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iCAD, Inc.

TotalLook MammoAdvantage™
DICOM Conformance Statement

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DICOM MergeCOM3 Advanced Integrator's Tool Kit
by Merge Technologies, Inc.



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1 Introduction

1.1 Scope and Field of Application

This document is the DICOM Conformance Statement for TotalLook MammoAdvantage™ developed by iCAD, Inc. This statement contains detailed descriptions of how TotalLook MammoAdvantage™ collaborates with other medical imaging devices and applications that conform to the DICOM 3.0 standard.

The intended user of this document is involved with software design and system integration. It is understood that this individual is familiar with the concepts and terms used throughout this document. Readers unfamiliar with the DICOM 3.0 standard should consult the actual documentation prior to examining this conformance statement.

2 Terminology

2.1 Acronyms

The following acronyms and abbreviations are used in this document.

AE – Application Entity

ACR – American College of Radiology

ANSI – American National Standards Institute

CAD – Computer Aided Detection

DICOM – Digital Imaging and Communications in Medicine

FSE – Field Service Engineer

GUI – Graphical User Interface

HIS – Hospital Information System

IOD – Information Object Definition

NEMA – National Electrical Manufacturers Association

PACS – Picture Archiving and Communications System

PDU – Protocol Data Unit

RIS – Radiological Information System

ROI – Region Of Interest

SCP – Service Class Provider

SCU – Service Class User

SOP – Service Object Pair

TCP/IP – Transmission Control Protocol/Internet Protocol

UID – Unique Identifier

VR – Value Representation

Furthermore, all symbols, abbreviations, and definitions used herein are described in the Digital Imaging and Communications in Medicine (DICOM) standard, parts 1 through 18 (NEMA PS 3.1-18).

3 Related Documentation

- All symbols and abbreviations used herein are described in the Digital Imaging and Communications in Medicine (DICOM) standard, parts 1 through 18 (NEMA PS 3.1-18).

4 Considerations

Readers should note the following points:

- This Conformance Statement by itself does not guarantee successful interoperability of TotalLook MammoAdvantage™ with any equipment and/or applications offered by other vendors.
- Integration of TotalLook MammoAdvantage™ with the equipment and/or applications of different vendors are outside the scope of the DICOM 3.0 standard and product conformance statements. Integration and interoperability of different equipment/applications are the sole responsibility of the user.
- In the case of any possible connectivity inferred by a user to exist between TotalLook MammoAdvantage™ and another product, the user is responsible for testing and verifying the inferred connectivity.
- Future changes to the DICOM 3.0 standard may require alterations to be made to TotalLook MammoAdvantage™. iCAD, Inc. reserves the right to modify TotalLook MammoAdvantage™ architecture as needed, in order to meet changing standards.
- The user should ensure that any existing DICOM equipment also changes with the future developments of the DICOM standards. Failure to keep pace with any alterations in the DICOM standards may result in decreased or lost connectivity.

5 Implementation Model

5.1 Application Data Flow Diagram

The implementation Model for the TotalLook MammoAdvantage™ DICOM service is shown in Figure 5-1.

