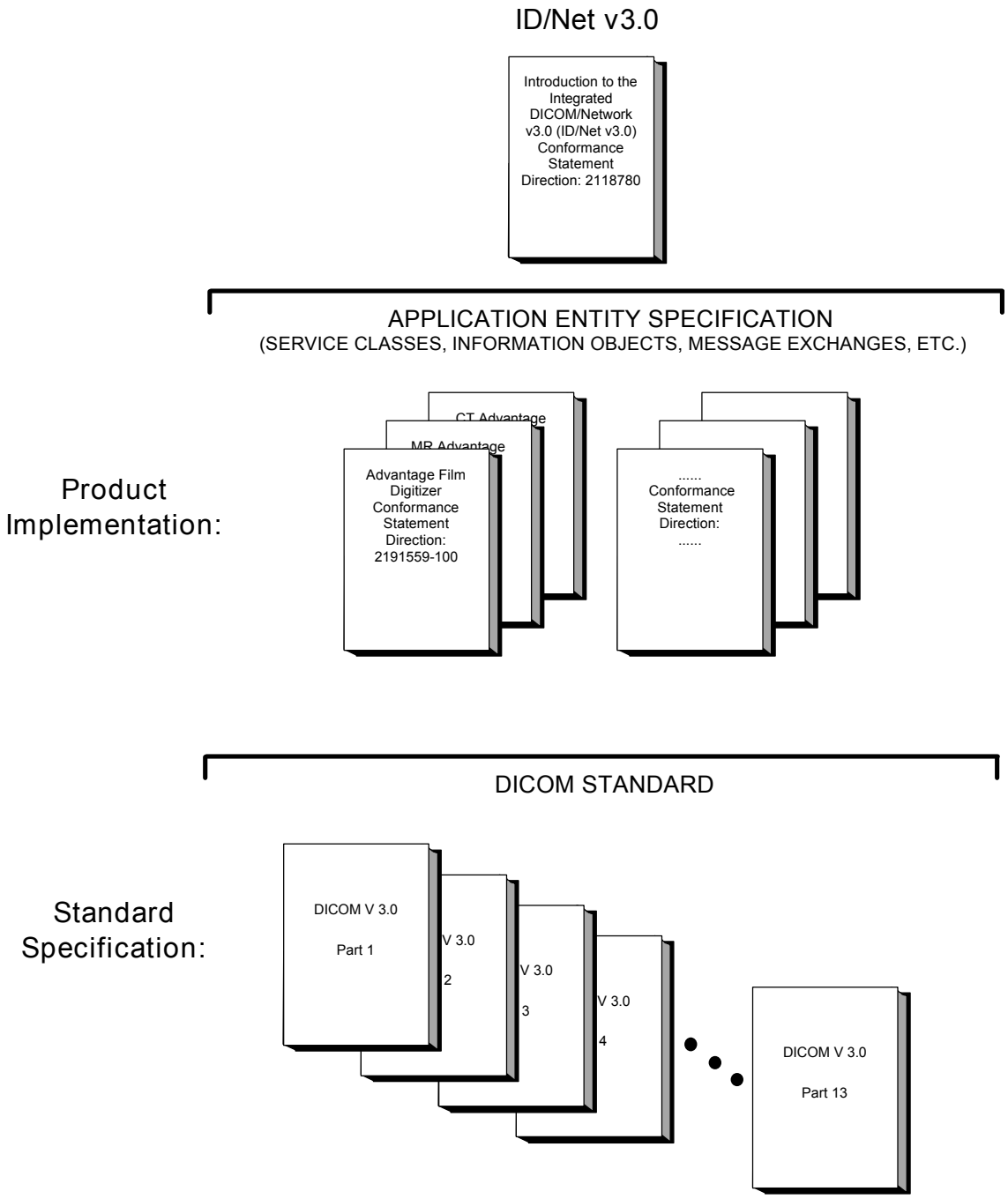
1.1 Overview

This DICOM Conformance Statement is divided into Sections as described below:

Section 1 - Introduction
Section 2 - Implementation Model
Section 3 - AE Specifications
Section 4 - Communication Profiles
Section 5 - Extensions, Specializations, Privatizations
Section 6 - Configuration
Section 7 - Support for Extended Character Sets

1.2 Overall Dicom Conformance Statement Document Structure

The Documentation Structure of the GEMS Conformance Statements and their relationship with the DICOM v3.0 Conformance Statements is shown in the Illustration below.



This document specifies the DICOM v3.0 implementation. It is entitled:

Advantage Film Digitizer
Conformance Statement for DICOM v3.0
Direction 2191559-100

This DICOM Conformance Statement documents the DICOM v3.0 Conformance Statement and Technical Specification required to interoperate with the GEMS network interface. Introductory information, which is applicable to all GEMS Conformance Statements, is described in the document:

Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)
Conformance Statement
Direction: 2118780.

