

Technical Publications

DOC0267787

Revision 4 Version 5

CardIQ Physio

CONFORMANCE STATEMENT for DICOM

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REVISION HISTORY

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4	1	R.Bhat	May 16, 2007	Incorporate changes to fix Documentation issues. (WGEbg30996)
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4	3	Shibu P Pillai	Jun 11, 2007	Fixes for WGEbg31232
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1. INTRODUCTION

1.1 OVERVIEW

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

Section 1 (Introduction), which describes the overall structure, intent, and references for this Conformance Statement

Section 2 (Network Conformance Statement), which specifies the GE HEALTHCARE equipment compliance to the DICOM requirements for the implementation of Networking features.

Section 3 (Media Storage Conformance Statement), which specifies the GE HEALTHCARE equipment compliance to the DICOM requirements for the implementation of Media Storage features.

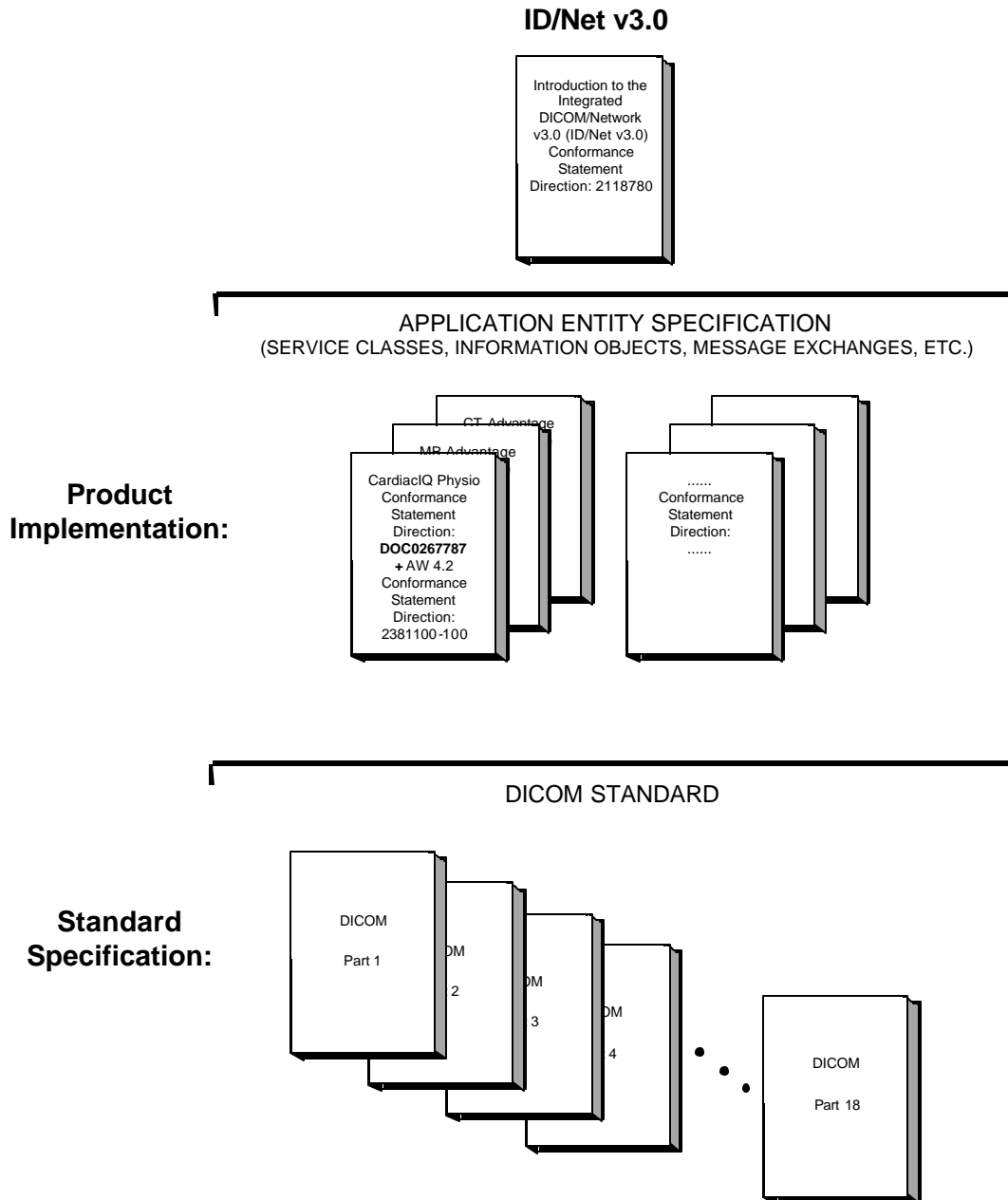
Section 4 (PET Information Object Implementation), which specifies the GE HEALTHCARE equipment compliance to DICOM requirements for the implementation of a PET Information Object.

Section 5 (SC Information Object Implementation), which specifies the GE HEALTHCARE equipment compliance to DICOM requirements for the implementation of SC Information object.