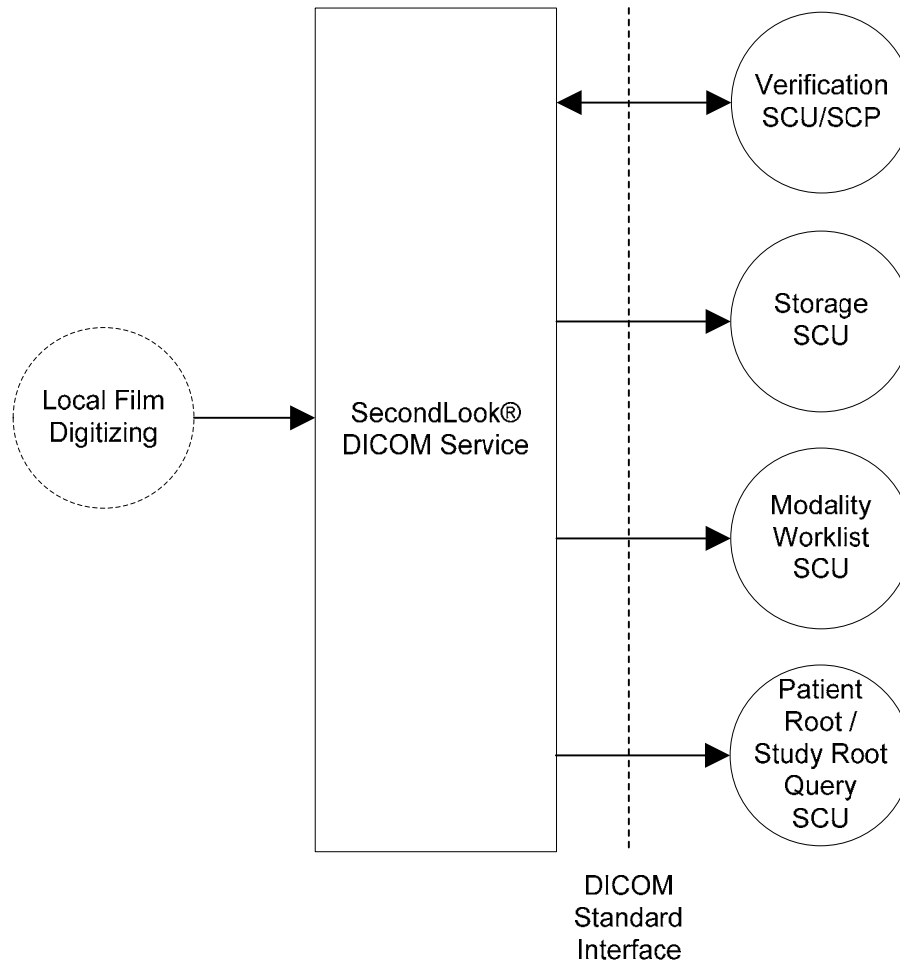


Figure 5-1 Application Data Flow

TotalLook MammoAdvantage™ supports a number of DICOM services. TotalLook MammoAdvantage™ will only perform these services when the DICOM service is started. If the DICOM service is not started, then TotalLook MammoAdvantage™ will not perform these services. The TotalLook MammoAdvantage™ DICOM service can be configured to start automatically when the system is started and will remain active until the system is shutdown.

5.2 Functional Definitions of Application Entities

All communications and image transfer with the remote application is accomplished utilizing the DICOM protocol over a network using the TCP/IP protocol stack.

The TotalLook MammoAdvantage™ DICOM service acts as an SCU for the verification, storage, Modality Worklist Query, Patient Root Query, and Study Root Query SOP classes.

The TotalLook MammoAdvantage™ DICOM service acts as an SCP for the verification SOP class.

Table 1 list the functions supported by the TotalLook MammoAdvantage™ application entity.

Table 1 – Supported SCU and SCP DICOM SOP Classes

SCU	SCP
<ul style="list-style-type: none"> • Verification • Storage • Modality Worklist Query • Patient Root Query • Study Root Query 	<ul style="list-style-type: none"> • Verification

5.3 Sequencing of Real-World Activities

No sequencing of Real World activities is required. An association is opened at the beginning of each activity and the association is ended when the activity is completed.

6 AE Specifications

6.1 AE Specifications for the TotalLook MammoAdvantage™ DICOM service

The TotalLook MammoAdvantage™ DICOM service provides support for the DICOM 3.0 SOP Classes as an SCU as described in Table 2.

Table 2 - Supported SCU SOP Classes

SOP Classes as SCU	
SOP Class UID	SOP Class Name
Verification	
1.2.840.10008.1.1	Verification
Storage	
1.2.840.10008.5.1.4.1.1.7	Secondary Capture
1.2.840.10008.5.1.4.1.1.1.2.1	Digital Mammography X-Ray – For Processing
1.2.840.10008.5.1.4.1.1.1.2	Digital Mammography X-Ray – For Presentation
Query	
1.2.840.10008.5.1.4.31	Modality Worklist Information Model – FIND
1.2.840.10008.5.1.4.1.2.1.1	Patient Root Query - FIND
1.2.840.10008.5.1.4.1.2.2.1	Study Root Query - FIND

The TotalLook MammoAdvantage™ DICOM service provides support for the DICOM 3.0 SOP Classes as an SCP as described in Table 3.

Table 3 - Supported SCP SOP Classes

SOP Classes as SCP	
SOP Class UID	SOP Class Name
Verification	
1.2.840.10008.1.1	Verification

6.1.1 Association Establishment Policies

6.1.1.1 General

The maximum PDU size accepted is 28672. If during association negotiation the maximum sized PDU of the system negotiating with the application is larger than this value, the PDU size will be limited to this value. This value is defined in the mergecom.pro file provided with the MergeCOM-3 Advanced Integrator's Tool Kit.

6.1.1.2 Number of Associations

The TotalLook MammoAdvantage™ DICOM service AE SCU will initiate only one DICOM association at a time to perform a storage, verification, or modality worklist query to a remote host.

The TotalLook MammoAdvantage™ DICOM service AE SCP can have a maximum of one DICOM association open to respond to an echo request.

6.1.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations are performed synchronously.

6.1.1.4 Implementation Identifying Information

The Implementation Class UID is "1.2.840.114191.1", and the Implementation Version Name is "SL_500". These values are defined in the mergecom.pro file provided with the MergeCOM-3 Advanced Integrator's Tool Kit.

6.1.2 Association Initiation Policy

TotalLook MammoAdvantage™ initiates associations for the following activities:

- DICOM communication verification between TotalLook MammoAdvantage™ and a remote system.
- Sending images from TotalLook MammoAdvantage™ to a remote system.
- Retrieve a Modality Worklist from a remote system.
- Perform and Patient Root or Study Root query from a remote system.

6.1.2.1 Verify Communication with a Remote System

6.1.2.1.1 Associated Real World Activity

TotalLook MammoAdvantage™ sends out a request to test DICOM communications with a remote device via its user interface.