This Introduction familiarizes the reader with DICOM terminology and general concepts. It should be read prior to reading the individual products' GEMS Conformance Statements.

The GEMS Conformance Statement, contained in this document, also specifies the Lower Layer communications which it supports (e.g., TCP/IP). However, the Technical Specifications are defined in the DICOM v3.0 Part 8 standard.

For more information including Network Architecture and basic DICOM concepts, please refer to the Introduction.

For the convenience of software developers, there is "collector" Direction available. By ordering the collector, the Introduction described above and all of the currently published GEMS Product Conformance Statements will be received. The collector Direction is:

ID/Net v3.0 Conformance Statements
Direction: 2117016

For more information regarding DICOM v3.0, copies of the Standard may be obtained by written request or phone by contacting:

NEMA Publication
1300 North 17th Street
Suite 1847
Rosslyn, VA 22209
USA
Phone: (703) 841-3200

1.3 Intended Audience

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM v3.0 Standards and with the terminology and concepts which are used in those Standards.

If readers are unfamiliar with DICOM v3.0 terminology they should first refer to the document listed below, then read the DICOM v3.0 Standard itself, prior to reading this DICOM Conformance Statement document.

Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)
Conformance Statement
Direction: 2118780

1.4 Scope And Field Of Application

It is the intent of this document, in conjunction with the Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780, to provide an unambiguous specification for GEMS implementations. This specification, called a Conformance Statement, includes a DICOM v3.0 Conformance Statement and is necessary to ensure proper processing and interpretation of GEMS medical data exchanged using DICOM v3.0. The GEMS Conformance Statements are available to the public.

The reader of this DICOM Conformance Statement should be aware that different GEMS devices are capable of using different Information Object Definitions. For example, a GEMS CT Scanner may send images using the CT Information Object, MR Information Object, Secondary Capture Object, etc.

Included in this DICOM Conformance Statement are the Module Definitions which define all data elements used by this GEMS implementation. If the user encounters unspecified private data elements while parsing a GEMS Data Set, the user is well advised to ignore those data elements (per the DICOM v3.0 standard). Unspecified private data element information is subject to change without notice. If, however, the device is acting as a "full fidelity storage device", it should retain and re-transmit all of the private data elements which are sent by GEMS devices.

1.5 Important Remarks

The use of these DICOM Conformance Statements, in conjunction with the DICOM v3.0 Standards, is intended to facilitate communication with GE imaging equipment. However, by itself, it is not sufficient to ensure that inter-operation will be successful The user (or user's agent) needs to proceed with caution and address at least four issues:

- Integration - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non–GE systems is the user's responsibility and should not be underestimated. The user is strongly advised to ensure that such an integration analysis is correctly performed.

- Validation - Testing the complete range of possible interactions between any GE device and non–GE devices, before the connection is declared operational, should not be overlooked. Therefore, the user should ensure that any non–GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non–GE device and the stability of the image data for the intended applications.

  Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on GE imaging equipment are processed/displayed on a non-GE device, as well as when images acquired on non-GE equipment is processed/displayed on a GE console or workstation.

- Future Evolution - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM v3.0 Standard. DICOM v3.0 will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEMS protocol is based on DICOM v3.0 as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM v3.0. In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements. The user should ensure that any non–GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM

Standard changes and GE Products are enhanced to support these changes.

- To be informed of the evolution of the implementation described in this document, the User is advised to regularly check the GE Internet Server, accessible via anonymous ftp (GE Internet Server Address: ftp.med.ge.com, 192.88.230.11).
- Interaction - It is the sole responsibility of the non–GE provider to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.6 References

A list of references which is applicable to all GEMS Conformance Statements is included in the Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.
The information object implementation refers to DICOM PS 3.3 (Information Object Definition).

1.7 Definitions

A set of definitions which is applicable to all GEMS Conformance Statements is included in the Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.

1.8 Symbols And Abbreviations

A list of symbols and abbreviations which is applicable to all GEMS Conformance Statements is included in the Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780.

2. Implementation Model

ADVANTAGE FILM DIGITIZER is a service class user for DIMSE-C services for the storage of images. ADVANTAGE FILM DIGITIZER is a PC Windows/NT scanning software package engineered to work with the Lumisys' LSDT 20 and 75 scanners. The product is designed to allow technicians a simple mechanism to scan film into DICOM images and send them to remote stations using the DICOM protocol.