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1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GE HEALTHCARE Conformance Statements and their relationship with the DICOM Conformance Statements is shown in the Illustration below.



This document specifies the DICOM implementation. It is entitled:

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*CardIQ Physio
Conformance Statement for DICOM
Direction: **DOC0267787***

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

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

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

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

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

For more information regarding DICOM, copies of the Standard may be obtained on the Internet at <http://medical.nema.org>. Comments on the Standard may be addressed to:

DICOM Secretariat
NEMA
1300 N. 17th Street, Suite 1847
Rosslyn, VA 22209
USA
Phone: +1.703.841.3200

1.3 INTENDED AUDIENCE

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

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

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

1.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document, in conjunction with the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*, to provide an unambiguous specification for GE HEALTHCARE implementations. This specification, called a Conformance Statement, includes a *DICOM* Conformance Statement and is necessary to ensure proper processing and

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interpretation of GE HEALTHCARE medical data exchanged using *DICOM*. The GE HEALTHCARE Conformance Statements are available to the public.

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

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

1.5 IMPORTANT REMARKS

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

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (*DICOM*), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non-GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.
- **Validation** - Testing the complete range of possible interactions between any GE device and non-GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non-GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non-GE device and the stability of the image data for the intended applications.

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

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

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- **Interaction** - It is the sole responsibility of the **non-GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.6 REFERENCES

A list of references which is applicable to all GE HEALTHCARE Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*.

The information object implementation refers to DICOM PS 3.3 (Information Object Definition).

1.7 DEFINITIONS

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

1.8 SYMBOLS AND ABBREVIATIONS

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

1.9 TERMS DEFINITIONS

In the following conformance statement, the following terms describe the use of each of the DICOM tags. When CardIQ Physio is loading DICOM data files, we use the following terms:

- **Ignored:** the software will ignore the value of the tag
- **Used:** the software might use at some point the value of this tag; the value could be used for computations, for display, or to regenerate the value of a secondary capture
- **Mandatory:** the software will need a valid value for this tag; this value will be used for computations and an invalid value will prevent the software to load the data

When the application is saving some reformatted or secondary capture images, we use the following terms:

- **Removed:** the tag is removed from the module and will be absent from the data set
- **Generated:** the software will generate a value, generally by computing a new value
- **Copied:** the software will try as much as possible to duplicate the value found in the source images if the value is the same on all the source images; if the value is not consistent, the tag will be absent from the data set if “Ignored” at load or possibly regenerated if “Used” at load

2. NETWORK CONFORMANCE STATEMENT

CardIQ Physio is a software application designed to be used on the Advantage Windows workstation. This means that networking and media storage features are inherited from this platform. The application uses DICOM images to create reformatted slices. The slices displayed by the application are saved in DICOM format (Secondary Capture or modality reformatted images). These images can be loaded and displayed by other GE HEALTHCARE applications (such as Volume Viewer or the Image Viewer).

For a complete description of the networking conformance, refer to the AW 4.2 conformance statement, direction 2340652-100.

The **goal of this document** is to give a detailed description of:

- The DICOM PET IODs that are required for use in CardIQ Physio (Section 4),
- The DICOM SC IODs written by the application (section 5),

Modality	SOP Class	FSR	FSC	Remarks
PET	1.2.840.10008.5.1.4.1.1.128	Yes	Yes	Read and Write
SC	1.2.840.10008.5.1.4.1.1.7	Yes	No	

3. MEDIA STORAGE CONFORMANCE STATEMENT

CardIQ Physio is a software application developed for use on the Advantage Windows workstation. This means that networking and media storage features are inherited from this platform.

The application uses DICOM images to create reformatted slices. The slices displayed by the application are saved in DICOM format (Secondary Capture or modality reformatted images). These images can be loaded and displayed by other GE HEALTHCARE applications (such as Volume Viewer or the Image Viewer).

For a complete description of the media storage conformance, refer to the AW 4.2 conformance statement, direction 2381100-100.

The **goal of this document** is to give a detailed description of:

- The DICOM PET IODs that are required for use in CardIQ Physio (section 4)
- The DICOM SC IODs written by the application (section 5),

Modality	SOP Class	FSR	FSC	Remarks
PET	1.2.840.10008.5.1.4.1.1.128	Yes	Yes	
SC	1.2.840.10008.5.1.4.1.1.7	No	Yes	

4. PET INFORMATION OBJECT IMPLEMENTATION

4.1 INTRODUCTION

This section specifies the use of the DICOM PET Image IOD to represent the information included in PET images produced by this implementation. Corresponding attributes are conveyed using the module construct. The contents of this section are:

[4.2 – IOD Description](#)

[4.3- IOD Entity-Relationship Model](#)

[4.4- IOD Module Table](#)

[4.5 - IOD Module Definition](#)

4.2 PET IOD DESCRIPTION

The Positron Emission Tomography (PET) Image Information Object Definition specifies an image which has been created by a Positron Tomograph imaging device, including dedicated PET cameras and Nuclear Medicine imaging devices operating in coincidence mode. This includes data created by external detection devices which create images of the distribution of administered radioactive materials, specifically positron emitters, in the body. Depending on the specific radiopharmaceuticals administered and the particular imaging procedure performed, problems involving changes in metabolism, function, or physiology can be investigated and various region pathologies can be studied. For these problems, quantitation of image data in absolute activity and physiological units is important. In addition, the PET Image IOD specifies attenuation (transmission) images used for correction and anatomical reference of emission images.

