Abbott

DICOM

CONFORMANCE STATEMENT

CARDIOLOGY:

ILUMIEN™ PCI OPTIMIZATION SYSTEM

ILUMIEN™ OPTIS™

OPTIS™ INTEGRATED SYSTEM

OPTIS™ MOBILE SYSTEM

TABLE OF CONTENTS

1 CONFORMANCE STATEMENT OVERVIEW

The Abbott Medical PCI optimization systems implement several DICOM services for exchanging information and images. These systems allow for the querying of patient information from a network storage device, as well as the storing of acquired OCT images and Physiology images, as "secondary capture" images, to the network storage device or CD/DVD. All references to PCI Optimization System in this document refer to the ILUMIEN PCI Optimization System (at D.2 or higher), ILUMIEN OPTIS Mobile System (at E.1.1 or higher), OPTIS Mobile System (at E.1.1 or higher), and OPTIS Integrated System (at E.1.1 or higher).

1.1 NETWORK SERVICES

The table below gives an overview of the network services supported by the PCI optimization systems.

TABLE 1 - NETWORK SERVICES

Information Object	Service Class	Service Class User (SCU)	Service Class Provider (SCP)
Multi-frame True Color Secondary Capture Image	Storage	Yes	No
Secondary Capture Image	Storage	Yes	No
Ultrasound Multi-frame Image	Storage	Yes	No
Intravascular OCT Image - For Presentation	Storage	Yes	No
Patient Root Information Model	Query/Retrieve	Yes	No
Modality Worklist Information Model	Query/Retrieve	Yes	No
Verification	Verification	Yes	No

1.2 SOP CLASSES

The supported SOP classes, as derived from the table above, are listed in the following table:

TABLE 2 - UID VALUES

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.7.4	Multi-frame True Color Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.3.1	Ultrasound Multi-frame Image Storage
1.2.840.10008.5.1.4.1.1.14.1	Intravascular OCT Image Storage – For Presentation
1.2.840.10008.5.1.4.1.2.1.1	Patient Root Query/Retrieve Information Model – FIND
1.2.840.10008.5.1.4.31	Modality Worklist Information Model – FIND
1.2.840.10008.1.1	Verification

1.3 MEDIA EXCHANGE

The PCI optimization systems also support the necessary DICOM Media Storage services to write acquired OCT images and Physiology images to CD/DVD. These systems perform as File-set Creators (FSC) and use the M-WRITE operation to store the Secondary Capture image on the exchange media. The PCI optimization systems do not support the Media Storage Print option.

2 INTRODUCTION

This document serves as a formal statement of the conformance to the DICOM Standard of the DICOM implementation used by the Abbott Medical PCI optimization systems. In this Conformance Statement you will find a description of the DICOM services, objects, and protocols used by these systems. This document satisfies the DICOM requirement for a vendor conformance specification.

2.1 REVISION HISTORY

The history of modifications and revisions to this document are described in the following table.

TABLE 3 - REVISION HISTORY

Revision	Date of Issue	Description of Modifications
B	12/2013	• Initial revision, based off Document number 15760A • Added US modality • Added Modality Worklist Information Modal – FIND
D	10/2015	• Added Intravascular OCT Image Storage – For Presentation • Latin alphabet No.1 charset support
E	6/2019	• Various updates based on comments from SQA • Updated the description of Manufacturer's Model Name

2.2 AUDIENCE

This Conformance Statement is intended for current or potential users and administrators of the Abbott Medical PCI optimization systems wishing to understand the DICOM features and requirements of these systems. The information contained in this document will be most valuable to medical system integrators and software designers/implementers. It is assumed that the reader is familiar with the DICOM Standard and has a working understanding of DICOM.

2.3 REMARKS

The structure of this document follows the DICOM Conformance Statement template as described in the DICOM Standard (PS 3.2-2014).

2.4 TERMS AND ABBREVIATIONS

The following acronyms and abbreviations are used in this document.

AE	Application Entity
ANSI	American National Standards Institute
CD-R	Compact Disc-Recordable
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DNS	Domain Name System
FFR	Fractional Flow Reserve
FSC	File-set Creator
ICMP	Internet Control Message Protocol
IOD	Information Object Definition
ISO	International Standard Organization

NEMA	National Electrical Manufacturers Association
OCT	Optical Coherence Tomography
OID	Object Identifier
PDU	Protocol Data Unit
RFR	Resting Full-cycle Ratio
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

2.5 REFERENCES

DICOM Digital Imaging and Communications in Medicine (DICOM),
Part 1 – 16 (NEMA PS 3.1– 3.16, 2014),
National Electrical Manufacturers Association (NEMA)
1300 N. 17th Street
Rosslyn, Virginia 22209, USA

3 NETWORKING

The Abbott Medical PCI optimization systems implement several DICOM services for exchanging information and images over a network connection. These systems allow for the querying of patient information from, as well as the saving of acquired OCT images and Physiology images to, a DICOM compliant network storage device.

3.1 IMPLEMENTATION MODEL

The PCI optimization systems use DICOM network services to support four features of their software: importing patient demographic information; query modality worklist; exporting OCT images and Physiology images to a network storage device; and testing the connection to the network storage device. Each of these features requires that the software be configured to connect to a DICOM compliant network storage device. This configuration is managed in the DICOM tab of the Setup Configuration dialog. To help with the setup of this network connection a "Test Connection" button is available, which uses the DICOM C-Echo Request service.

3.1.1 APPLICATION DATA FLOW

The relationship between the features of the PCI optimization systems and the networked DICOM Application Entity (AE) is depicted in the diagram in Figure 1. As can be seen in this diagram, a single AE, the Local Application Entity, is used to perform all user-interface activities that require DICOM network services.

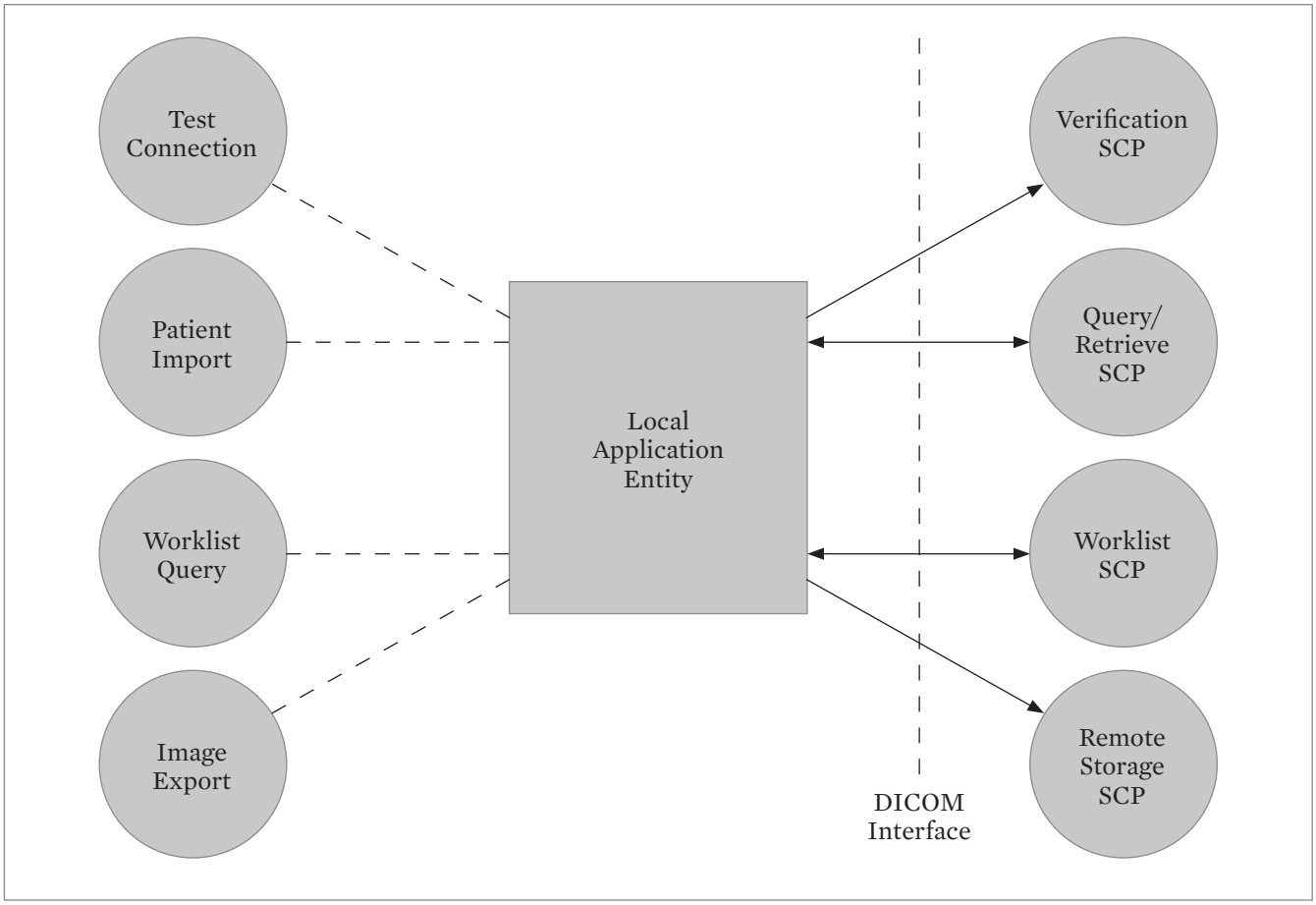

FIGURE 1 – LOCAL AE DATA FLOW

3.1.2 FUNCTIONAL DEFINITION OF LOCAL AE

The PCI optimization systems' only Application Entity, the Local AE, is used by all features requiring DICOM network services. To perform each of these features the Local AE must be properly configured to connect to a DICOM compliant network storage device.