6.1.2.1.2 Accepted Presentation Contexts

Table 4 shows the proposed presentation contexts performed by TotalLook MammoAdvantage™ as an SCP.

Table 4 - SCP Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR, Big Endian	1.2.840.10008.1.2.2	SCU	None

6.1.2.1.3 SOP Specific Conformance Statement for SOP Class Verification

TotalLook MammoAdvantage™ DICOM service provides standard conformance for DICOM communication verification.

6.1.2.2 Send Images to a Remote System

6.1.2.2.1 Associated Real World Activity

The TotalLook MammoAdvantage™ DICOM service can be configured to send images to any number of remote systems. TotalLook MammoAdvantage™ will digitize a patient case. The images can be configured to be pushed manually or automatically to any remote device.

6.1.2.2.2 Accepted Presentation Contexts for TotalLook MammoAdvantage™ – Image Storage

Table 5 shows the proposed presentation contexts for image storage performed by TotalLook MammoAdvantage™ as an SCU.

Table 5 - Image Storage Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Secondary Capture	1.2.840.10008.5.1.4.1.1.7	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR, Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51	SCU	None
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCU	None
Digital Mammography X-Ray – For Processing	1.2.840.10008.5.1.4.1.1.2.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR, Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51	SCU	None
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCU	None
Digital Mammography X-Ray – For Presentation	1.2.840.10008.5.1.4.1.1.2	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR, Big Endian	1.2.840.10008.1.2.2	SCU	None
		JPEG Extended (Process 2 & 4)	1.2.840.10008.1.2.4.51	SCU	None
		JPEG Lossless, Non-Hierarchical (Process 14)	1.2.840.10008.1.2.4.57	SCU	None

6.1.2.2.3 SOP Specific Conformance Statement for SOP Class Storage

If a C-STORE response indicates success, the associated images shall be marked as completed in the TotalLook MammoAdvantage™ worklist. The patient case can be re-pushed as long as it exists in the TotalLook MammoAdvantage™ worklist.

If a C-STORE response indicates failure, the failure will be logged, the association will be reattempted at a later time, and the associated images shall not be deleted. After a specified time period of successive failed attempts, no more attempts will be made, and the associated images shall be marked as failed in the TotalLook MammoAdvantage™ worklist. The retry interval and retry duration are configurable per destination. The patient case can be re-pushed

as long as it exists in the TotalLook MammoAdvantage™ worklist. The user will be prompted to re-push the patient if a failed case is to be removed from the TotalLook MammoAdvantage™ worklist.

All the image SOP Classes have the Type 1 attributes populated with a valid value. All Type 2 attributes shall be present and may be of zero length.

Detailed information of the Secondary Capture object creation is shown in Appendix A.

Detailed information of the Digital Mammography X-Ray – For Processing object and the Digital Mammography X-Ray – For Presentation object creation is shown in Appendix B.

6.1.2.3 Retrieve from a Remote System

6.1.2.3.1 Associated Real World Activity

The TotalLook MammoAdvantage™ DICOM service can query a remote device using a Modality Worklist query, Patient Root query, or Study Root query to aid in populating patient demographics into the TotalLook MammoAdvantage™ patient worklist. A user can configure TotalLook MammoAdvantage™ to perform a primary search on Patient Name, Patient ID, or Accession. A user can barcode the desired field to perform the query and populate the demographics automatically or the user and type information into the primary search field and press the query button.

6.1.2.3.2 Accepted Presentation Contexts

Table 6 shows the proposed presentation contexts performed by TotalLook MammoAdvantage™ for the SOP Class query as an SCU.

Table 6 Proposed Presentation Contexts for SOP Class Query

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Modality Worklist Query	1.2.840.10008.5.1.4.31	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR, Big Endian	1.2.840.10008.1.2.2	SCU	None
Patient Root Query	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR, Big Endian	1.2.840.10008.1.2.2	SCU	None
Study Root Query	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR, Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR, Little Endian	1.2.840.10008.1.2.1	SCU	None
		Explicit VR, Big Endian	1.2.840.10008.1.2.2	SCU	None

6.1.2.3.3 SOP Specific Conformance Statement for SOP Class Query

The TotalLook MammoAdvantage™ DICOM service shall populate the Patient Name, Patient ID, or Accession Number in the query request based on information entered from the user.

All fields listed in Table 7 are always included in the Modality Worklist query request to ask the SCP to return them for each response.