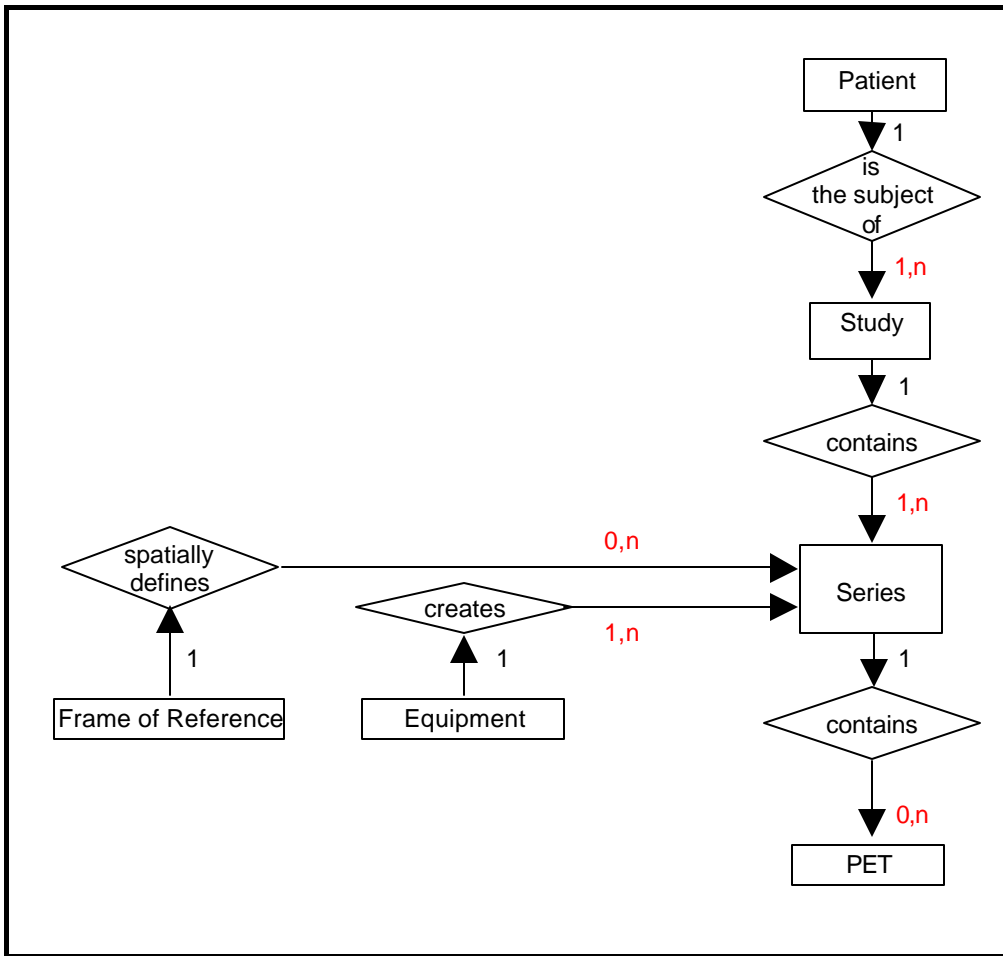
4.3 PET ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the PET Image interoperability schema is shown in. In this figure Illustration-4.3.1, the following diagrammatic convention is established to represent the information organization :

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to n Images per Series, but the Patient to Study relationship has 1 Study for each Patient (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION – 4.3.1
 PET IMAGE ENTITY RELATIONSHIP DIAGRAM



4.3.1 Entity Descriptions

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities contained within the PET Information Object.

4.3.2 CardIQ Physio Mapping of DICOM entities

TABLE 4.3-1
 MAPPING OF DICOM ENTITIES TO CARDIQ PHYSIO ENTITIES

DICOM	CardIQ Physio Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image
Frame	Not Applicable

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4.4 IOD MODULE TABLE

Within an entity of the DICOM PET IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 4.4-1 identifies the defined modules within the entities that comprise the DICOM PET IOD. Modules are identified by Module Name.

See DICOM Part 3 for a complete definition of the entities, modules, and attributes.