The first feature, Test Connection, opens a TCP/IP connection to the configured IP address and port number; creates an association between the "Local AE" and the "Server AE" using the configured AE titles; and sends a C-Echo request from the Verification SCU (Local AE) to the Verification SCP (Server AE) if SCP supports Verification service.

The Patient Import feature opens a TCP/IP connection to the Remote DICOM Store; creates an association between the "Local AE" and the "Server AE"; and sends a Patient Root C-Find request containing the "Patient Name" and/or "Patient ID" query strings to the Query/Retrieve SCP.

The Worklist Query feature opens a TCP/IP connection to the remote Modality Worklist server; creates an association between the "Local AE" and the "Server AE"; and sends a Worklist C-Find request containing the "Patient Based Query" or "Broad Query" query criteria to the Query/Retrieve SCP.

An Image Export to a Remote DICOM Store is performed by opening a TCP/IP connection to the Remote DICOM Store and creating an association between the "Local AE" and the "Server AE". Once this connection is established each image to be stored is sent to the "Server AE" as part of a C-Store Request using the "Little-Endian Implicit-VR" Transfer Syntax.

3.1.3 SEQUENCING OF REAL-WORLD ACTIVITIES

The three software features that use the Local AE to perform DICOM networking services operate independently of each other. These features each operate synchronously beginning with a connection to the Server AE and ending with that connection being closed. Since each of these features operate independently and synchronously and may only be initiated by the Local AE there are no sequencing constraints between the various operations performed by this AE.

3.2 LOCAL AE SPECIFICATION

The Local AE provides Standard Conformance to the following SOP Classes:

TABLE 4 - SOP CLASSES FOR LOCAL AE

SOP Class Name	SOP Class UID	SCU	SCP
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
Intravascular OCT Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.14.1	Yes	No
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No
Verification	1.2.840.10008.1.1	Yes	No

3.2.1 ASSOCIATION POLICIES

The Local AE will establish a DICOM Associate connection with the Remote DICOM Store upon initiation of one of its features. This Application Entity does not accept DICOM Associate connections from external entities.

3.2.1.1 GENERAL

The maximum PDU (Protocol Data Unit, or DICOM lower-level protocol packet) size that can be received by the Local AE is 16384 bytes. This value is not configurable by the user.

The Application Context Name used in a DICOM Associate connection initiated by the Local AE is “1.2.840.10008.3.1.1.1”.

3.2.1.2 NUMBER OF ASSOCIATIONS

The Local AE supports only 1 active DICOM Associate connection at any time.

3.2.1.3 ASYNCHRONOUS NATURE

DICOM Associate connections initiated by the Local AE do not support Asynchronous Operations.

3.2.1.4 IMPLEMENTATION IDENTIFYING INFORMATION

The Local AE implementation identifying information is shown in Table 5. The class UID is prefixed with the Abbott Medical ANSI OID (“2.16.840.1.114432”) to guarantee global uniqueness. The version name shown in the table will be used initially, but is subject to change as newer versions of this DICOM implementation become available.

TABLE 5 - IMPLEMENTATION CLASS AND VERSION FOR LOCAL AE

Name	Value
Implementation Class UID	2.16.840.1.114432.2.10
Implementation Version Name	LLI_OCT_V1

3.2.2 ASSOCIATION INITIATION POLICY

As stated earlier, the Local AE will initiate an association with the Remote DICOM Store when any of the following features are invoked: Test Connection; Patient Import; or Image Export. The association initiation for each feature is described further in this section.

3.2.2.1 TEST CONNECTION

The Test Connection feature can be accessed from the DICOM tab of the Setup dialog. Once a configured DICOM server has been selected from the list, clicking the "Test Connection" button will verify that a valid DICOM connection can be established. The user is prompted with a message box stating the success or failure of the verification process.

3.2.2.1.1 DESCRIPTION AND SEQUENCING OF ACTIVITIES

The Test Connection feature is performed by: opening a TCP/IP connection to the configured IP address and port number; creating an association between the "Local AE" and the "Server AE" using the configured AE titles; and sending a C-Echo request from the Verification SCU (Local AE) to the Verification SCP (Server AE). If the SCP does not support Verification server, no C-Echo request is sent to SCP and the connection is closed; otherwise, the connection is closed as soon as the C-Echo result is received.

This sequence of activities is illustrated in Figure 2.

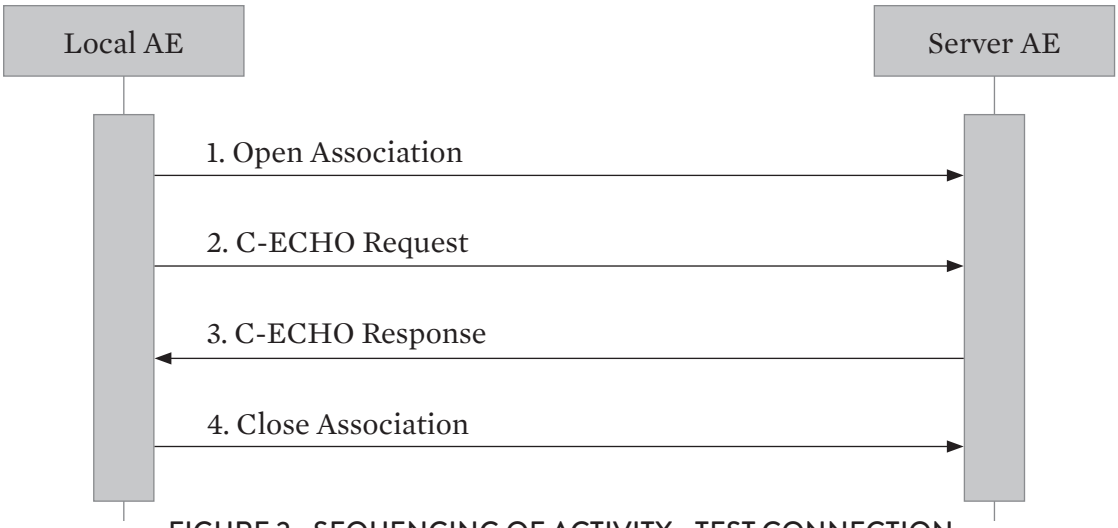

FIGURE 2 - SEQUENCING OF ACTIVITY - TEST CONNECTION

3.2.2.2 QUERY SERVER

The Query Server feature can be accessed from the Configure DICOM dialog. The Query Server is performed with the Test Connection process. In addition to performing the Verification in Table 4, queries for all other SOP classes listed in the table are performed. The query results are presented in the dialog.

3.2.2.3 PATIENT IMPORT

The Patient Import feature can be accessed from the "Add Patient" wizard with its DICOM Patient Info option selected. This wizard provides the patient query page that can be used to enter "Patient Name" and/or "Patient ID" query strings used to query the database on the Remote DICOM Store. The Patient Import process is started by clicking the "Search" button on the page. When the query results are received the user can select a patient then start a recording. The details of the query result are listed in Table 6.

TABLE 6 - PATIENT QUERY RESULT

Attribute Name	Description
Patient Name	First name and last name
Patient ID	Patient identification
Birth Date	Birth date of the patient
Gender	Gender of the named patient – Male, Female, Unknown

3.2.2.3.1 DESCRIPTION AND SEQUENCING OF ACTIVITIES

This process is really just a query of the Remote DICOM Store database and is performed by: opening a TCP/IP connection to the Remote DICOM Store; creating an association between the "Local AE" and the "Server AE"; and sending a Patient Root C-Find request containing the "Patient Name" and/or "Patient ID" query strings to the Query/Retrieve SCP. The connection is closed as soon as the results of the query are received.

This sequence of activities is illustrated in Figure 3.