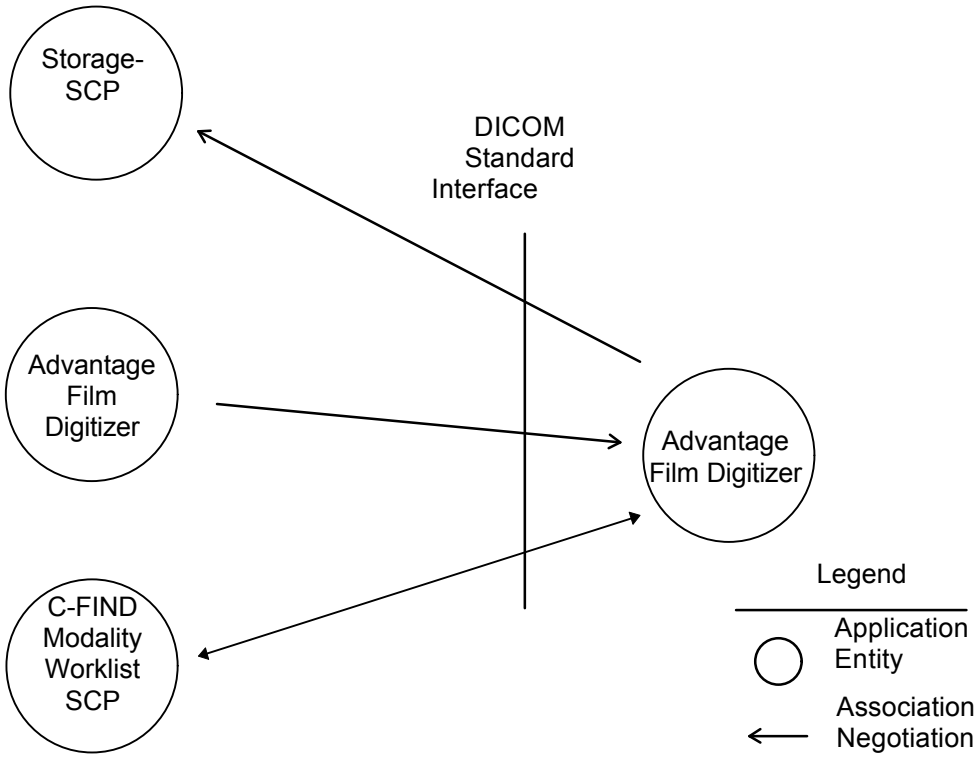
Support for DICOM Lossy JPEG compression for sending and receiving has been implemented to provide an integrated tele-radiology package for inter and intra hospital communication over low bandwidth lines.

ADVANTAGE FILM DIGITIZER is also able to receive Secondary Capture images. In this way, images can be pushed from one Advantage Film Digitizer to another Advantage Film Digitizer to provide a simple mechanism of exchanging information between institutions.

ADVANTAGE FILM DIGITIZER is able to request demographic information to avoid unnecessary typing by technologists.

2.1 Application Data Flow Diagram

ADVANTAGE FILM DIGITIZER behaves as a single Application Entity according to DICOM. Advantage Film Digitizer can initiate associations to send images for storage and to send images for printing to DICOM Service Class Providers. ADVANTAGE FILM DIGITIZER can also receive association requests to be able to store images to its local cache. ADVANTAGE FILM DIGITIZER is able to initiate an association with a Worklist SCP for the purposes of retrieving demographic information as well as being able to receive event notification of studies to be completed.


Storage-
SCP
DICOM
Standard
Interface
Advantage
Film
Digitizer
Advantage
Film Digitizer
C-FIND
Modality
Worklist
SCP
Legend
Application
Entity
Association
Negotiation

2.2 Functional Definition of Application Entities

ADVANTAGE FILM DIGITIZER acts as a Service Class User for the purposes of storage and requesting demographic information. ADVANTAGE FILM DIGITIZER also acts as a Service Class Provider for the purposes of storage.
As an SCU, ADVANTAGE FILM DIGITIZER utilizes the DICOM C-Store to store images to a remote archive. The DICOM C-Find modality worklist service class is used to retrieve demographic information.
As an SCP, ADVANTAGE FILM DIGITIZER supports the DICOM C-Store service class to receiving images from a remote SCU, such as another ADVANTAGE FILM DIGITIZER. ADVANTAGE FILM DIGITIZER is not an SCP for the Query/Retrieve Service Class.

3. AE Specifications

3.1 Services Used by ADVANTAGE FILM DIGITIZER as an SCU

3.1.1 Verification as an SCU

ADVANTAGE FILM DIGITIZER provides Standard Conformance to the following DICOM V3.0 Verification SOP Class as an SCU.