**TABLE 4.4-2
PET IMAGE IOD MODULES**

Entity Name	Module Name	Reference
Patient	Patient	4.5.1.1
Study	General Study	4.5.2.1
	Patient Study	4.5.2.2
Series	General Series	4.5.3.1
	PET Series	4.5.10.1
	PET Isotope	0
	PET Multi-gated Acquisition	4.5.10.3
	NM/PET Patient Orientation	4.5.10.4
Frame of Reference	Frame of Reference	4.5.4.1
Equipment	General Equipment	4.5.5.1
Image	General Image	4.5.6.1
	Image Plane	4.5.6.2
	Image Pixel	4.5.6.3
	PET Image	4.5.10.5
	Overlay Plane	4.5.7.1
	VOI LUT	4.5.8.1
	SOP Common	4.5.9.1

4.5 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities and modules contained within the PET Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

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4.5.1 Common Patient Entity Modules

4.5.1.1 Patient Module

This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

TABLE 4.5-3
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Used / Copied
Patient ID	(0010,0020)	2	Used / Copied
Patient's Birth Date	(0010,0030)	2	Used / Copied
Patient's Sex	(0010,0040)	2	Used / Copied
Referenced Patient Sequence	(0008,1120)	3	Ignored / Copied
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient's Birth Time	(0010,0032)	3	Ignored / Copied
Other Patient IDs	(0010,1000)	3	Ignored / Copied
Other Patient Names	(0010,1001)	3	Ignored / Copied
Ethnic Group	(0010,2160)	3	Ignored / Copied
Patient Comments	(0010,4000)	3	Ignored / Copied

4.5.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs which reference the Study IE. These Modules contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

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4.5.2.1 General Study Module

This section specifies the Attributes that describe and identify the Study performed upon the Patient.

TABLE 4.5-4
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Mandatory / Copied
Study Date	(0008,0020)	2	Used / Copied
Study Time	(0008,0030)	2	Used / Copied
Referring Physician's Name	(0008,0090)	2	Used / Copied
Study ID	(0020,0010)	2	Used / Copied
Accession Number	(0008,0050)	2	Used / Copied
Study Description	(0008,1030)	3	Used / Copied
Physician(s) of Record	(0008,1048)	3	Ignored / Copied
Name of Physician(s) Reading Study	(0008,1060)	3	Used / Copied
Referenced Study Sequence	(0008,1110)	3	Ignored / Copied
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Requested Procedure ID	(0040,1001)		Ignored / Copied
Procedure Code Sequence	(0008,1032)	3	Ignored / Copied
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	1C	

4.5.2.2 Patient Study Module

This section defines Attributes that provide information about the Patient at the time the Study was performed.

TABLE 4.5-5
PATIENT STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Ignored / Copied
Patient's Age	(0010,1010)	3	Used/Copied
Patient's Size	(0010,1020)	3	Used / Copied
Patient's Weight	(0010,1030)	3	Used / Copied
Occupation	(0010,2180)	3	Ignored / Copied
Additional Patient's History	(0010,21B0)	3	Ignored / Copied

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4.5.3 Common Series Entity Modules

The following Series IE Modules are common to all Composite Image IODs that reference the Series IE.

4.5.3.1 General Series Module

This section specifies the Attributes that identify and describe general information about the Series within a Study.

TABLE 4.5-6
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Used / Copied Defined Terms : PT = Positron Emission Tomography
Series Instance UID	(0020,000E)	1	Mandatory / Generated (no explain needed)
Series Number	(0020,0011)	2	Used / Generated (platform generated)
Laterality	(0020,0060)	2C	Ignored / Copied
Series Date	(0008,0021)	3	Used / Generated (Current Date)
Series Time	(0008,0031)	3	Used / Generated (Current Time)
Performing Physicians' Name	(0008,1050)	3	Used / Copied
Protocol Name	(0018,1030)	3	Used / Copied
Series Description	(0008,103E)	3	Used / Generated (application generated on save)
Operators' Name	(0008,1070)	3	Used / Copied
Referenced Study Component Sequence	(0008,1111)	3	Ignored / Removed on AW.
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Body Part Examined	(0018,0015)	3	Ignored / Copied
Patient Position	(0018,5100)	2C	Mandatory / Copied The Defined Terms are: HFP = Head First-Prone HFS = Head First-Supine HFDR = Head First-Decubitus Right HFDL = Head First-Decubitus Left FFDR = Feet First-Decubitus Right FFDL = Feet First-Decubitus Left FFP = Feet First-Prone FFS = Feet First-Supine
Smallest Pixel Value in Series	(0028,0108)	3	Ignored / Removed
Largest Pixel Value in Series	(0028,0109)	3	Ignored / Removed
Request Attributes Sequence	(0040,0275)	3	Ignored / Copied

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>Requested Procedure ID	(0040,1001)	1C	
>Scheduled Procedure Step ID	(0040,0009)	1C	
>Scheduled Procedure Step Description	(0040,0007)	3	
>Scheduled Protocol Code Sequence	(0040,0008)	3	
>>Code Value	(0008,0100)	1C	
>>Code Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	1C	
Performed Procedure Step ID	(0040,0253)	3	Ignored / Removed on AW
Performed Procedure Step Start Date	(0040,0244)	3	Ignored / Removed on AW
Performed Procedure Step Start Time	(0040,0245)	3	Ignored / Removed on AW
Performed Procedure Step Description	(0040,0254)	3	Ignored / Removed on AW
Performed Action Item Sequence	(0040,0260)	3	Ignored / Removed
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	1C	

4.5.4 Common Frame Of Reference Entity Modules

The following Frame of Reference IE Module is common to all Composite Image IODs that reference the Frame of Reference IE.