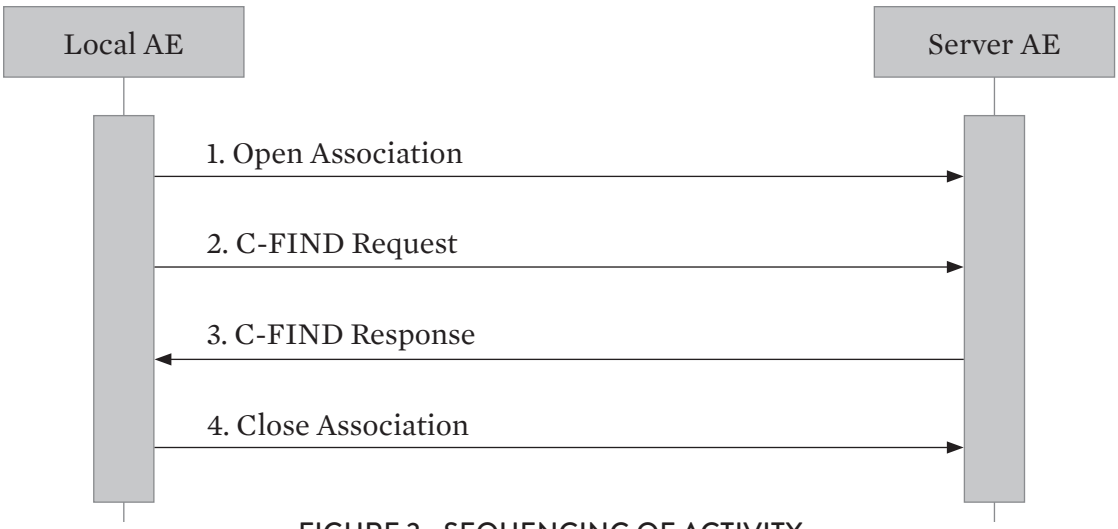

FIGURE 3 - SEQUENCING OF ACTIVITY – PATIENT IMPORT/MODALITY WORKLIST QUERY

3.2.2.4 MODALITY WORKLIST QUERY

The Modality Worklist Query feature can be accessed from the "Add Patient" wizard with its DICOM Worklist Items option selected. The wizard provides pages to specify query criteria and to perform a worklist query. The query criteria page can be used to enter "Patient Based Query" or "Broad Query" query information for querying the scheduled worklist items from the remote modality worklist server. The Modality Worklist Query process is started by clicking the "Search" button in query page of the wizard. When the query results are received the user can select a patient for use.

3.2.2.4.1 DESCRIPTION AND SEQUENCING OF ACTIVITIES

To complete the modality worklist query process the software will perform the following steps:

1. A TCP/IP connection is opened to the remote Modality Worklist Server;
2. An association is created between the "Local AE" and the "Server AE";
3. A worklist C-Find request containing the "Patient Based Query" or "Broad Query" query information is sent to the Query/Retrieve SCP.
4. The connection is closed as soon as the results of the query are received.

This sequence of activities is illustrated in Figure 3.

3.2.2.4.2 PATIENT BASED MODALITY WORKLIST QUERY ATTRIBUTES

The patient based modality worklist query criteria can be entered as listed in Table 7.

TABLE 7 - PATIENT BASED QUERY ATTRIBUTES

Tag	Tag Name	Description
(0010,0010)	Patient's Name	First name and last name
(0010,0020)	Patient ID	Patient identification
(0008,0050)	Accession Number	A departmental information system generated number that identifies the order for a study
(0040,1001)	Requested Procedure ID	Identify a requested procedure

3.2.2.4.3 BROAD MODALITY WORKLIST QUERY ATTRIBUTES

The broad modality worklist query criteria can be entered as listed in Table 8.

TABLE 8 - BROAD QUERY ATTRIBUTES

Tag	Tag Name	Description
(0008,0060)	Modality	Modality to query
(0040,0002)	Scheduled Procedure Step Start Date	Scheduled procedure step start date
(0040,0001)	Scheduled Station AE Title	Scheduled station AE title

3.2.2.4.4 WORKLIST QUERY IDENTIFIER

Acquired images will always use the Study Instance UID specified for the Scheduled Procedure Step (if available). If an acquisition is unscheduled, a Study Instance UID will be generated locally.

The modality worklist query is initiated by the user only. The ILUMIEN OPTIS, OPTIS Mobile and OPTIS Integrated Systems do not support automated worklist queries.

Not all attributes in the Worklist Query Identifier are saved after query if a scheduled procedure is not performed after a query, or, the procedure is cancelled while performing. Only the patient identification and demographic information are saved for a not performed or cancelled scheduled procedure after query.

The table below provides a description of the ILUMIEN OPTIS, OPTIS Mobile or OPTIS Integrated System Worklist Request Identifier and specifies the attributes that are copied into the images. Unexpected attributes returned in a C-Find response are ignored.

Requested return attributes not supported by the SCP are set to have no value. Non-matching responses returned by the SCP due to unsupported optional matching keys are ignored. No attempt is made to filter out possible duplicate entries.

TABLE 9 - WORKLIST REQUEST IDENTIFIER

Module Name	Attribute	Tag	Matching Key	Return-Key	Displayed	IOD
Patient Identification						
	Patient's Name	(0010,0010)	X	X	X	X
	Patient ID	(0010,0020)	X	X	X	X
Patient Demographic						
	Patient's Birth Date	(0010,0030)		X	X	X
	Patient's Sex	(0010,0040)		X	X	X
Scheduled Procedure Step						
	Scheduled Procedure Step Sequence	(0040,0100)		X		
	>Modality	(0008,0060)	X	X	X	
	>Scheduled Procedure Station AE Title	(0040,0001)	X	X	X	
	>Scheduled Procedure Step Start Date	(0040,0002)	X	X	X	
	>Scheduled Performing Physician's Name	(0040,0006)		X		X
Requested Procedure						
	Requested Procedure ID	(0040,1001)	X	X	X	
	Study Instance UID	(0020,1001)		X		X
Imaging Service Request						
	Accession Number	(0008,0050)	X	X	X	X

The columns in the table above are described as follows:

- Module Name: The name of the associated module for supported worklist attributes.
- Attribute Name: Attributes supported to build the Worklist Request Identifier.
- Tag: DICOM tag for the attribute.
- Matching Key: Indicates the attribute is used as a matching key for worklist query.
- Return Key: Indicates a Return Key attribute.
- Displayed: Indicates the attribute is displayed in the query result.
- IOD: Indicates the attribute is returned to the PACS in the Image IODs.

3.2.2.5 IMAGE EXPORT

The final feature requiring support of the Local AE is the Image Export feature. This feature may be accessed by initiating an export via the “Export” button in the live view screens. When an export is initiated the “Export image files” dialog is displayed. An export to the Remote DICOM Store may be accomplished by selecting the “Remote DICOM Store” Export Destination option and clicking the “Export” button.

3.2.2.5.1 DESCRIPTION AND SEQUENCING OF ACTIVITIES

An Image Export to a Remote DICOM Store is performed by opening a TCP/IP connection to the Remote DICOM Store and creating an association between the “Local AE” and the “Server AE”. Once this connection is established each image to be stored is exported to a DICOM Data Set and sent to the “Server AE” as part of a C-Store Request. The connection is closed after all images are sent to the “Server AE”.

This sequence of activities, with n representing the number of images to be stored, is illustrated in Figure 4.

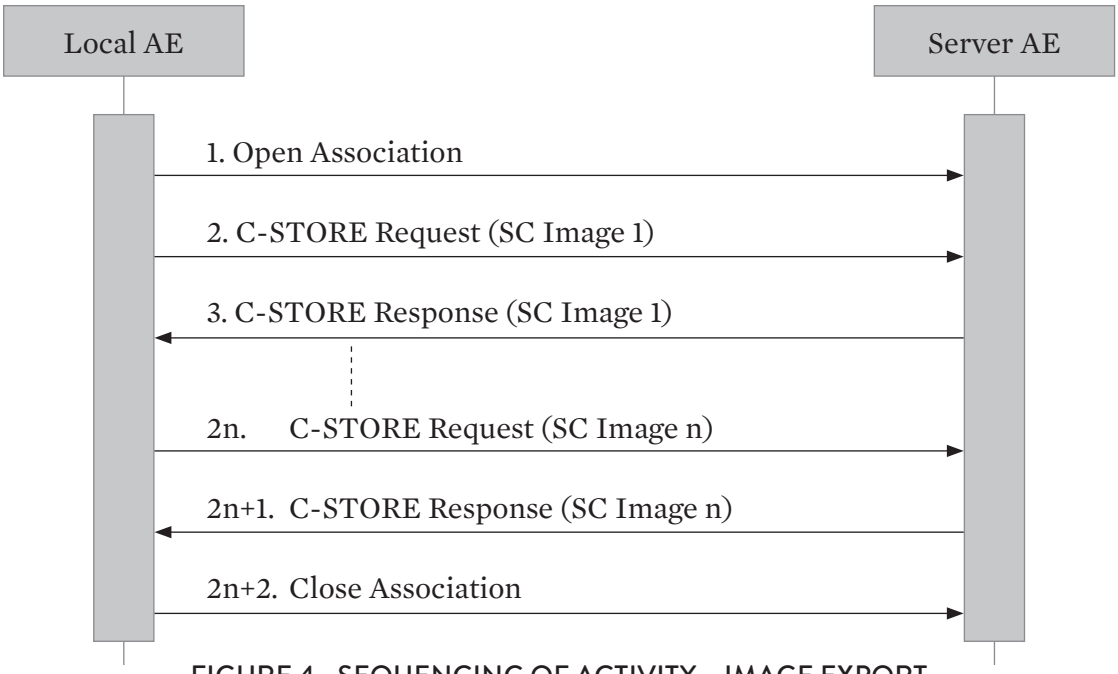

FIGURE 4 - SEQUENCING OF ACTIVITY – IMAGE EXPORT

3.2.2.5.2 IMAGE EXPORT OPTIONS

There are three options provided when exporting image files, “Playback time for Frame Time”, the “IVUS pullback rate”, and “Include region calibration”. If the “Playback time for Frame Time” is selected, the Frame Time (0018:1063) will be the playback frame time, otherwise, the acquisition frame time. If the “IVUS pullback rate” option is selected the IVUS pullback rate (0018:3101) will be included in the exported image file and set as OCT pullback rate. If the “Include region calibration” option is selected the region calibration information of the calibrated images will be stored in the image files. The three options do not apply for the Physiology image.