Table 7 Modality Worklist Query Fields

Modality Worklist Query: Supported Keys			
Module	Description	Tag	Type
Scheduled Procedure Step	Schedule Procedure Step Sequence	(0040,0100)	
	> Scheduled Station AE Title	(0040,0001)	Single Value or Null
	> Scheduled Procedure Step Start Date	(0040,0002)	Range Matching
	> Scheduled Procedure Step Start Time	(0040,0003)	Null
	> Modality	(0008,0060)	Single Value or Null
	> Scheduled Performing Physicians Name	(0040,0006)	Null
	> Scheduled Procedure Step Description	(0040,0007)	Null
	> Scheduled Procedure Step ID	(0040,0009)	Null
Requested Procedure	Requested Procedure ID	(0040,1001)	Null
	Requested Procedure Description	(0032,1060)	Null
	Study Instance UID	(0020,000D)	Null
Imaging Service Request	Accession Number	(0008,0050)	Single Value, Wildcard or Null
	Referring Physician's Name	(0008,0090)	Null
Patient Identification	Patient's Name	(0010,0010)	Single Value, Wildcard or Null
	Patient ID	(0010,0020)	Single Value, Wildcard or Null
Patient Demographic	Patient's Birth Date	(0010,0030)	Null
	Patient's Sex	(0010,0040)	Null

Table 8 defines the supported keys for the Patient Root query as an SCU.

Table 8 Patient Root Query Keys

Patient Root Query: Supported Keys		
Description	Tag	Type
Patient's Name	(0010,0010)	Single Value or Wildcard
Patient ID	(0010,0020)	Single Value or Wildcard
Patient's Birth Date	(0010,0030)	Null Value
Patient's Sex	(0010,0040)	Null Value

Table 9 defines the supported keys for the Study Root query as an SCU.

Table 9 Study Root Query Keys

Study Root Query: Supported Keys		
Description	Tag	Type
Study Instance UID	(0020,000D)	Null Value
Accession Number	(0008,1030)	Single Value or Wildcard
Referring Physicians Name	(0008,0090)	Null Value
Referenced Study Sequence	(0008,1110)	Null Value
Modalities in Study	(0008,0061)	Single Value or Wildcard
Study Description	(0008,1030)	Null Value
Study Date	(0008,0020)	Range Matching
Study Time	(0008,0030)	Null Value

7 Communication Profiles

7.1 Supported Communication Stacks

The TotalLook MammoAdvantage™ DICOM service provides DICOM V3.0 TCP/IP Network Communication support as defined in Part 8 of the DICOM Standard.

7.2 OSI Stack

Not Supported

7.3 TCP/IP Stack

The TotalLook MammoAdvantage™ DICOM service inherits its TCP/IP stack from the Microsoft™ Windows™ operating system of the computer upon which it executes.

7.3.1 Physical Media Supported

The physical media supported by the TCP/IP stack are 10BaseT, 100BaseT, and 1000BaseT with an RJ45 connector.

7.4 Point-to-Point Stack

The TotalLook MammoAdvantage™ DICOM service does not support the 50-poin ACR-NEMA connection

8 Extensions/Specializations/Privatizations

8.1 Standard Extended/Specialized/Private SOPs

TotalLook MammoAdvantage™ does not use any private group or element codes. See Appendix A.1.10 for the configurable extended attributes of the Secondary Capture SOP class.

8.2 Private Transfer Syntaxes

Not applicable.

9 Configuration

The TotalLook MammoAdvantage™ DICOM service is configurable from files internal to the application.

9.1 AE Title/Presentation Address Mapping

The local AE title, local host name, and DICOM port number can be configured by authorized personnel.

Systems wanting to receive output from TotalLook MammoAdvantage™ need to have their AE title, host name, DICOM port number, and desired output entered into the TotalLook MammoAdvantage™ configuration files by authorized personnel.

The presentation address mapping is configured in the mergecom.app file that is provided with the MergeCOM-3 Advanced Integrator's Took Kit.

9.2 Configurable Parameters

The following fields are configurable for TotalLook MammoAdvantage™:

- AE Title
- Hostname
- IP Address
- Net Mask
- Default Gateway
- Port Number

The following fields are configurable for each output device:

- AE Title
- Hostname/IP Address
- Retry Interval (in seconds)
- Service List and Transfer Syntax
- Image Output(s) to receive

10 Support of Extended Character Sets

TotalLook MammoAdvantage™ supports the default character set (ISO-IR 6 Basic G0 Set). Extended Character Sets are not supported.

A Secondary Capture

A.1 Secondary Capture Image Object Definition (IOD)

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
Series	General Series	M
Equipment	General Equipment	U
	SC Equipment	M
Image	General Image	M
	Image Pixel	M
	SC Image	M
	SOP Common	M

A.1.1 Secondary Capture Patient Module

Attribute Name	Tag	Type	VR	Description
Patient's Name	(0010,0010)	2	PN	Patient's name obtained from modality worklist or entered by technician.
Patient ID	(0010,0020)	2	LO	Patient ID obtained from modality worklist or entered by technician.
Patient's Birth Date	(0010,0030)	2	DA	Patient birth date obtained from modality worklist or entered by technician.
Patient's Sex	(0010,0040)	2	CS	F = Female

A.1.2 Secondary Capture General Study Module

Attribute Name	Tag	Type	VR	Description
Study Instance UID	(0020,000D)	1	UI	Unique identifier for the study.
Study Date	(0008,0020)	2	DA	Date the image was scanned. Through system configuration, it may be the date the film was exposed.
Study Time	(0008,0030)	2	TM	Time the image was scanned. Through system configuration, it may be the time the film was exposed.
Referring Physician's Name	(0008,0090)	2	PN	Name of the patient's referring physician obtained from modality worklist.
Study Description	(0008,1030)	3	LO	Institution-generated description or classification of the Study (component) performed.
Study ID	(0020,0010)	2	SH	User or equipment generated study ID obtained from modality worklist.
Accession Number	(0008,0050)	2	SH	A number that identifies the order for the study obtained from the modality worklist or entered by the technician.