TABLE 4.5-7
FRAME OF REFERENCE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	Mandatory / Copied
Position Reference Indicator	(0020,1040)	2	Ignored / Copied

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4.5.4.1 Frame Of Reference UID

Images should share the same Frame Of Reference UID as a necessary condition to be in the same 3D model.

Orthogonal or oblique reformatted PET Images shall have the frame of reference UID copied.

4.5.5 Common Equipment Entity Modules

The following Equipment IE Module is common to all Composite Image IODs which reference the Equipment IE.

4.5.5.1 General Equipment Module

This section specifies the Attributes that identify and describe the piece of equipment that produced a Series of Images.

CardIQ Physio can create derived series. This module will then be generated according to the System on which the application is running and the name of the application creating it.

As the application can simulate the generation of an image by the scanner, we have chosen to copy this module, but to omit the fields that could be altered by the reformation

TABLE 4.5-8
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Used / Copied
Institution Name	(0008,0080)	3	Used / Copied
Institution Address	(0008,0081)	3	Ignored / Generated (from platform configuration)
Station Name	(0008,1010)	3	Used / Generated (from platform configuration)
Institutional Department Name	(0008,1040)	3	Ignored / Generated (from platform configuration)
Manufacturer's Model Name	(0008,1090)	3	Used / Generated
Device Serial Number	(0018,1000)	3	Ignored / Removed
Software Versions	(0018,1020)	3	Ignored / Copied
Spatial Resolution	(0018,1050)	3	Ignored/Removed
Date of Last Calibration	(0018,1200)	3	Ignored / Removed
Time of Last Calibration	(0018,1201)	3	Ignored / Removed
Pixel Padding Value	(0028,0120)	3	Ignored / Removed

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4.5.6 Common Image Entity Modules

The following Image IE Modules are common to all Composite Image IODs which reference the Image IE.

4.5.6.1 General Image Module

This section specifies the Attributes that identify and describe an image within a particular series.

TABLE 4.5-9
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	2	Used / Generated (same as Image Index (0054, 1330), see PET Image Module Attributes)
Patient Orientation	(0020,0020)	2C	Ignored/ Copied
Content Date	(0008,0023)	2C	Used / Generated (Current date)
Content Time	(0008,0033)	2C	Used / Generated (Current time)
Image Type	(0008,0008)	3	Used / Generated
Acquisition Number	(0020,0012)	3	Ignored / Copied
Acquisition Date	(0008,0022)	3	Used / Copied
Acquisition Time	(0008,0032)	3	Used / Copied
Referenced Image Sequence	(0008,1140)	3	Ignored / Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Derivation Description	(0008,2111)	3	Ignored / Generated
Source Image Sequence	(0008,2112)	3	Ignored / Generated
>Referenced SOP Class UID	(0008,1150)	1C	Generated from contributing images
>Referenced SOP Instance UID	(0008,1155)	1C	Generated from contributing images
Images in Acquisition	(0020,1002)	3	Ignored / Removed
Image Comments	(0020,4000)	3	Ignored / Removed
Quality Control Image	(0028,0300)	3	Ignored / Removed
Burned In Annotations	(0028,0301)	3	Ignored / Generated
Lossy Image Compression	(0028,2110)	3	Used / Copied
Lossy Image Compression Ratio	(0028,2112)	3	Ignored / Copie d

4.5.6.1.1 General Image Attribute Descriptions

4.5.6.1.1.1 Patient Orientation

Since the coordinates of the image are always written, this field is never present in the created images.

PET images use Image Orientation Patient (0020,0037) and Image Position Patient (0020,0032).

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4.5.6.1.1.2 Image Type

As an FSC, here are the values that may be sent.

Value 1 has the following value:

- DERIVED all images generated are results of post processing input images. Application does not support source data (raw scan data).

Value 2 has the following value:

- PRIMARY assumes all images created as part of initial patient examination.
- SECONDARY not supported by the application

Value 3 has the following value:

- REFORMATTED orthogonal or oblique reformatting (MPR)
- SUMMED sum of multiple images.
- PROJECTION images derived by projection rendering techniques, MIP, Volume Rendering, Ray Tracing, Surface Rendering, Surface Extraction and Projection
- REGISTERED images transformed to a new frame of reference by rigid and/or non-rigid processes.

Value 4, if defined, can have the following values:

- MIP identifies a thick Maximum Intensity Projection Image
- MIN IP identifies a thick Minimum Intensity Projection Image
- AVERAGE identifies a thick Average Image
- VOLREN identifies a thick Volume Rendered Image
- TIME identifies a image created by summing over time.
- LOCATION identifies a image created by summing over location.
- REFRAME identifies a image created by adding frames or bins
- 3DSSP 3D Stereotaxic Surface Projection
- RIGID
- NONRIGID

DERIVED\SECONDARY\SUMMED\TIME – SUMMED REFORMATS

DERIVED\SECONDARY\REFORMATTED – Gated Reformats

4.5.6.1.1.3 Derivation Description and Source Image Sequence

“SUM OVER TIME” for reformatted and summed reformatted saves.