Table 1 Verification SOP Classes

SOP Class	SOP Class UID
Verification	1.2.840.10008.1.1

3.1.2 Storage as an SCU

ADVANTAGE FILM DIGITIZER provides Standard Conformance to the following DICOM V3.0 Storage SOP Class as an SCU.

Table 2 Storage SOP Classes

SOP Class	SOP Class UID
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7

3.1.3 Query/Retrieve as an SCU

ADVANTAGE FILM DIGITIZER provides Standard Conformance to the following DICOM V3.0 Query/Retrieve SOP Class as an SCU.

Table 3 Query/Retrieve SOP Classes

SOP Class	SOP Class UID
Patient Root Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.1.1
Study Root Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.2.1
Patient/Study Only Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.3.1

3.1.4 Detached Study Component Management as an SCU

ADVANTAGE FILM DIGITIZER provides Standard Conformance to the following DICOM V3.0 Detached Study Component Management SOP Class as an SCU.

Table 4 Worklist SOP Classes

SOP Class	SOP Class UID
Detached Study Component Management	1.2.840.10008.3.1.2.3.1

3.1.5 Worklist Management as an SCU

ADVANTAGE FILM DIGITIZER provides Standard Conformance to the following DICOM V3.0 Worklist Management SOP Class as an SCU.

Table 5 Worklist SOP Classes

SOP Class	SOP Class UID
Modality Worklist Info Model -FIND	1.2.840.10008.5.1.4.31

3.2 Services Provided by ADVANTAGE FILM DIGITIZER as an SCP

3.2.1 Verification as an SCP

ADVANTAGE FILM DIGITIZER provides Standard Conformance to the following DICOM V3.0 Verification SOP Class as an SCP.

Table 6 Verification SOP Class

SOP Class	SOP Class UID
Verification	1.2.840.10008.1.1

3.2.2 Query/Retrieve as an SCP

ADVANTAGE FILM DIGITIZER provides Standard Conformance to the following DICOM V3.0 Query/Retrieve SOP Class as an SCP.

Table 7 Query/Retrieve SOP Classes

SOP Class	SOP Class UID
Patient Root Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.1.1
Study Root Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.2.1
Patient/Study Only Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.3.1

3.2.3 Storage as an SCP

ADVANTAGE FILM DIGITIZER provides Standard Conformance to the following DICOM V3.0 Storage SOP Classes as an SCP.

Table 8 Storage SOP Classes

SOP Class	SOP Class UID
Secondary Capture Image Storage (SC)	1.2.840.10008.5.1.4.1.1.7

3.3 Association Establishment Policies

3.3.1 General

ADVANTAGE FILM DIGITIZER contains a limitation of 100000 bytes for maximum PDU size.

3.3.2 Number of Associations

ADVANTAGE FILM DIGITIZER can issue up to four association requests at a time.

3.3.3 Asynchronous Nature

ADVANTAGE FILM DIGITIZER allows a single outstanding operation on any association. Therefore, ADVANTAGE FILM DIGITIZER does not support asynchronous operations window negotiation, other than the default as specified by the DICOM specification.

3.3.4 Implementation Identifying Information

ADVANTAGE FILM DIGITIZER will respond with the following implementation identifying parameters:

- Implementation Class UID `1.2.124.113532.5000`
- Implementation Version Name `FE974.2`

The implementation version name policies are the following: product name "**FE**" followed by the year of the product "97", and finally the version of the product, "4.2".

3.3.5 Called/Calling Titles

The calling title is defined during the installation by the operator.

3.3.6 Association Initiation by Real World Activity

ADVANTAGE FILM DIGITIZER will issue a new association with a remote device when images are to be transmitted.

3.3.6.1 Real World Activity - Verification

3.3.6.1.1 Associated Real World Activity - Verification

ADVANTAGE FILM DIGITIZER will issue a Verification request when a user of ADVANTAGE FILM DIGITIZER wishes send a study of images to a remote DICOM SCP.

3.3.6.1.2 Proposed Presentation Contexts - Verification

ADVANTAGE FILM DIGITIZER supports the transfer syntaxes listed in Table 9. For a Verification request, ADVANTAGE FILM DIGITIZER will propose the Presentation Contexts listed in Table 10.

Table 9 Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2

Table 10 Verification SOP Classes

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	SOP Class UID			
Verification	1.2.840.10008.1.1	all from Table 9	SCU	None

3.3.6.1.3 SOP Specific Conformance - Verification

ADVANTAGE FILM DIGITIZER provides standard conformance to the DICOM Verification Service Class.

3.3.6.2 Real World Activity - Query

3.3.6.2.1 Associated Real World Activity - Query

ADVANTAGE FILM DIGITIZER will issue a C-Find request when a user of ADVANTAGE FILM DIGITIZER wishes to query a remote DICOM SCP to confirm that the images have been properly sent.