A.1.3 Secondary Capture General Series Module

Attribute Name	Tag	Type	VR	Description
Modality	(0008,0060)	1	CS	RG
Series Date	(0008,0021)	3	DA	Date the image was scanned. Through system configuration, it may be the date the film was exposed.
Series Time	(0008,0031)	3	TM	Time the image was scanned. Through system configuration, it may be the time the film was exposed.
Series Description	(0008,103E)	3	LO	User provided description of the Series.
Body Part Examined	(0018,0015)	3	CS	Text description of the part of the body examined. Defined Terms: BREAST
Series Instance UID	(0020,000E)	1	UI	Unique identifier for the series.
Series Number	(0020,0011)	2	IS	A number that identifies the series: 1
Laterality	(0020,0060)	2C	CS	Laterality of body part examined. R = right L = left B = both
Operators' Name	(0008,1070)	3	PN	Technician's initials entered into worklist.

A.1.4 Secondary Capture General Equipment Module

Attribute Name	Tag	Type	VR	Description
Manufacturer	(0008,0070)	2	LO	iCAD, Inc.
Station Name	(0008,1010)	3	SH	Name of computer
Software Versions	(0018,1020)	3	LO	Manufacturer's designation of software version of the equipment that produced the digitized films.

A.1.5 Secondary Capture SC Equipment

Attribute Name	Tag	Type	VR	Description
Conversion Type	(0008,0064)	1	CS	Describes the kind of image conversion: DF = Digitized Film
Secondary Capture Device ID	(0018,1010)	3	LO	User defined identification of the device that converted the image.
Secondary Capture Device Manufacturer	(0018,1016)	3	LO	Manufacturer of the Secondary Capture Device: Vidar
Secondary Capture Device Model Name	(0018,1018)	3	LO	Manufacturer's model number of the Secondary Capture Device: VXR-12
Secondary Capture Device Software Version	(0018,1019)	3	LO	Manufacturer's designation of software version of the Secondary Capture Device: Vendor: Vidar, Device: VXR-12

A.1.6 Secondary Capture General Image Module

Attribute Name	Tag	Type	VR	Description
Instance Number	(0020,0013)	2	IS	A number that identifies the image. 1-N based on the image order of digitization.
Patient Orientation	(0020,0020)	2C	CS	Patient direction of the rows and columns of the image.
Acquisition Date	(0008,0022)	3	DA	The date image was digitized. Through system configuration, it may be the date the film was exposed.
Content Date	(0008,0023)	2C	DA	The date image was digitized
Acquisition Time	(0008,0032)	2C	TM	The time the image was digitized. Through system configuration, it may be the time the film was exposed.
Content Time	(0008,0033)	2C	TM	The time the image was digitized.

A.1.7 Secondary Capture Image Pixel Module

Attribute Name	Tag	Type	VR	Description
Samples Per Pixel	(0028,0002)	1	US	Number of samples (planes) in this image: 1
Photometric Interpretation	(0028,0004)	1	CS	Specifies the intended interpretation of the pixel data: MONOCHROME2
Rows	(0028,0010)	1	US	Number of rows in the image.
Columns	(0028,0011)	1	US	Number of columns in the image.
Bits Allocated	(0028,0100)	1	US	Number of bits allocated for each pixel sample: 16
Bits Stored	(0028,0101)	1	US	Number of bits stored for each pixel sample: 12
High Bit	(0028,0102)	1	US	Most significant bit for pixel sample data: 11
Pixel Representation	(0028,0103)	1	US	Data representation of the pixel samples: 0 = Unsigned Integer
Pixel Data	(7FE0,0010)	1	OW /OB	A data stream of the pixel samples that comprise the image.

A.1.8 Secondary Capture SC Image

Attribute Name	Tag	Type	VR	Description
Date of Secondary Capture	(0018,1012)	3	DA	Not Used.
Time of Secondary Capture	(0018,1014)	3	TM	Not Used.

A.1.9 Secondary Capture SOP Common Module

Attribute Name	Tag	Type	VR	Description
Specific Character Set	(0008,0005)	1C	CS	Character Set that expands or replaces the Basic Graphic Set. Required if an expanded or replacement character set is used. Default: ISO_IR 100
SOP Class UID	(0008,0016)	1	UI	Uniquely identifies the SOP Class: 1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	(0008,0018)	1	UI	Uniquely identifies the SOP instance.

A.1.10 Secondary Capture Extended Attributes

Note: Through a configuration file, the following group of attributes can be added to the Secondary Capture object.