4.5.6.1.1.4 Lossy Image Compression

The application does not use compression when saving images, nor it decompress images. So this field is just copied.

4.5.6.2 Image Plane Module

This section specifies the Attributes that define the transmitted pixel array of a two dimensional image plane.

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TABLE 4.5-10
IMAGE PLANE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Pixel Spacing	(0028,0030)	1	Mandatory /Used/ Copied or Generated
Image Orientation (Patient)	(0020,0037)	1	Mandatory / Copied or Generated
Image Position (Patient)	(0020,0032)	1	Mandatory / Copied or Generated
Slice Thickness	(0018,0050)	2	Used / Copied or Generated
Slice Location	(0020,1041)	3	Used/ Copied or Generated

4.5.6.2.1 Pixel Spacing

The Pixel spacing is calculated by the application for all images. Summing over time operation will result in copied pixel spacing. All others are generated. **The pixel spacing is truncated to two decimal space for reformatted save.**

4.5.6.2.2 Image Orientation

Summing over time operation will result in copied Orientation. All others are generated.

4.5.6.2.3 Image Position

The Image Position is treated as the position of the upper left hand corner of the first pixel of the image for images coming from GE (Manufacturer is “GE HEALTHCARE”) where the Manufacturer Model Name is “Advance”, “Discovery LS” or “Discovery QX/i”.

Otherwise, the Image Position is treated as the position of the center of the first pixel of the image.

All images saved by the application are encoded with Image Position as the center of the first pixel of the image. Thus converting from the upper left hand corner to the center as necessary.

4.5.6.2.4 Slice Thickness

The Slice Thickness shall be copied for images summed over time.

The Slice Thickness shall be generated for all others.

4.5.6.3 Image Pixel Module

This section specifies the Attributes that describe the pixel data of the image.

TABLE 4.5-11
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Ignored (expect “1”) / Generated “1”
Photometric Interpretation	(0028,0004)	1	Ignored (expect “MONOCHROME2”) / Generated “MONOCHROME2”
Rows	(0028,0010)	1	Mandatory (expect from 64 to 256) / Generated

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Columns	(0028,0011)	1	Mandatory (expect from 64 to 256) / Generated
Bits Allocated	(0028,0100)	1	Ignored (expect "16") / Generated "16"
Bits Stored	(0028,0101)	1	Ignored (expect "16") / Generated "16"
High Bit	(0028,0102)	1	Ignored (expect "15") / Generated "15"
Pixel Representation	(0028,0103)	1	Ignored (expect "1") / Generated "1"
Pixel Data	(7FE0,0010)	1	Used / Generated
Planar Configuration	(0028,0006)	1C	Ignored/Copied
Pixel Aspect Ratio	(0028,0034)	1C	Ignored/Copied
Smallest Image Pixel Value	(0028,0106)	3	Ignored/Copied
Largest Image Pixel Value	(0028,0107)	3	Ignored/Copied
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Ignored/Copied
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Ignored/Copied
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Ignored/Copied
Red Palette Color Lookup Table Data	(0028,1201)	1C	Ignored/Copied
Green Palette Color Lookup Table Data	(0028,1202)	1C	Ignored/Copied
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Ignored/Copied

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4.5.7 Common Overlay Modules

4.5.7.1 Overlay plane module

This section contains Attributes that describe characteristics of an Overlay Plane.

This module is not currently supported by the application and will be ignored.

**TABLE 4.5-12
OVERLAY PLANE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Overlay Rows	(60xx,0010)	1	Module Unsupported
Overlay Columns	(60xx,0011)	1	Module Unsupported
Overlay Type	(60xx,0040)	1	Module Unsupported
Origin	(60xx,0050)	1	Module Unsupported
Overlay Bits Allocated	(60xx,0100)	1	Module Unsupported
Bit Position	(60xx,0102)	1	Module Unsupported
Overlay Data	(60xx,3000)	1C	Module Unsupported
Overlay Description	(60xx,0022)	3	Module Unsupported
Overlay Subtype	(60xx,0045)	3	Module Unsupported
Overlay Label	(60xx,1500)	3	Module Unsupported
ROI Area	(60xx,1301)	3	Module Unsupported
ROI Mean	(60xx,1302)	3	Module Unsupported
ROI Standard Deviation	(60xx,1303)	3	Module Unsupported
Overlay Descriptor - Gray	(60xx,1100)	3	Module Unsupported
Overlay Descriptor - Red	(60xx,1101)	3	Module Unsupported
Overlay Descriptor - Green	(60xx,1102)	3	Module Unsupported
Overlay Descriptor - Blue	(60xx,1103)	3	Module Unsupported
Overlays - Gray	(60xx,1200)	3	Module Unsupported
Overlays - Red	(60xx,1201)	3	Module Unsupported
Overlays - Green	(60xx,1202)	3	Module Unsupported
Overlays - Blue	(60xx,1203)	3	Module Unsupported

4.5.8 Common Lookup Table Modules

4.5.8.1 VOILUT module

This section specifies the Attributes that describe the VOI LUT.