3.3.6.2.2 Proposed Presentation Contexts - Query

ADVANTAGE FILM DIGITIZER supports the transfer syntaxes listed in Table 11. For a C-Find request, ADVANTAGE FILM DIGITIZER will propose the Presentation Contexts listed in Table 12.

Table 11 Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2

Table 12 Query SOP Classes

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	SOP Class UID			
Patient Root Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.1.1	all from Table 11	SCU	None
Study Root Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.2.1	all from Table 11	SCU	None
Patient/Study Only Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.3.1	all from Table 11	SCU	None

3.3.6.3 Real World Activity - Storage

3.3.6.3.1 Associated Real World Activity - Storage

ADVANTAGE FILM DIGITIZER will issue a Storage request when a user of ADVANTAGE FILM DIGITIZER wishes to send a study of images to a remote DICOM SCP.

3.3.6.3.2 Proposed Presentation Contexts - Storage

ADVANTAGE FILM DIGITIZER supports the transfer syntaxes listed in Table 13. For a Storage request, ADVANTAGE FILM DIGITIZER will propose the Presentation Contexts listed in Table 14.

Table 13 Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2
DICOM Baseline Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
DICOM Extended Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression	1.2.840.10008.1.2.4.51

Table 14 Storage SOP Classes

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	SOP Class UID			
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	all from Table 13	SCU	None

3.3.6.3.3 SOP Specific Conformance - Storage

3.3.6.3.3.1 Storage of Optical Density Image Data - Monochrome 1

ADVANTAGE FILM DIGITIZER will scan the film to create images of any modality as specified within the DICOM specification. The following values will be encoded for a non-compressed image:

Grp Elmt	Description	VR	Value
0008, 0008	image_type	CS	“DERIVED\SECONDARY”
0008, 0016	sop_class_uid	UI	1.2.840.10008.5.1.4.1.1.7
0008, 0018	sop_instance_uid	UI	
0008, 0020	study_date	DA	
0008, 0023	image_date	DA	
0008, 0030	study_time	TM	
0008, 0033	image_time	TM	
0008, 0050	accession_number	SH	
0008, 0060	modality	CS	
0008, 0064	conversion_type	CS	DF
0008, 0070	manufacturer	LO	LUMISYS
0008, 0080	institution_name	LO	
0008, 0081	institution_address	ST	
0008, 0090	referring_physician_name	PN	
0008, 1010	station_name	SH	

0008, 1030	study_description	LO	
0008, 103e	series_description	LO	
0008, 1040	institutional_department_name	LO	
0010, 0010	patient_name	PN	
0010, 0020	patient_id	LO	
0010, 0030	patient_birth_date	DA	
0010, 0040	patient_sex	CS	
0010, 1000	other_patient_ids	LO	
0010, 1010	patient_age	AS	
0010, 21B0	additional_patient_history	LT	
0018, 1010	secondary_capture_device_id	LO	
0018, 1012	date_of_secondary_capture	DA	
0018, 1014	time_of_secondary_capture	TM	
0018, 1016	secondary_capture_device_manufacturer	LO	LUMISYS
0018, 1018	secondary_capture_device_manufacturer_model_name	LO	“Scanner Model Number” eg: LS75
0018, 1019	secondary_capture_device_software_versions	LO	“Software Version Number” eg: Version: 4.3
0018, 1200	date_of_last_calibration	DA	
0018, 1201	time_of_last_calibration	TM	
0020, 000d	study_instance_uid	UI	
0020, 000e	series_instance_uid	UI	
0020, 0010	study_id	SH	
0020, 0011	series_number	IS	1
0020, 0013	image_number	IS	
0020,0020	patient_orientation	CS	
0028, 0002	samples_per_pixel	US	1
0028, 0004	photometric_interpretation	CS	MONOCHROME1
0028, 0010	rows	US	
0028, 0011	columns	US	
0028, 0100	bits_allocated	US	16
0028, 0101	bits_stored	US	12
0028, 0102	high_bit	US	11
0028, 0103	pixel_representation	US	0
0028, 1050	window_center	DS	
0028, 1051	window_width	DS	
0028, 1052	rescale_intercept	DS	0.0
0028, 1053	rescale_slope	DS	1.0
0028, 1054	rescale_type	LO	OD

0028, 2110	lossy_image_compression	CS	00
0032, 4000	study_comments	LT	

The “OD” stipulation for rescale type means that the pixel data is optical density x 1000. (i.e. the range for the Advantage Film Digitizer images will be 0 (clear) to 4095 (black).)