Attribute Name	Tag	Type	VR	Description
Imager Pixel Spacing	(0018,1164)	1	DS	Physical distance measured at the front plane of the detector housing between the center of each image pixel specified by numeric pair – row spacing value (delimiter) column spacing value in mm. Default: 0.1000\0.1000 (100 microns) Range: 0.0446\0.0446 – 0.1000\0.1000
Image Laterality	(0020,0062)	2	CS	Laterality of body part examined: R = right L = left B = Both
Window Center	(0028,1050)	3	DS	2200 , configurable
Window Width	(0028,1051)	3	DS	3200 , configurable
View Code Sequence	(0054,0220)	1	SQ	Sequence that describes the projection of the anatomic region of interest on the image receptor.
>Code Value	(0008,0100)	1C	SH	R-10224 = ML R-10226 = MLO R-10228 = LM R-10230 = LMO R-10242 = CC R-10244 = FB R-102D0 = SIO R-102CF = XCC R-1024A = XCCL R-1024B = XCCM
>Coding Scheme Designator	(0008,0102)	1C	SH	SNM3
>Code Meaning	(0008,0104)	1C	LO	medio-lateral Medio-lateral oblique latero-medial latero-medial oblique cranio-caudal caudo-canal (from below) superolateral to inferomedial oblique exaggerated cranio-caudal

				cranio-caudal exaggerated laterally cranio-caudal exaggerated medially
>View Modifier Code Sequence	(0054,0222)	2	SQ	View modifier. Items are included in this list only if view modifier information was added by the user.
>>Code Value	(0008,0100)	1C	SH	R-102D2 = CV R-102D1 = AT R-102D3 = RL R-102D4 = RM R-102CA = RI R-102C9 = RS R-102D5 = ID R-102D6 = M R-102D7 = S R-102C2 = TAN
>>Coding Scheme Designator	(0008,0102)	1C	SH	SNM3 or SRT
>>Code Meaning	(0008,0104)	1C	LO	Cleavage Axillary Tail Rolled Lateral Rolled Medial Rolled Inferior Rolled Superior Implant Displaced Magnification Spot Compression Tangential

B Digital Mammography X-Ray

B.1 Digital Mammography X-Ray Image Object Definition (IOD)

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
Series	General Series	M
	DX Series	M
	Mammography Series	M
Equipment	General Equipment	M
Image	General Image	M
	Image Pixel	M
	DX Anatomy Imaged	M
	DX Image	M
	DX Detector	M
	Mammography Image	M
	VOI LUT	C – “FOR PRESENTATION” only
	Acquisition Context	M
	SOP Common	M
Extended Attributes		U

B.1.1 Digital Mammography X-Ray – Patient Module

Attribute Name	Tag	Type	VR	Description
Patient's Name	(0010,0010)	2	PN	Patient's name obtained from modality worklist or entered by technician.
Patient ID	(0010,0020)	2	LO	Patient ID obtained from modality worklist or entered by technician.
Patient's Birth Date	(0010,0030)	2	DA	Patient birth date obtained from modality worklist or entered by technician.
Patient's Sex	(0010,0040)	2	CS	F = Female

B.1.2 Digital Mammography X-Ray – General Study Module

Attribute Name	Tag	Type	VR	Description
Study Instance UID	(0020,000D)	1	UI	Unique identifier for the study.
Study Date	(0008,0020)	2	DA	Date the image was scanned. Through system configuration, it may be the date the film was exposed.
Study Time	(0008,0030)	2	TM	Time the image was scanned. Through system configuration, it may be the time the film was exposed.
Referring Physician's Name	(0008,0090)	2	PN	Name of the patient's referring physician obtained from modality worklist.
Study Description	(0008,1030)	3	LO	Institution-generated description or classification of the Study (component) performed.
Study ID	(0020,0010)	2	SH	User or equipment generated study ID obtained from modality worklist.
Accession Number	(0008,0050)	2	SH	A number that identifies the order for the study obtained from the modality worklist or entered by the technician.

B.1.3 Digital Mammography X-Ray – General Series Module

Attribute Name	Tag	Type	VR	Description
Modality	(0008,0060)	1	CS	MG
Series Date	(0008,0021)	3	DA	Date the image was scanned. Through system configuration, it may be the date the film was exposed.
Series Time	(0008,0031)	3	TM	Time the image was scanned. Through system configuration, it may be the time the film was exposed.
Series Description	(0008,103E)	3	LO	User provided description of the Series.
Body Part Examined	(0018,0015)	3	CS	Text description of the part of the body examined. Defined Terms: BREAST
Series Instance UID	(0020,000E)	1	UI	Unique identifier for the series.
Series Number	(0020,0011)	2	IS	A number that identifies the series: 1
Laterality	(0020,0060)	2C	CS	Not Used
Operators' Name	(0008,1070)	3	PN	Technician's initials entered into worklist.