3.2.2.6 PROPOSED PRESENTATION CONTEXTS

The Local AE is capable of proposing the Presentation Contexts shown in Table 10 when initiating an associate connection.

TABLE 10 - PROPOSED PRESENTATION CONTEXTS

Abstract Syntax		Transfer Syntax		Role	
Name	**UID**	**Name List**	**UID List**	**Role**	
Multi-frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Intravascular OCT Image Storage – For Presentation	1.2.840.100008.5.1.4.1.1.14.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.2.2.6.1 MULTI-FRAME TRUE COLOR SECONDARY CAPTURE IMAGE STORAGE SOP CLASS

When the OCT intravascular imaging systems store their OCT images in DICOM format, they can be stored as Multi-frame Secondary Capture images. Physiology image can also be stored to SCP as Multi-frame Secondary Capture image if SCP does not support Secondary Capture Image. When stored to media, Physiology images are always stored as Secondary Capture Image.

The “PALETTE COLOR” selection is provided as an option to the DICOM standard “RGB” setting for “Photometric Interpretation”. When “PALETTE COLOR” is selected the “Samples Per Pixel” value for the images is 1 instead of 3, which reduce the image size to approximately 33% of what would be required to comply with the standard in this regard. The Physiology image is always exported as standard “RGB” image. The “PALETTE COLOR” selection has no impact on exporting the Physiology image.

The Multi-frame True Color Secondary Capture IOD is extended slightly to support additional attributes appropriate for OCT images, thereby making it a DICOM Standard Extended Object. The attributes of this SOP Class are shown in Table 11.

TABLE 11 - MULTI-FRAME SECONDARY CAPTURE IMAGE SOP CLASS ATTRIBUTES

Module (* multi-frame)	Attribute	Tag	Description
Patient	Patient's Name	0010:0010	OCT database Patient info
	Patient ID	0010:0020	OCT database Patient info
	Patient's Birth Date	0010:0030	OCT database Patient info
	Patient's Sex	0010:0040	OCT database Patient info
General Study	Study Instance UID	0020:000D	Internally generated or imported from Modality Worklist
	Study Date	0008:0020	OCT database Case info
	Study Time	0008:0030	OCT database Case info
	Referring Physician's Name	0008:0090	<empty>
	Study ID	0020:0010	1
	Accession Number	0008:0050	User defined or imported from Modality Worklist
Patient Study	Patient's Age	0010:1010	OCT database Patient info
General Series	Modality	0008:0060	"OCT","OT" or "US" (Physiology is always "OT")
	Series Instance UID	0020:000E	Internally generated
	Series Number	0020:0011	Internally generated, starting from 1 within a Study
	Series Date	0008:0021	OCT database Case info
	Series Time	0008:0031	OCT database Case info
	Performing Physician Name	0008:1050	OCT database Case info
	Body Part Examined	0018:0015	"HEART"
General Equipment	Manufacturer	0008:0070	"Abbott Medical"
	Institution Name	0008:0080	User defined institution name
	Manufacturer's Model Name	0008:1090	See Table 12
	Software Versions	0018:1020	Software version
General Image	Instance Number	0020:0013	0 – For OCT pullback, Captured frame not associated with an OCT pullback, and Physiology Frame number (starting from 1) – For single frame exported from an OCT pullback

TABLE 11 - MULTI-FRAME SECONDARY CAPTURE IMAGE SOP CLASS ATTRIBUTES (Continued)

Module (* multi-frame)	Attribute	Tag	Description
General Image (continued)	Patient Orientation	0020:0020	<empty>
	Content Date	0008:0023	Creation date of image first frame
	Content Time	0008:0033	Creation time of image first frame
	Image Type	0008:0008	"ORIGINAL/PRIMARY/INTRA-VASCULAR" ("ORIGINAL/PRIMARY" for Physiology)
	Acquisition Date	0008:0022	OCT database Image info
	Acquisition Time	0008:0032	OCT database Image info
	Burned In Annotation	0028:0301	"NO"
	Image Comments	0020:4000	User defined image comment
	Lossy Image Compression	0028:2110	00 (image not lossy compressed)
	Lossy Image Compression Ratio	0028:2112	0
Image Pixel	Samples per Pixel	0028:0002	Set to 1 for PALETTE COLOR, 3 for RGB
	Photometric Interpretation	0028:0004	"RGB" or "PALETTE COLOR"
	Rows	0028:0010	Number of rows in the exported image
	Columns	0028:0011	Number of columns in the exported image
	Bits Allocated	0028:0100	8
	Bits Stored	0028:0101	8
	High Bit	0028:0102	7
	Pixel Representation	0028:0103	0
	Planar Configuration	0028:0006	0 (Only included for RGB images)
	Red Palette Color Lookup Table Descriptor	0028:1101	256\0\16. Only included for PALETTE COLOR images
	Green Palette Color Lookup Table Descriptor	0028:1102	256\0\16. Only included for PALETTE COLOR images
	Blue Palette Color Lookup Table Descriptor	0028:1103	256\0\16. Only included for PALETTE COLOR images
	Red Palette Color Lookup Table Data	0028:1201	Lookup table data for red color. Only included for PALETTE COLOR images
	Green Palette Color Lookup Table Data	0028:1202	Lookup table data for green color. Only included for PALETTE COLOR images

TABLE 11 - MULTI-FRAME SECONDARY CAPTURE IMAGE SOP CLASS ATTRIBUTES (Continued)

Module (* multi-frame)	Attribute	Tag	Description
Image Pixel (Continued)	Blue Palette Color Lookup Table Data	0028:1203	Lookup table data for blue color. Only included for PALETTE COLOR images
	Pixel Data	7FE0:0010	Image data for all frames
Cine*	Frame Time	0018:1063	1000 / Acquisition Frame Rate
	Recommended Display Frame Rate	0008:2144	Playback Frame Rate
Multi-frame*	Number of Frames	0028:0008	Number of frames in a Multi-frame image
	Frame Increment Pointer	0028:0009	0018:1063 (Frame Time tag). Only included when number of frames is greater than 1.
US Region Calibration (optional)	Sequence of Regions	0018:6011	1 or more regions may be included
	>Region Location Min x0	0018:6018	Rectangle upper-left X position
	>Region Location Min y0	0018:601A	Rectangle upper-left Y position
	>Region Location Max x1	0018:601C	Rectangle lower-right X position
	>Region Location Max y1	0018:601E	Rectangle lower-right Y position
	>Physical Units X Direction	0018:6024	0003H (cm)
	>Physical Units Y Direction	0018:6026	0003H (cm)
	>Physical Delta X	0018:602C	Pixel X size in cm's (calculated)
	>Physical Delta Y	0018:602E	Pixel Y size in cm's (calculated)
	>Region Spatial Format	0018:6012	0000H (not applicable)
	>Region Data Type	0018:6014	0000H (not applicable)
	>Region Flags	0018:6016	0000H (low priority, not protected)
SC Multi-frame Image*	Burned In Annotation	0028:0301	"NO"
	Frame Increment Pointer	0028:0009	0018:1063 (Frame Time tag). Only included when number of frames is greater than 1.
	Pixel Spacing	0028:0030	Physical distance in the patient between the center of each pixel, in mm. Only included when only one region and image is calibrated.
SOP Common	SOP Class UID	0008:0016	"1.2.840.10008.5.1.4.1.1.7.4"
	SOP Instance UID	0008:0018	Internally generated
	Specific Character Set	0008:0005	ISO_IR 100
	Instance Creation Date	0008:0012	Current date
	Instance Creation Time	0008:0013	Current time

TABLE 11 - MULTI-FRAME SECONDARY CAPTURE IMAGE SOP CLASS ATTRIBUTES (Continued)

Module (* multi-frame)	Attribute	Tag	Description
SOP Common (Continued)	Timezone Offset from UTC	0008:0201	System timezone offset
	Instance Number	0020:0013	Same as in General Image Module
SC Equipment	Conversion Type	0008:0064	"SI" (scanned image)
	Modality	0008:0060	"OCT", "OT" or "US" (Physiology is always "OT")
	Secondary Capture Device Manufacturer	0018:1016	"Abbott Medical"
	Secondary Capture Device Manufacturer's Model Name	0018:1018	See Table 12
	Secondary Capture Device Software Version	0018:1019	Software Version
Additional	IVUS Pullback	0018:3101	OCT pullback rate (Optional)

Note: Modules marked with an asterisk (*) are only included in SOP Instances for multi-frame images.