3.3.6.3.3.2 Storage of Video Image Data - Monochrome 2

3.3.6.3.3.2.1 Simplification to 12bit Monochrome 2 data

Twelve bit Optical Density (OD) data can be simplified to 12bit Video data during a C-Store. The newly created 12 bit Video images are then transmitted to the remote Application Entity.

Simplification takes a 12-bit input image and changes it to 12-bit Video. The original 12-bit image can be either Video or OD. The rescale slope/intercept and the window center/width of the 12bit input data are applied to produce the 12 bit Video values. The Window Width/Center values of 4095/2048 are defined to show the full range of 12 bit data. These values are then transformed from Optical Density data to Video data by converting the data from logarithmic to gamma-corrected luminance data.

Below is a list of the affected elements for 12bit Video data.

Grp Elmt	Description	VR	Value
0008, 0018	sop_instance_uid	UI	newly generated unique identifier
0028, 0002	samples_per_pixel	US	1
0028, 0004	photometric_interpretation	CS	MONOCHROME2
0028, 0100	bits_allocated	US	16
0028, 0101	bits_stored	US	12
0028, 0102	high_bit	US	11
0028, 0103	pixel_representation	US	0
0028, 1050	window_center	DS	2048
0028, 1051	window_width	DS	4095
0028, 1052	rescale_intercept	DS	0.0
0028, 1053	rescale_slope	DS	1.0
0028, 1054	rescale_type	LO	US

3.3.6.3.3.2.2 Simplification to 8bit Monochrome 2 data

Twelve bit Optical Density (OD) data can be simplified to 8bit Video data during a C-Store. The newly created 8 bit Video images are then transmitted to the remote Application Entity.

Simplification takes a 12-bit input image and changes it to 8-bit Video. The original 12-bit image can be either Video or OD. The rescale slope/intercept and the window center/width of the 12bit input data are applied to produce the 8 bit Video values. The Window Width/Center values of 255/127 are defined to show the full range of 8 bit data. These values are then transformed from Optical Density data to Video data by converting the data from logarithmic to gamma-corrected luminance data.

Below is a list of the affected elements for 8bit Video data.

Grp Elmt	Description	VR	Value
0008, 0018	sop_instance_uid	UI	newly generated unique identifier
0028, 0002	samples_per_pixel	US	1
0028, 0004	photometric_interpretation	CS	MONOCHROME2
0028, 0006	planar_configuration	US	1
0028, 0100	bits_allocated	US	8
0028, 0101	bits_stored	US	8
0028, 0102	high_bit	US	7
0028, 0103	pixel_representation	US	0
0028, 1050	window_center	DS	127
0028, 1051	window_width	DS	255
0028, 1052	rescale_intercept	DS	0.0
0028, 1053	rescale_slope	DS	1.0
0028, 1054	rescale_type	LO	US

3.3.6.3.3.3 Storage of JPEG Compressed Image Data

Images (both 12bit and 8bit) are compressed during a C-Store to a remote Application Entity. The following elements are added/changed when the image has undergone DICOM-compliant JPEG compression. All elements not listed take on the same values whether compressed or not compressed.
For JPEG Compressed Images:

Grp Elmt	Description	VR	Value
0008, 0008	image_type	CS	“DERIVED\SECONDARY”
0008, 0018	sop_instance_uid	UI	newly generated unique identifier
0008, 2111	derivation_description	ST	"{Compression Algorithm}, Q={q factor value}, Ratio={approximated compression ratios}" Eg: "LOSSY JPEG, Q=80, Ratio=8:1"
0028, 2110	lossy_image_compression	CS	01

3.3.6.4 Real World Activity - Detached Study Component Management

3.3.6.4.1 Associated Real World Activity - Detached Study Component Management

ADVANTAGE FILM DIGITIZER will receive DIMSE N-EVENT-REPORT. The following message is supported:

- Study Scheduled - to signal that the study has been scheduled to occur

3.3.6.4.2 Presentation Context Table - Detached Study Component Management

ADVANTAGE FILM DIGITIZER supports the transfer syntaxes listed in Table 15.

Table 15: Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2

Table 16: Presentation Contexts

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	SOP Class UID			
Detached Study Management	1.2.840.10008.3.1.2.3.1	all from Table 15	SCU	None

3.3.6.4.3 SOP Specific Conformance - Detached Study Component Management

ADVANTAGE FILM DIGITIZER provides standard conformance to the DICOM Detached Study Component Management Service Class.