**TABLE 4.5-13
VOI LUT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
VOI LUT Sequence	(0028,3010)	3	Ignored / Removed
>LUT Descriptor	(0028,3002)	1C	
>LUT Explanation	(0028,3003)	3	
>LUT Data	(0028,3006)	1C	

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Window Center	(0028,1050)	3	Ignored at load (an automatic W/L is computed on the whole series) / Generated
Window Width	(0028,1051)	1C	Ignored at load (an automatic W/L is computed on the whole series) / Generated
Window Center & Width Explanation	(0028,1055)	3	Ignored / Removed

4.5.8.1.1 Window Center and Width

Generated from the current W/L max and min for the series.

4.5.9 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

4.5.9.1 SOP Common Module

This section defines the Attributes that are required for proper functioning and identification of the associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

TABLE 4.5-14
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Used / Copied
SOP Instance UID	(0008,0018)	1	Used / Generated
Specific Character Set	(0008,0005)	1C	Used / Copied Only the "ISO_IR 100" character sets is supported.
Instance Creation Date	(0008,0012)	3	Ignored / Generated (system clock)
Instance Creation Time	(0008,0013)	3	Ignored / Generated (system clock)
Instance Creator UID	(0008,0014)	3	Ignored / Copied
Time zone Offset From UTC	(0008,0201)	3	Ignored / Removed
Instance Number	(0020,0013)	3	Used / Generated (same as Image Index 0054, 1330).
SOP Instance Status	(0100,0410)	3	Ignored / Removed
SOP Authorization Date and Time	(0100,0420)	3	Ignored / Removed
SOP Authorization Comment	(0100,0414)	3	Ignored / Removed
Authorization Equipment Certification Number	(0100,0416)	3	Ignored / Removed

4.5.10 PET Modules

This Section describes PET Series, Equipment, and Image Modules. These Modules contain Attributes that are specific to PET Image IOD.

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4.5.10.1 PET Series

The table in this Section contains IOD Attributes that describe PET Series.

**TABLE 4.5-15
PET SERIES MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Series Date	(0008,0021)	1	Used / Generated (Current Date)
Series Time	(0008,0031)	1	Used / / Generated (Current Time)
Units	(0054,1001)	1	Used / Copied
Counts Source	(0054,1002)	1	Ignored / Copied
Series Type	(0054,1000)	1	Used / Copied
Reprojection Method	(0054,1004)	2C	Ignored / Copied
Number of R-R Intervals	(0054,0061)	1C	Ignored / Copied
Number of Time Slots	(0054,0071)	1C	Used / Copied or Generated (For saving subset of reformats, save actual number of frames saved. For the summed series, set it to "1". Also, while saving the LA Images, the number of frames are multiplied by 3)
Number of Time Slices	(0054,0101)	1C	Ignored / Copied
Number of Slices	(0054,0081)	1	Used / Generated
Corrected Image	(0028,0051)	2	Used / Copied
Randoms Correction Method	(0054,1100)	3	Used / Copied
Attenuation Correction Method	(0054,1101)	3	Ignored / Copied
Scatter Correction Method	(0054,1105)	3	Ignored / Copied
Decay Correction	(0054,1102)	1	Used / Copied
Reconstruction Diameter	(0018,1100)	3	Used/ Copied
Convolution Kernel	(0018,1210)	3	Ignored / Copied
Reconstruction Method	(0054,1103)	3	Used / Copied
Detector Lines of Response Used	(0054,1104)	3	Ignored / Copied
Acquisition Start Condition	(0018,0073)	3	Ignored / Copied
Acquisition Start Condition Data	(0018,0074)	3	Ignored / Copied
Acquisition Termination Condition	(0018,0071)	3	Ignored / Copied
Acquisition Termination Condition Data	(0018,0075)	3	Ignored / Copied
Field of View Shape	(0018,1147)	3	Ignored / Copied
Field of View Dimensions	(0018,1149)	3	Ignored / Copied
Gantry/Detector Tilt	(0018,1120)	3	Ignored / Copied
Gantry/Detector Slew	(0018,1121)	3	Ignored / Copied
Type of Detector Motion	(0054,0202)	3	Ignored / Copied
Collimator Type	(0018,1181)	2	Used / Copied

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Collimator/Grid Name	(0018,1180)	3	Ignored / Copied
Axial Acceptance	(0054,1200)	3	Ignored / Copied
Axial Mash	(0054,1201)	3	Ignored / Copied
Transverse Mash	(0054,1202)	3	Ignored / Copied
Detector Element Size	(0054,1203)	3	Ignored / Copied
Coincidence Window Width	(0054,1210)	3	Ignored / Copied
Energy Window Range Sequence	(0054,0013)	3	Ignored / Copied
>Energy Window Lower Limit	(0054,0014)	3	Ignored / Copied
>Energy Window Upper Limit	(0054,0015)	3	Ignored / Copied
Secondary Counts Type	(0054,1220)	3	Ignored / Copied

4.5.10.2 PET Isotope

The table in this Section contains IOD Attributes that describe PET Series.