The Manufacturer's Model Name (0008:1090) and the Secondary Capture Manufacturer's Model Name (0018:1018) contains information about the system on which the OCT recording was originally captured, not the current platform information. Table 12 below summarizes the Manufacturer's Model Name used.

TABLE 12 - MANUFACTURER'S MODEL NAME FOR RECORDINGS

Engine or SW Version	Manufacturer's Model Name (0008:1090 and 0018:1018)
Model M2 or M3	M2
Model M4	M4
Software Version C.x	C7
Software Version D.x	ILUMIEN
Software Version E.x	OPTIS
Not M2, Not M4 and Software Version unknown.	OPTIS

3.2.2.6.2 SECONDARY CAPTURE IMAGE STORAGE SOP CLASS

Originally, a single, relatively unconstrained, single-frame SC Image IOD was defined in the DICOM Standard. This IOD is retained and not retired since it is in common use. This single-frame Secondary Capture IOD is used to store Physiology images on media, and also a preferred storage type when export to SCP. It is also supported by the PCI optimization systems as an option to store OCT images in DICOM format. The attributes of this SOP Class are shown in Table 13.

TABLE 13 - SECONDARY CAPTURE IMAGE SOP CLASS ATTRIBUTES

Module	Attribute	Tag	Description
Patient	Patient's Name	0010:0010	OCT database Patient info
	Patient ID	0010:0020	OCT database Patient info
	Patient's Birth Date	0010:0030	OCT database Patient info
	Patient's Sex	0010:0040	OCT database Patient info
General Study	Study Instance UID	0020:000D	Internally generated or imported from Modality Worklist
	Study Date	0008:0020	OCT database Case info
	Study Time	0008:0030	OCT database Case info
	Referring Physician's Name	0008:0090	<empty>
	Study ID	0020:0010	1
	Accession Number	0008:0050	User defined
Patient Study	Patient's Age	0010:1010	OCT database Patient info
General Series	Modality	0008:0060	"OCT", "OT" or "US" (Physiology is always "OT")
	Series Instance UID	0020:000E	Internally generated
	Series Number	0020:0011	Internally generated, starting from 1 within a Study
	Series Date	0008:0021	OCT database Case info
	Series Time	0008:0031	OCT database Case info
	Performing Physician's Name	0008:1050	OCT database Case info
	Body Part Examined	0018:0015	"HEART"
General Equipment	Manufacturer	0008:0070	"Abbott Medical"
	Institution Name	0008:0080	User defined institution name
	Manufacturer's Model Name	0008:1090	See Table 12
	Software Versions	0018:1020	Software version
General Image	Instance Number	0020:0013	Frame number starting from 1. For captured frame not associated with an OCT pullback, or Physiology, it is 0
	Patient Orientation	0020:0020	<empty>
	Content Date	0008:0023	Creation date of image first frame
	Content Time	0008:0033	Creation time of image first frame

TABLE 13 - SECONDARY CAPTURE IMAGE SOP CLASS ATTRIBUTES (Continued)

Module	Attribute	Tag	Description
General Image (Continued)	Image Type	0008:0008	"ORIGINAL/PRIMARY/INTRA-VASCULAR" ("ORIGINAL/PRIMARY" for Physiology)
	Acquisition Date	0008:0022	OCT database Image info
	Acquisition Time	0008:0032	OCT database Image info
	Image Comments	0020:4000	User defined image comment
	Lossy Image Compression	0028:2110	00 (image not lossy compressed)
	Lossy Image Compression Ratio	0028:2112	0
Image Pixel	Samples per Pixel	0028:0002	Set to 1 for PALETTE COLOR, 3 for RGB
	Photometric Interpretation	0028:0004	"RGB" or "PALETTE COLOR"
	Rows	0028:0010	Number of rows in the image
	Columns	0028:0011	Number of columns in the image
	Bits Allocated	0028:0100	8
	Bits Stored	0028:0101	8
	High Bit	0028:0102	7
	Pixel Representation	0028:0103	0
	Planar Configuration	0028:0006	0 (Only included for RGB images)
	Red Palette Color Lookup Table Descriptor	0028:1101	256\0\16. Only included for PALETTE COLOR images
	Green Palette Color Lookup Table Descriptor	0028:1102	256\0\16. Only included for PALETTE COLOR images
	Blue Palette Color Lookup Table Descriptor	0028:1103	256\0\16. Only included for PALETTE COLOR images
	Red Palette Color Lookup Table Data	0028:1201	Lookup table data for red color. Only included for PALETTE COLOR images
	Green Palette Color Lookup Table Data	0028:1202	Lookup table data for green color. Only included for PALETTE COLOR images
	Blue Palette Color Lookup Table Data	0028:1203	Lookup table data for blue color. Only included for PALETTE COLOR images
	Pixel Data	7FE0:0010	Image data for all frames
SC Image (Optional)	Pixel Spacing	0028:0030	Physical distance in the patient between the center of each pixel, in mm. Only included when only one region and image is calibrated.

TABLE 13 - SECONDARY CAPTURE IMAGE SOP CLASS ATTRIBUTES (Continued)

Module	Attribute	Tag	Description
US Region Calibration (Optional)	Sequence of Regions	0018:6011	1 or more regions may be included
	>Region Location Min x0	0018:6018	Rectangle upper-left X position
	>Region Location Min y0	0018:601A	Rectangle upper-left Y position
	>Region Location Max x1	0018:601C	Rectangle lower-right X position
	>Region Location Max y1	0018:601E	Rectangle lower-right Y position
	>Physical Units X Direction	0018:6024	0003H (cm)
	>Physical Units Y Direction	0018:6026	0003H (cm)
	>Physical Delta X	0018:602C	Pixel X size in cm (calculated)
	>Physical Delta Y	0018:602E	Pixel Y size in cm (calculated)
	>Region Spatial Format	0018:6012	0000H (not applicable)
	>Region Data Type	0018:6014	0000H (not applicable)
	>Region Flags	0018:6016	0000H (low priority, not protected)
SOP Common	SOP Class UID	0008:0016	“1.2.840.10008.5.1.4.1.1.7”
	SOP Instance UID	0008:0018	Internally generated
	Specific Character Set	0008:0005	ISO_IR 100
	Instance Creation Date	0008:0012	Current date
	Instance Creation Time	0008:0013	Current time
	Timezone Offset from UTC	0008:0201	System timezone offset
	Instance Number	0020:0013	Identifies image within the Series
SC Equipment	Conversion Type	0008:0064	“SI” (scanned image)
	Modality	0008:0060	“OCT”, “OT” or “US” (Physiology is always “OT”)
	Secondary Capture Device Manufacturer	0018:1016	“Abbott Medical”
	Secondary Capture Device Manufacturer’s Model Name	0018:1018	See Table 12
	Secondary Capture Device Software Versions	0018:1019	Software Version

3.2.2.6.3 ULTRASOUND MULTI-FRAME IMAGE STORAGE SOP CLASS

Ultrasound Multi-frame image IOD is another option for OCT image DICOM export. The exported Ultrasound Multi-frame DICOM files are compliant with the US Multi-frame Image IOD. The attributes of this SOP Class are shown in Table 14.