ADVANTAGE FILM DIGITIZER supports the following elements for this SOP class:

Table 17: Detached Study Management Object N-Event-Report Attributes

Event Type Name	Attribute Name	Tag
Study Scheduled	Specific Character Set	(0008,0005)
	Referenced Patient Sequence	(0008,1120)
	>Referenced SOP Class UID	(0008,1150)
	>Referenced SOP Instance UID	(0008,1155)
	Referenced Visit Sequence	(0008,1125)
	>Referenced SOP Class UID	(0008,1150)
	>Referenced SOP Instance UID	(0008,1155)
	Scheduled Study Start Date	(0032,1000)
	Scheduled Study Start Time	(0032,1001)
	Scheduled Study Location	(0032,1020)
	Requested Procedure Description	(0032,1060)
	Requested Procedure Code Sequence	(0032,1064)
	>Code Value	(0008,0100)
	>Coding Scheme Designator	(0008,0102)
	>Code Meaning	(0008,0104)

ADVANTAGE FILM DIGITIZER returns one of the following status codes.

Table 18: Detached Study Management status codes.

Service Status	Further Meaning	Protocol Codes	Related Fields	Description
Success	Success	0000		Operation performed properly.

3.3.6.4.4 Presentation Context Acceptance Criterion - Detached Study Management

ADVANTAGE FILM DIGITIZER will always accept a Presentation Context for the Detached Study Management SOP Class.

3.3.6.4.5 Transfer Syntax Selection Policies - Detached Study Management

ADVANTAGE FILM DIGITIZER supports only the Little Endian Implicit Transfer Syntax.

3.3.6.5 Real World Activity - Modality Worklist Management

3.3.6.5.1 Associated Real World Activity - Modality Worklist Management

ADVANTAGE FILM DIGITIZER will receive unsolicited Study-Scheduled N-Event-Reports.
ADVANTAGE FILM DIGITIZER will then request DIMSE-C FINDs.

3.3.6.5.2 Presentation Context Table - Modality Worklist Management

ADVANTAGE FILM DIGITIZER supports the transfer syntaxes listed in Table 19.

Table 19: Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2

Table 20: Presentation Contexts

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	SOP Class UID			
Modality Worklist Info Model -FIND	1.2.840.10008.5.1.4.31	all from Table 19	SCU	None

3.3.6.5.3 SOP Specific Conformance - Modality Worklist Management

ADVANTAGE FILM DIGITIZER provides standard conformance to the DICOM Basic Worklist Management Service Class.
ADVANTAGE FILM DIGITIZER supports all required matching key types:

Matching Key Types	
SV	single valued match
WC	wild card match
SQ	sequence match
DR	date range match

ADVANTAGE FILM DIGITIZER uses the following elements for this SOP class:

Table 21: Modality Worklist Information Model Attributes

Module	Attribute Name	Tag	Match	Return
SOP Common	Specific Character Set	(0008,0005)		1C
Scheduled Procedure Step	Scheduled Procedure Step Sequence	(0040,0100)	SQ	1
	>Scheduled Station AE Title	(0040,0001)	SV	1
	>Scheduled Procedure Step Start Date	(0040,0002)	DR	1
	>Scheduled Procedure Step Start Time	(0040,0003)	DR	1
	>Modality	(0008,0060)	SV	1
Requested Procedure	Requested Procedure ID	(0040,1001)		1
	Requested Procedure Description	(0032,1060)		1C
	Study Instance UID	(0020,000D)	SV	1
	Referenced Study Sequence	(0008,1110)		2
	>Referenced SOP Class UID	(0008,1150)		1C
	>Referenced SOP Instance UID	(0008,1155)		1C
Imaging Service Request	Accession Number	(0008,0050)	SV	2
	Referring Physician's Name	(0008,0090)		2
	Reason for Imaging Service Request	(0040,2001)		3
Patient Identification	Patient Name	(0010,0010)	WC	1
	Patient ID	(0010,0020)	SV	1
Patient Demographic	Patient Birth Date	(0010,0030)		2
	Patient Sex	(0010,0040)		2

3.3.6.6 Real World Activity - Query

3.3.6.6.1 Associated Real World Activity - Query

ADVANTAGE FILM DIGITIZER will issue a C-Find request when a user of ADVANTAGE FILM DIGITIZER wishes to query a remote DICOM SCP to confirm that the images have been properly sent.

3.3.6.6.2 Proposed Presentation Contexts - Query

ADVANTAGE FILM DIGITIZER supports the transfer syntaxes listed in Table 11. For a C-Find request, ADVANTAGE FILM DIGITIZER will propose the Presentation Contexts listed in Table 12.

Table 22 Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2

Table 23 Query SOP Classes

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	SOP Class UID			
Patient Root Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.1.1	all from Table 11	SCP	None
Study Root Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.2.1	all from Table 11	SCP	None
Patient/Study Only Query/Retrieve - Find	1.2.840.10008.5.1.4.1.2.3.1	all from Table 11	SCP	None

3.3.6.7 Real World Activity - Storage

3.3.6.7.1 Associated Real World Activity - Storage

ADVANTAGE FILM DIGITIZER will accept a C-Store request when a remote station wishes to store images to this scanning station.