B.1.4 Digital Mammography X-Ray – DX Series Module

Attribute Name	Tag	Type	VR	Description
Modality	(0008,0060)	1	CS	MG
Presentation Intent Type	(0008,0068)	1	CS	FOR PRESENTATION or FOR PROCESSING

B.1.5 Digital Mammography X-Ray – Mammography Series Module

Attribute Name	Tag	Type	VR	Description
Modality	(0008,0060)	1	CS	MG

B.1.6 Digital Mammography X-Ray – General Equipment Module

Attribute Name	Tag	Type	VR	Description
Manufacturer	(0008,0070)	2	LO	iCAD, Inc.
Institution Name	(0008,0080)	3	LO	Name of institution, user configurable
Institution Address	(0008,0081)	3	ST	Address of institution, user configurable
Station Name	(0008,1010)	3	SH	Name of computer
Software Versions	(0018,1020)	3	LO	Manufacturer's designation of software version of the equipment that produced the digitized films.

B.1.7 Digital Mammography X-Ray – General Image Module

Attribute Name	Tag	Type	VR	Description
Instance Number	(0020,0013)	2	IS	A number that identifies the image. 1-N based on the image order of digitization.
Patient Orientation	(0020,0020)	2C	CS	Patient direction of the rows and columns of the image.
Acquisition Date	(0008,0022)	3	DA	The date image was digitized. Through system configuration, it may be the date the film was exposed.

Content Date	(0008,0023)	2C	DA	The date image was digitized
Acquisition Time	(0008,0033)	3	TM	The time the image was digitized. Through system configuration, it may be the time the film was exposed.
Content Time	(0008,0033)	2C	TM	The time the image was digitized

B.1.8 Digital Mammography X-Ray – Image Pixel Module

Attribute Name	Tag	Type	VR	Description
Samples Per Pixel	(0028,0002)	1	US	Number of samples (planes) in this image: 1
Photometric Interpretation	(0028,0004)	1	CS	Specifies the intended interpretation of the pixel data: MONOCHROME2
Rows	(0028,0010)	1	US	Number of rows in the image.
Columns	(0028,0011)	1	US	Number of columns in the image.
Bits Allocated	(0028,0100)	1	US	Number of bits allocated for each pixel sample: 16
Bits Stored	(0028,0101)	1	US	Number of bits stored for each pixel sample: 12
High Bit	(0028,0102)	1	US	Most significant bit for pixel sample data: 11
Pixel Representation	(0028,0103)	1	US	Data representation of the pixel samples: 0 = Unsigned Integer
Pixel Data	(7FE0,0010)	1	OW/OB	A data stream of the pixel samples that comprise the image.

B.1.9 Digital Mammography X-Ray – DX Anatomy Imaged Module

Attribute Name	Tag	Type	VR	Description
Image Laterality	(0020,0062)	1	CS	Laterality of body part examined: R = Right L = Left B = Both
Anatomic Region Sequence	(0008,2218)	2	SQ	Sequence that identifies the anatomic region of interest in this image.
>Code Value	(0008,0100)	1C	SH	T-04000
>Coding Scheme Designator	(0008,0102)	1C	SH	SNM3
>Code Meaning	(0008,0104)	1C	LO	Breast

B.1.10 Digital Mammography X-Ray – DX Image Module

Attribute Name	Tag	Type	VR	Description
Image Type	(0008,0008)	1	CS	Configurable. Default: ORIGINALPRIMARY
Samples Per Pixel	(0028,0002)	1	US	Number of samples (planes) in this image: 1
Photometric Interpretation	(0028,0004)	1	CS	Specifies the intended interpretation of the pixel data: MONOCHROME2
Bits Allocated	(0028,0100)	1	US	Number of bits allocated for each pixel sample: 16
Bits Stored	(0028,0101)	1	US	Number of bits stored for each pixel sample: 12

High Bit	(0028,0102)	1	US	Most significant bit for pixel sample data: 11
Pixel Representation	(0028,0103)	1	US	Data representation of the pixel samples: 0 = Unsigned Integer
Pixel Intensity Relationship	(0028,1040)	1	CS	The relationship between the pixel sample values and the X-Ray beam intensity. LIN = Linearly proportional to X-Ray beam intensity.
Pixel Intensity Relationship Sign	(0028,1041)	1	SS	The sign of the relationship between the pixel sample values stored in pixel data (7FE0,0010) and the X-Ray beam intensity: -1 = Higher pixel values correspond to less X-Ray beam intensity.
Rescale Intercept	(0028,1052)	1	DS	The value b in the relationship between stored values (SV) in pixel data (7FE0,0010) and the output units specified in Rescale Type (0028,1054). Output units = m*SV + b. value = 0
Rescale Slope	(0028,1053)	1	DS	m in the equation specified by Rescale Intercept (0028,1052). value = 1
Rescale Type	(0028,1054)	1	LO	Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052). US = Unspecified
Presentation LUT Shape	(2050,0020)	1	CS	Specifies an identity transformation for the Presentation LUT, other than to account for the value of Photometric Interpretation (0028,0004), such that the output of all grayscale transformations defined in the IOD containing this Module are defined to be P-Values. IDENTITY – output is in P-Values
Lossy Image Compression	(0028,2110)	1	CS	Specifies whether an Image has undergone lossy compression. 00 = Image has NOT been subjected to lossy compression. 01 = Image has been subjected to lossy compression.
Patient Orientation	(0020,0020)	1	CS	Patient direction of the rows and columns of the image.
Burned In Annotation	(0028,0301)	1	CS	Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. NO
Window Center	(0028,1050)	1C	DS	Defines a Window Center for display.
Window Width	(0028,1055)	1C	DS	Window Width for display.