TABLE 14 - ULTRASOUND MULTI-FRAME IMAGE SOP CLASS ATTRIBUTES

Module (* multi-frame)	Attribute	Tag	Description
Patient	Patient's Name	0010:0010	OCT database Patient info
	Patient ID	0010:0020	OCT database Patient info
	Patient's Birth Date	0010:0030	OCT database Patient info
	Patient's Sex	0010:0040	OCT database Patient info
General Study	Study Instance UID	0020:000D	Internally generated or imported from Modality Worklist
	Study Date	0008:0020	OCT database Case info
	Study Time	0008:0030	OCT database Case info
	Referring Physician's Name	0008:0090	<empty>
	Study ID	0020:0010	1
	Accession Number	0008:0050	User defined or imported from Modality Worklist
Patient Study	Patient's Age	0010:1010	OCT database Patient info
General Series	Modality	0008:0060	"OCT", "OT" or "US"
	Series Instance UID	0020:000E	Internally generated
	Series Number	0020:0011	Internally generated, starting from 1 within a Study
	Series Date	0008:0021	OCT database Case info
	Series Time	0008:0031	OCT database Case info
	Performing Physician's Name	0008:1050	OCT database Case info
	Body Part Examined	0018:0015	"HEART"
General Equipment	Manufacturer	0008:0070	"Abbott Medical"
	Institution Name	0008:0080	User defined institution name
	Manufacturer's Model Name	0008:1090	See Table 12
	Software Versions	0018:1020	Software version
General Image	Instance Number	0020:0013	0 – for OCT pullback, Captured frame not associated with the OCT pullback Frame number (starting from 1) – for frame in an OCT pullback
	Content Date	0008:0023	Creation date of image first frame
	Content Time	0008:0033	Creation time of image first frame
	Image Type	0008:0008	"ORIGINAL/PRIMARY/INTRA-VASCULAR"

TABLE 14 - ULTRASOUND MULTI-FRAME IMAGE SOP CLASS ATTRIBUTES (Continued)

Module (* multi-frame)	Attribute	Tag	Description
General Image (Continued)	Acquisition Date	0008:0022	OCT database Image info
	Acquisition Time	0008:0032	OCT database Image info
	Image Comments	0020:4000	User defined image comment
	Lossy Image Compression	0028:2110	00 (image not lossy compressed)
	Lossy Image Compression Ratio	0028:2112	0
Image Pixel	Samples per Pixel	0028:0002	1 for PALETTE COLOR, 3 for RGB
	Photometric Interpretation	0028:0004	“RGB” or “PALETTE COLOR”
	Rows	0028:0010	Number of rows in the exported image
	Columns	0028:0011	Number of columns in the exported image
	Bits Allocated	0028:0100	8
	Bits Stored	0028:0101	8
	High Bit	0028:0102	7
	Pixel Representation	0028:0103	0
	Planar Configuration	0028:0006	0 (Only included for RGB images)
	Red Palette Color Lookup Table Descriptor	0028:1101	256\0\16. Only included for PALETTE COLOR images
	Green Palette Color Lookup Table Descriptor	0028:1102	256\0\16. Only included for PALETTE COLOR images
	Blue Palette Color Lookup Table Descriptor	0028:1103	256\0\16. Only included for PALETTE COLOR images
	Red Palette Color Lookup Table Data	0028:1201	Lookup table data for red color. Only included for PALETTE COLOR images
	Green Palette Color Lookup Table Data	0028:1202	Lookup table data for green color. Only included for PALETTE COLOR images
	Blue Palette Color Lookup Table Data	0028:1203	Lookup table data for blue color. Only included for PALETTE COLOR images
	Pixel Data	7FE0:0010	Image data for all frames
Cine	Frame Time	0018:1063	1000 / Acquisition Frame Rate (0 if only one frame)
	Recommended Display Frame Rate	0008:2144	Playback Frame Rate (Only included when number of frames is greater than 1)

TABLE 14 - ULTRASOUND MULTI-FRAME IMAGE SOP CLASS ATTRIBUTES (Continued)

Module (* multi-frame)	Attribute	Tag	Description
Multi-frame	Number of Frames	0028:0008	Number of frames in Multi-frame image.
	Frame Increment Pointer	0028:0009	0018:1063 (Frame Time tag)
US Region Calibration (optional)	Sequence of Regions	0018:6011	1 or more regions may be included
	>Region Location Min x0	0018:6018	Rectangle upper-left X position
	>Region Location Min y0	0018:601A	Rectangle upper-left Y position
	>Region Location Max x1	0018:601C	Rectangle lower-right X position
	>Region Location Max y1	0018:601E	Rectangle lower-right Y position
	>Physical Units X Direction	0018:6024	0003H = cm
	>Physical Units Y Direction	0018:6026	0003H = cm
	>Physical Delta X	0018:602C	Pixel X size in cm's (calculated)
	>Physical Delta Y	0018:602E	Pixel Y size in cm's (calculated)
	>Region Spatial Format	0018:6012	0000H (not applicable)
	>Region Data Type	0018:6014	0000H (not applicable)
	>Region Flags	0018:6016	0000H (low priority, not protected)
SOP Common	SOP Class UID	0008:0016	"1.2.840.10008.5.1.4.1.1.3.1"
	SOP Instance UID	0008:0018	Internally generated
	Specific Character Set	0008:0005	ISO_IR_100
	Instance Creation Date	0008:0012	Current date
	Instance Creation Time	0008:0013	Current time
	Timezone Offset from UTC	0008:0201	System timezone offset
	Instance Number	0020:0013	Same as in General Image module
US Image	Samples Per Pixel	0028:0002	for PALETTE COLOR, 3 for RGB
	Photometric Interpretation	0008:0004	PALETTE COLOR or RGB
	Bits Allocated	0028:0100	8
	Bits Stored	0028:0101	8
	High Bit	0028:0102	7
	Frame Increment Pointer	0028:0009	0018:1063 (Frame Time tag)
	Pixel Representation	0028:0103	0
	Planar Configuration	0028:0006	0 (Only included for RGB images)
	Image Type	0008:0008	"ORIGINAL/PRIMARY/INTRA-VASCULAR"
	Lossy Image Compression	0028:2110	00 (image not lossy)compressed
	IVUS Pullback Rate	0018:3101	OCT pullback rate

TABLE 14 - ULTRASOUND MULTI-FRAME IMAGE SOP CLASS ATTRIBUTES (Continued)

Module (* multi-frame)	Attribute	Tag	Description
Palette Color Look-up Table	Red Palette Color Lookup Table Descriptor	0028:1101	Set to 126\0\16. Only included for PALETTE COLOR images
	Green Palette Color Lookup Table Descriptor	0028:1102	Set to 126\0\16. Only included for PALETTE COLOR images
	Blue Palette Color Lookup Table Descriptor	0028:1103	Set to 126\0\16. Only included for PALETTE COLOR Images
	Red Palette Color Lookup Table Data	0028:1201	Lookup table data for red color. Only included for PALETTE COLOR images
	Green Palette Color Lookup Table Data	0028:1202	Lookup table data for green color. Only included for PALETTE COLOR images
	Blue Palette Color Lookup Table Data	0028:1203	Lookup table data for blue color. Only included for PALETTE COLOR images

Note: Modules marked with an asterisk (*) are only included in SOP Instances for multi-frame images

3.2.2.6.4 INTRAVASCULAR OCT IMAGE STORAGE – FOR PRESENTATION SOP CLASS

Intravascular OCT For Presentation image IOD is another option for OCT image DICOM export. The exported Intravascular OCT – For Presentation DICOM files are compliant with the Intravascular OCT Image IOD. The attributes of this SOP Class are shown in Table 15.

TABLE 15 - INTRAVASCULAR OCT IMAGE – FOR PRESENTATION SOP CLASS ATTRIBUTES

Module	Attribute	Tag	Description
Patient	Patient's Name	0010:0010	OCT database Patient info
	Patient ID	0010:0020	OCT database Patient info
	Patient's Birth Date	0010:0030	OCT database Patient info
	Patient's Sex	0010:0040	OCT database Patient info
General Study	Study Instance UID	0020:000D	Internally generated or imported from Modality Worklist
	Study Date	0008:0020	OCT database Patient info
	Study Time	0008:0030	OCT database Patient info
	Referring Physician's Name	0008:0090	<empty>
	Study ID	0020:0010	1
	Accession Number	0008:0050	User defined or imported from Modality Worklist
Patient Study	Patient's Age	0010:1010	OCT database Patient info

TABLE 15 - INTRAVASCULAR OCT IMAGE – FOR PRESENTATION SOP CLASS ATTRIBUTES (Continued)

Module	Attribute	Tag	Description
General Series	Modality	0008:0060	"IVOCT"
	Series Instance UID	0020:000E	Internally generated
	Series Number	0020:0011	Internally generated, starting from 1 within a Study
	Series Date	0008:0021	OCT database Patient info
	Series Time	0008:0031	OCT database Patient info
	Performing Physician Name	0008:1050	OCT database Patient info
	Body Part Examined	0018:0015	"HEART"
Intravascular OCT Series	Modality	0008:0060	"IVOCT"
	Series Number	0020:0011	Same as in General Series module
	Presentation Intent Type	0008:0068	"FOR PRESENTATION"
Frame of Reference	Frame of Reference UID	0020:0052	Internally generated.
Synchronization	Position Reference Indicator	0020:1040	<empty>
	Synchronization Frame of Reference UID	0020:0200	Internally generated.
	Synchronization Trigger	0018:106A	"NO TRIGGER"
	Acquisition Time Synchronized	0018:1800	"N"
General Equipment	Manufacturer	0008:0070	"Abbott Medical"
	Institution Name	0008:0080	User defined institution name
	Manufacturer's Model Name	0008:1090	See Table 12
	Software Versions	0018:1020	Software Version used to acquire the OCT
Enhanced General Equipment	Manufacturer	0008:0070	"Abbott Medical"
	Manufacturer's Model Name	0008:1090	See Table 12
	Device Serial Number	0018:1000	User defined
	Software Versions	0018:1020	Software Version used to acquire the OCT recording
Image Pixel	Samples per Pixel	0028:0002	1
	Photometric Interpretation	0028:0004	"MONOCHROME2"
	Rows	0028:0010	Number of rows in the image
	Columns	0028:0011	Number of columns in the image
	Bits Allocated	0028:0100	8
	Bits Stored	0028:0101	8
	High Bit	0028:0102	7
	Pixel Representation	0028:0103	0
	Pixel Data	7FE0:0010	Image data for all frames