3.3.6.7.2 Presentation Context Table - Storage

ADVANTAGE FILM DIGITIZER supports the transfer syntaxes listed in Table 27. For Storage acceptance, ADVANTAGE FILM DIGITIZER will propose the Presentation Contexts listed in Table 28.

Table 24 Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2
DICOM Baseline Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
DICOM Extended Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression	1.2.840.10008.1.2.4.51

Table 25 Storage SOP Classes

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	SOP Class UID			
Secondary Capture Image Storage (SC)	1.2.840.10008.5.1.4.1.1.7	all from Table 24	SCP	None

Note 1: Storage Extended Negotiation will be supported. ADVANTAGE FILM DIGITIZER will respond with the following information:

Table 26 Storage Extended Negotiation

Field Name	Value	Description of Field
Level of Support	2	level 2 (FULL) SCP
Element Coercion	0	does not coerce any element

3.3.6.7.2.1 SOP Specific Conformance - Storage

ADVANTAGE FILM DIGITIZER conforms to the DICOM Storage Service Class as an SCP at level 2 (Full). No elements are discarded or coerced by ADVANTAGE FILM DIGITIZER. In the event of a successful C-STORE operation, the image has been written to internal storage.
Required DICOM elements:

DICOM Tag	Element name
(0010, 0020)	patient id
(0020, 000d)	study instance uid
(0020, 000e)	series instance uid
(0008, 0018)	sop instance uid
(0008, 0016)	sop class uid

ADVANTAGE FILM DIGITIZER returns one of the following status codes.

Table 27 C-STORE status codes.

Service Status	Further Meaning	Protocol Codes	Related Fields	Description
Refused	Out of resources	A700		Indicates that there was not enough storage space to store the image. Recovery from this condition is left to the administrative functions available in ADVANTAGE FILM DIGITIZER.
	SOP Class not supported	A800		Indicates that the SOP Class of the Image in the C-STORE operation did not match the Abstract Syntax negotiated for the Presentation Context.
Error	Data set does not match SOP Class	A900		Indicates that the Data Set does not encode an instance of the SOP Class specified.
	Failed	C000		The operation was not successful.
	Cannot understand	C005		Indicates that the Data Set cannot be parsed into elements by ADVANTAGE FILM DIGITIZER.
Warning	Coercion of data elements	B000		Data elements were modified before being stored.
	Data set does not match SOP Class	B007		Indicates that the Data Set does not match the SOP Class, but that the image was stored anyway.
	Elements Discarded	B006		Indicates that some of the elements of the Data Set were discarded.
	Duplicate SOP Instance UID	D000		Indicates that the SOP Instance UID of the specified image is already stored in the database.
Success	Success	0000		Operation performed properly.

3.3.6.7.2.2 Presentation Context Acceptance Criterion - Storage

ADVANTAGE FILM DIGITIZER will accept any number of Storage Presentation Contexts per association request.

3.3.6.7.2.3 Transfer Syntax Selection Policies - Storage

ADVANTAGE FILM DIGITIZER only receives images encoded using the DICOM default implicit VR little endian, Baseline Default Transfer Syntax for Lossy JPEG 8, and Baseline Default Transfer Syntax for Lossy JPEG 12.

3.3.6.7.2.4 Association Acceptance Policy

ADVANTAGE FILM DIGITIZER will accept association requests for C-Store.

4. Communications Profiles

ADVANTAGE FILM DIGITIZER provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.1 TCP/IP Stack

ADVANTAGE FILM DIGITIZER inherits its TCP/IP stack from the computer system upon which it executes.

4.1.1 Physical Media Support

ADVANTAGE FILM DIGITIZER is indifferent to the physical medium over which TCP/IP executes; it inherits the medium from the computer system upon which it executes.

5. Extensions/Specializations/Privatizations

ADVANTAGE FILM DIGITIZER uses the DICOM study_comments field (0032, 4000) to encode anecdotal study information by technologist/physicians.

6. Configuration

ADVANTAGE FILM DIGITIZER obtains configuration information from the following sources:

- Mapping from Application Entity Title to Presentation Address is provided by the database.
- Configuration table stores Application Entity Title, default PDU size, and preferred byte orders for the SOP classes that ADVANTAGE FILM DIGITIZER supports.

7. Support for Extended Character Sets

ADVANTAGE FILM DIGITIZER is known to support the following character sets:

• ISO-IR 6 (default)	Basic G0 Set
• ISO-IR 100	Latin Alphabet No. 1

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