B.1.11 Digital Mammography X-Ray – DX Detector Module

Attribute Name	Tag	Type	VR	Description
Detector Type	(0018,7004)	2	CS	The type of detector used to acquire this image: FILM = Scanned film/screen
Imager Pixel Spacing	(0018,1164)	1	DS	Physical distance measured at the front plane of the detector housing between the center of each image pixel specified by numeric pair – row spacing value (delimiter) column spacing value in mm. Default: 0.1000\0.1000 (100 microns) Range: 0.0446\0.0446 – 0.1000\0.1000

B.1.12 Digital Mammography X-Ray – DX Positioning Module

Attribute Name	Tag	Type	VR	Description
View Position	(0018,5101)	3	CS	Radiographic view of the image relative to the imaging subject's orientation. Shall be consistent with View Code Sequence (0054,0220). ML MLO LM LMO CC FB SIO XCC XCCL XCCM

B.1.13 Digital Mammography X-Ray – Mammography Image Module

Attribute Name	Tag	Type	VR	Description
Positioner Type	(0018,1508)	1	CS	MAMMOGRAPHIC
Image Laterality	(0020,0062)	1	CS	Laterality of body part examined: R = Right L = Left B = Both
Organ Exposed	(0040,0318)	1		Organ to which Organ Dose (0040,0316) applies. BREAST
Anatomic Region Sequence	(0008,2218)	2	SQ	Sequence that identifies the anatomic region of interest in this image.
>Code Value	(0008,0100)	1C	SH	T-04000
>Coding Scheme Designator	(0008,0102)	1C	SH	SNM3
>Code Meaning	(0008,0104)	1C	LO	Breast
View Code Sequence	(0054,0220)	1	SQ	Sequence that describes the projection of the anatomic region of interest on the image receptor.
>Code Value	(0008,0100)	1C	SH	R-10224 = ML R-10226 = MLO R-10228 = LM

				R-10230 = LMO R-10242 = CC R-10244 = FB R-102D0 = SIO R-102CF = XCC R-1024A = XCCL R-1024B = XCCM
>Coding Scheme Designator	(0008,0102)	1C	SH	SNM3
>Code Meaning	(0008,0104)	1C	LO	medio-lateral Medio-lateral oblique latero-medial latero-medial oblique cranio-caudal caudo-canal (from below) superolateral to inferomedial oblique exaggerated cranio-caudal cranio-caudal exaggerated laterally cranio-caudal exaggerated medially
>View Modifier Code Sequence	(0054,0222)	2	SQ	View modifier. Items are included in this list only if view modifier information was added by the user.
>>Code Value	(0008,0100)	1C	SH	R-102D2 = CV R-102D1 = AT R-102D3 = RL R-102D4 = RM R-102CA = RI R-102C9 = RS R-102D5 = ID R-102D6 = M R-102D7 = S R-102C2 = TAN
>>Coding Scheme Designator	(0008,0102)	1C	SH	SNM3 or SRT
>>Code Meaning	(0008,0104)	1C	LO	Cleavage Axillary Tail Rolled Lateral Rolled Medial Rolled Inferior Rolled Superior Implant Displaced Magnification Spot Compression Tangential

B.1.14 Digital Mammography X-Ray – VOI LUT

NOTE: The Digital Mammography X-Ray – VOI LUT can be enabled or disabled on “FOR PRESENTATION” objects through a configuration change.

Attribute Name	Tag	Type	VR	Description
VOI LUT Sequence	(0028,3010)	3	SQ	Defines a sequence of VOI LUTs
>LUT Descriptor	(0028,3002)	1C	US	Specifies the format of the LUT Data in this Sequence: 4096/0/12
>LUT Data	(0028,3006)	1C	US	LUT Data in this Sequence

B.1.15 Digital Mammography X-Ray – Acquisition Context

Attribute Name	Tag	Type	VR	Description
Acquisition Context Sequence	(0040,0555)	2	SQ	A sequence of repeating items that describes the conditions present during the acquisition of an image. There are no items in this sequence.

B.1.16 Digital Mammography X-Ray – SOP Common

Attribute Name	Tag	Type	VR	Description
Specific Character Set	(0008,0005)	1C	CS	Character Set that expands or replaces the Basic Graphic Set. Required if an expanded or replacement character set is used. Default: ISO_IR 100
SOP Class UID	(0008,0016)	1	UI	Uniquely identifies the SOP Class. For Processing: 1.2.840.10008.5.1.4.1.1.1.2.1 For Presentation: 1.2.840.10008.5.1.4.1.1.1.2
SOP Instance UID	(0008,0018)	1	UI	Uniquely identifies the SOP instance.