TABLE 15 - INTRAVASCULAR OCT IMAGE – FOR PRESENTATION SOP CLASS ATTRIBUTES (Continued)

Module	Attribute	Tag	Description
Image Pixel (Continued)	Red Palette Color Lookup Table Descriptor	0028:1101	256\0\16
	Green Palette Color Lookup Table Descriptor	0028:1102	256\0\16
	Blue Palette Color Lookup Table Descriptor	0028:1103	256\0\16
	Red Palette Color Lookup Table Data	0028:1201	Lookup table data for red color
	Green Palette Color Lookup Table Data	0028:1202	Lookup table data for green color
	Blue Palette Color Lookup Table Data	0028:1203	Lookup table data for blue color
Supplemental Palette Color Lookup Table	Red Palette Color Lookup Table Descriptor	0028:1101	256\0\16
	Green Palette Color Lookup Table Descriptor	0028:1102	256\0\16
	Blue Palette Color Lookup Table Descriptor	0028:1103	256\0\16
	Red Palette Color Lookup Table Data	0028:1201	Lookup table data for red color
	Green Palette Color Lookup Table Data	0028:1202	Lookup table data for green color
	Blue Palette Color Lookup Table Data	0028:1203	Lookup table data for blue color
Enhanced Contrast/Bolus	Contrast/Bolus Agent Sequence	0018:0012	One item. See Table 16
	>Code Value	0008:0100	See Table 16
	>Coding Scheme Designator	0008:0102	“SRT”
	>Coding Meaning	0008:0104	See Table 16
	>Contrast/Bolus Agent Number	0018:9337	1
	>Contrast/Bolus Administration Route Sequence	0018:0014	One item
	>>Code Value	0008:0100	“G-D17C”
	>>Coding Scheme Designator	0008:0102	“SRT”
	>>Coding Meaning	0008:0104	“Intracoronary route”
	>Contrast/Bolus Ingredient Code Sequence	0018:9338	One item. See Table 16
	>>Code Value	0008:0100	See Table 16
	>>Coding Scheme Designator	0008:0102	“SRT”

TABLE 15 - INTRAVASCULAR OCT IMAGE – FOR PRESENTATION SOP CLASS ATTRIBUTES (Continued)

Module	Attribute	Tag	Description
Enhanced Contrast/Bolus (Continued)	>>Coding Meaning	0008:0104	See Table 16
	>Contrast/Bolus Volume	0018:1041	<empty>
	>Contrast/Bolus Ingredient Concentration	0018:1049	See Table 16
Multi-frame Functional Groups	Instance Number	0020:0013	Image number in case
	Content Date	0008:0023	Date first exported frame acquired
	Content Time	0008:0033	Time first exported frame acquired
	Number of Frames	0028:0008	Number of frames in image
	Shared Functional Groups Sequence	5200:9229	A set of Functional Group Macros
	>Pixel Measures Sequence	0028:9110	Physical characteristics of the pixels
	>>Pixel Spacing	0028:0030	Physical distance between the center of each pixel in mm (Row Spacing\ Column Spacing)
	>>Slice Thickness	0018:0050	PullbackSpeed (mm/s)/Frame Rate(Frame/s)
	>Frame Anatomy Sequence	0020:9071	One item
	>>Anatomic Region Sequence	0008:2218	One item
	>>>Code Value	0008:0100	“T-43000”
	>>>Coding Scheme Designator	0008:0102	“SRT”
	>>>Code Meaning	0008:0104	“Coronary Artery”
	>>Frame Laterality	0020:9072	“U”
	>Intravascular OCT Frame Type Sequence	0052:0025	One item
	>>Frame Type	0008:9007	“ORIGINAL\PRIMARY\AXIAL\ NONE”
	>Intravascular Frame Content Sequence	0052:0027	Present only if Playback Image Stabilization option is Uncorrected
	>>Seam Line Location	0052:0033	90 (Present only if Playback Image Stabilization option is Uncorrected)
	Per-frame Functional Groups Sequence	5200:9230	One or more items (Each frame has one item)
	>Frame Content Sequence	0020:9111	One item
	>>Frame Acquisition Datetime	0018:9074	Date and time the current frame acquired
	>>Frame Reference Datetime	0018:9151	Same value as Frame Acquisition Datetime
	>>Frame Acquisition Duration	0018:9220	Duration used to acquire the current frame (in milliseconds)

TABLE 15 - INTRAVASCULAR OCT IMAGE – FOR PRESENTATION SOP CLASS ATTRIBUTES (Continued)

Module	Attribute	Tag	Description
Multi-frame Functional Groups (Continued)	>>Dimension Index Values	0020:9157	Current frame number (starting from 1)
	>Intravascular Frame Content Sequence	0052:0027	Present only if Playback Image Stabilization option is not Uncorrected
	>>Seam Line Location	0052:0033	Calculated based on Registration Offset (Present only if Playback Image Stabilization option is not Uncorrected)
Multi-frame Dimension	Dimension Organization Sequence	0020:9221	One item
	>Dimension Organization UID	0020:9164	Internally generated
	Dimension Index Sequence	0020:9222	One item
	>Dimension Organization UID	0020:9164	Internally generated
	>Dimension Index Pointer	0020:9165	0018:9074 (Frame Acquisition DateTime tag)
	>Functional Group Pointer	0020:9167	0020:9111 (Frame Content Sequence tag)
Acquisition Context	Acquisition Context Sequence	0040:0555	<empty>
Cardiac Synchronization	Cardiac Synchronization Technique	0018:9037	"NONE"
SOP Common	SOP Class UID	0008:0016	"1.2.840.10008.5.1.4.1.1.14.1"
	SOP Instance UID	0008:0018	Internally generated
	Specific Character Set	0008:0005	ISO_IR 100
	Instance Creation Date	0008:0012	DICOM file creation date
	Instance Creation Time	0008:0013	DICOM file creation time
	Timezone Offset from UTC	0008:0201	File creation system timezone offset
	Instance Number	0020:0013	Image number in case
Intravascular OCT Image	Image Type	0008:0008	"ORIGINAL\PRIMARY\AXIAL\ NONE"
	Volumetric Properties	0008:9206	"DISTORTED"
	Pixel Presentation	0008:9205	"COLOR"
	Samples per Pixel	0028:0002	1
	Acquisition DateTime	0008:002A	Date and time the image acquired
	Acquisition Duration	0018:9073	Duration used to acquire the image (in seconds)
	Acquisition Number	0020:0012	1
	Photometric Interpretation	0028:0004	"MONOCHROME2"
	Pixel Representation	0028:0103	0
	Bits Allocated	0028:0100	8

TABLE 15 - INTRAVASCULAR OCT IMAGE – FOR PRESENTATION SOP CLASS ATTRIBUTES (Continued)

Module	Attribute	Tag	Description
Intravascular OCT Image (Continued)	Bits Stored	0028:0101	8
	High Bit	0028:0102	7
	Presentation LUT Shape	2050:0020	"IDENTITY"
	Lossy Image Compression	0028:2110	"00"
	Burned In Annotation	0028:0301	"NO"
	Recognizable Visual Features	0028:0302	"NO"
	Image Comments	0020:4000	OCT database Patient info
	Recommended Display Frame Rate	0008:2144	Playback Frame Rate
	Interpolation Type	0052:0039	"BILINEAR"
Intravascular OCT Acquisition Parameters	OCT Focal Distance	0052:0002	<empty>
	Beam Spot Size	0052:0003	<empty>
	OCT Acquisition Domain	0052:0006	"FREQUENCY" or "TIME" ("TIME" for M2/M3 engine)
	OCT Optical Center Wavelength	0052:0007	<empty>
	Axial Resolution	0052:0008	<empty>
	Ranging Depth	0052:0009	Current scan range (mm)
	A-line Rate	0052:0011	Scan line rate (line/sec)
	A-line Per Frame	0052:0012	Lines per frame
Intravascular Image Acquisition Parameters	IVUS Acquisition	0018:3100	"MOTORIZED"
	IVUS Pullback Rate	0018:3101	OCT pullback rate (mm/s)
	IVUS Pullback Start Frame Number	0018:3103	Start frame number (starting from 1)
	IVUS Pullback Stop Frame Number	0018:3104	End frame number
	Catheter Rotation Rate	0052:0013	Frame rate
	Catheter Direction of Rotation	0052:0031	"CC"
	Mode of Percutaneous Access Sequence	0052:0016	<empty>

TABLE 16 - VALUES IN CONTRAST/BOLUS MODULE

Flush Medium		Contrast/Bolus Agent		Contrast/Bolus Ingredient		Contrast/Bolus Ingredient Concentration
		Code Value	Code Meaning	Code Value	Code Meaning	
Contrast		C-B0300	Contrast agent	C-11400	Iodine	370
2:1 (Contrast:Saline)		C-B0300	Contrast agent	C-11400	Iodine	246.666666666667
1:1 (Contrast:Saline)		C-B0300	Contrast agent	C-11400	Iodine	185
Saline		C-70841	Saline	C-10120	Water	<empty value>
Customized Refraction Index value	1	A-80230	Air	A-80230	Air	<empty value>
	Other	C-B0300	Contrast agent	C-11400	Iodine	<empty value>

3.2.2.6.5 VERIFICATION SOP CLASS

The Local AE provides standard conformance of the Verification SOP Class as an SCU. The Server AE is required by the DICOM Standard to accept a Presentation Context for the Verification SOP Class because it accepts DICOM association requests.

3.2.3 ASSOCIATION ACCEPTANCE POLICY

The Local AE does not accept any DICOM Associate connections from external entities.

3.3 NETWORK INTERFACES

The Local AE uses TCP/IP as the low-level network communication protocol when communicating with remote Application Entities as defined in PS 3.8 (Part 8 – Networking) of the DICOM 3.0 Standard.

3.3.1 PHYSICAL NETWORK INTERFACE

The PCI optimization systems support standard IEEE 802.3 (Ethernet) 10BaseT/100BaseT connections through a standard RJ-45 UTP (Unshielded Twisted Pair) connector.

3.3.2 ADDITIONAL PROTOCOLS

In addition to the TCP/IP network protocol the DICOM networking support in the PCI optimization systems makes use of the following protocols:

- Dynamic Host Configuration Protocol (DHCP), used to obtain TCP/IP network configuration information, specifically the DNS server to be used for network address resolution.
- Domain Name System (DNS), used for network address resolution, only available if DHCP is in use and supplies a DNS server address.
- Internet Control Message Protocol (ICMP), used to send an echo message (network ping) to an IP address to verify that a valid network connection to that address exists.

3.4 CONFIGURATION

All user configurable DICOM Network parameters are accessible in the DICOM tab of the Setup configuration dialog. These parameters are described in Table 17.

TABLE 17 - NETWORK CONFIGURATION PARAMETERS

Parameter	Configurable	Default	Description
Local Hostname	No	Computer Name	The computer name of the OCT system used to identify the system on the network.
Local IP Address	If "Obtain an IP Address Automatically" is not checked	Current IP address of default network adapter	This is the IP address to use when identifying the local system. Be sure to acquire the IP address from the network administrator before setting to anything other than the default.
Subnet Mask	If "Obtain an IP Address Automatically" is not checked	Subnet Mask of default network adapter	This number is combined with the IP address number to identify which network segment the computer is on.
Gateway	If "Obtain an IP Address Automatically" is not checked	Default gateway IP address	This is the IP address to identify the gateway of the network the system is connected on.
Obtain an IP Address Automatically	Yes	True	When unchecked allows configuration of the Local IP Address and Subnet Mask settings.
Remote Hostname	If "Use DHCP"	<empty>	The network name of the computer containing the remote DICOM server.
Remote IP Address	If not "Use DHCP"	<empty>	The IP address of the computer containing the remote DICOM server.
Network Timeout	Yes	15 secs	TCP/IP connect request timeout
Local AE Title	Yes	<empty>	Application Entity title for Local AE
Server AE Title	Yes	<empty>	Application Entity title for remote Server AE
Server Port	Yes	104	IP port to connect to remote Server AE
Response Timeout	Yes	600 secs	DICOM service request timeout

4 MEDIA INTERCHANGE

4.1 IMPLEMENTATION MODEL

The Abbott Medical PCI optimization systems implement several DICOM services for exchanging information and images on a CD/DVD storage medium. These systems allow for the exporting of patient, case, and image information to a CD/DVD to be used for offline review of the information.

4.1.1 APPLICATION DATA-FLOW DIAGRAM

The "Export to CD/DVD" feature of the PCI optimization systems is performed for selected patients, cases, and images when requested by the user. This feature makes use of the Media Storage Application Entity to produce the CD/DVD image.

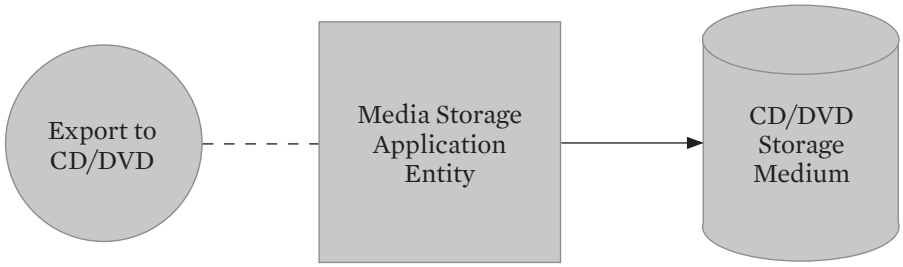

FIGURE 5 - MEDIA STORAGE AE DATA FLOW

4.1.2 FUNCTIONAL DEFINITION OF MEDIA STORAGE AE

Invocation of the "Export to CD/DVD" feature from either the select patient screen or patient summary screen's "Export" button, or the export icon on the image review screen, will open the "Export" wizard. Selecting the "DICOM" option and progressing through the wizard to initiate the export will pass the currently selected patient, case, and image(s) to the Media Storage AE. A DICOM Data Set (SOP Instance) will be created for each image and stored as a file in an image mastering staging area. The contents of this staging area will then be written to one or more CD/DVD's as space permits.

4.1.3 SEQUENCING OF REAL-WORLD ACTIVITIES

At least one image must be selected before the Media Storage AE can be invoked. If the export icon on the image review screen is used then the currently playing file is the one and only selected file. Once the "Export current/multiple image files" dialog is open the user can insert a blank CD/DVD into the drive at any time before or after invoking the Media Storage AE. The Media Storage AE will prompt the user for a blank CD/DVD if one is not inserted when it is required. The user can cancel the Media Storage AE process at any time before the CD/DVD is written.

4.1.4 IMPLEMENTATION CLASS AND VERSION

The Media Storage AE implementation information written to the File Meta Header is shown in Table 18. The class UID is prefixed with the Abbott Medical ANSI OID ("2.16.840.1.114432") to guarantee global uniqueness. The version name shown in the table will be used initially, but is subject to change as newer versions of this DICOM implementation become available.

TABLE 18 - IMPLEMENTATION CLASS AND VERSION FOR MEDIA STORAGE AE

Name	Value
Implementation Class UID	2.16.840.1.114432.2.10
Implementation Version Name	LLI_OCT_V1

4.2 MEDIA STORAGE AE SPECIFICATION

4.2.1 PROFILES, ACTIVITIES, AND ROLES

The Media Storage AE provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class (PS 3.4), the File Format Class (PS 3.10), and the Media Storage Application Profile (PS 3.11). The Application Profil9s and roles are listed in Table 19.

TABLE 19 - MEDIA STORAGE AE SPECIFICATION

Application Profile	Real World Activity	Role	SC Option
STD-GEN-CD	Export to CD/DVD	FSC	Interchange

4.2.2 ACTIVITY – EXPORT TO CD/DVD

The Media Storage AE acts as an FSC using the interchange option when requested to export SOP Instances from the local database to a CD/DVD.

When the “Export to CD/DVD” feature is invoked a dialog, “Export current/multiple image files”, is presented to the user allowing them to modify the volume label and exported filenames. If all files to be exported do not fit on a single CD/DVD, they will automatically be split across multiple CD/DVD’s.

The user will be prompted to insert a blank CD/DVD when necessary. Each disc that is written will contain a DICOMDIR file that references all DICOM files on that disc.

4.2.3 SOP CLASSES

The Media Storage AE supports the SOP Classes and Transfer Syntaxes listed in Table 20.

TABLE 20 - SOP CLASSES FOR MEDIA STORAGE AE

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Media Storage Directory Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Multi-Frame True Color Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Explicit VR Little Endian	1.2.840.10008.1.2.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
Intravascular OCT Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.14.1	Explicit VR Little Endian	1.2.840.10008.1.2.1

4.3 AUGMENTED AND PRIVATE APPLICATION PROFILES

The PCI optimization systems do not support any augmented or private application profiles.

4.4 MEDIA CONFIGURATION

There are no configuration options for the “Export to CD/DVD” feature.

5 SUPPORT OF EXTENDED CHARACTER SETS

The Local Application Entity and Media Storage Application Entity support following character set: ISO_IR 100.

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