**TABLE 4.5-16
PET ISOTOPE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Radiopharmaceutical Information Sequence	(0054,0016)	2	Used / Copied
>Radionuclide Code Sequence	(0054,0300)	2	Used / Copied
>>Code Value	(0008,0100)	1C	
>>Code Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	
>Radiopharmaceutical Route	(0018,1070)	3	Ignored / Copied
>Administration Route Code Sequence	(0054,0302)	3	Ignored / Copied
>>Code Value	(0008,0100)	1C	
>>Code Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	
>Radiopharmaceutical Volume	(0018,1071)	3	Used / Copied
>Radiopharmaceutical Start Time	(0018,1072)	3	Used / Copied
>Radiopharmaceutical Stop Time	(0018,1073)	3	Used / Copied
>Radionuclide Total Dose	(0018,1074)	3	Used / Copied
>Radionuclide Half Life	(0018,1075)	3	Used / Copied
>Radionuclide Positron Fraction	(0018,1076)	3	Used / Copied
>Radiopharmaceutical Specific Activity	(0018,1077)	3	Used / Copied
>Radiopharmaceutical	(0018,0031)	3	Used / Copied
>Radiopharmaceutical Code Sequence	(0054,0304)	3	Used / Copied
>>Code Value	(0008,0100)	1C	
>>Code Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	
Intervention Drug Information Sequence	(0018,0026)	3	Ignored / Copied

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>Intervention Drug Name	(0018,0034)	3	Ignored / Copied
>Intervention Drug Code Sequence	(0018,0029)	3	Ignored / Copied
>>Code Value	(0008,0100)	1C	
>>Code Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	
>Intervention Drug Start Time	(0018,0035)	3	Ignored / Copied
>Intervention Drug Stop Time	(0018,0027)	3	Ignored / Copied
>Intervention Drug Dose	(0018,0028)	3	Ignored / Copied

4.5.10.3 PET Multi-gated Acquisition

The table in this Section contains IOD Attributes that describe PET Series.

**TABLE 4.5-17
PET MULTI-GATED ACQUISITION MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Beat Rejection Flag	(0018,1080)	2	Ignored / Copied
Trigger Source or Type	(0018,1061)	3	Ignored / Copied
PVC Rejection	(0018,1085)	3	Used /Copied
Skip Beats	(0018,1086)	3	Ignored / Copied
Heart Rate	(0018,1088)	3	Ignored / Copied
Framing Type	(0018,1064)	3	Used / Copied

4.5.10.4 NM/PET Patient Orientation

The table in this Section contains IOD Attributes that describe NM/PET Patient Orientation.

**TABLE 4.5-18
NM/PET PATIENT ORIENTATION MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient Orientation Code Sequence	(0054,0410)	2	Ignored/Copied
> Code Value	(0008,0100)	1C	
> Coding Scheme Designator	(0008,0102)	1C	
> Code Meaning	(0008,0104)	3	
> Patient Orientation Modifier Code Sequence	(0054,0412)	2C	Ignored / Copied
>> Code value	(0008,0100)	1C	
>> Coding Scheme Designator	(0008,0102)	1C	
>> Code Meaning	(0008,0104)	3	
Patient Gantry Relationship Code Sequence	(0054,0414)	2	Ignored / Copied
> Code Value	(0008,0100)	1C	

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Attribute Name	Tag	Type	Attribute Description
> Coding Scheme Designator	(0008,0102)	1C	
> Code Meaning	(0008,0104)	3	Used /Generated
View Code Sequence	(0054,0220)	3	
> Code Value	(0008,0100)	1C	
> Coding Scheme Designator	(0008,0102)	1C	
> Code Meaning	(0008,0104)	3	
Slice Progression Direction	(0054,0500)	3	Used /Generated (APEX_TO_BASE)

4.5.10.5 PET Image Module

The table in this Section contains IOD Attributes that describe PET images.

TABLE 4.5-19
PET IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	Used / Generated
Samples per Pixel	(0028,0002)	1	Ignored (expect 1) / Generated "1"
Photometric Interpretation	(0028,0004)	1	Ignored (expect "MONOCHROME2") / Generated "MONOCHROME2" or "MONOCHROME1"
Bits Allocated	(0028,0100)	1	Shall be 16 / Generated "16"
Bits Stored	(0028,0101)	1	Ignored (expect 16) / Generated "16"
High Bit	(0028,0102)	1	Ignored (expect 15) / Generated "15"
Rescale Intercept	(0028,1052)	1	Used/Copied
Rescale Slope	(0028,1053)	1	Used / Generated
Frame Reference Time	(0054,1300)	1	Used / Copied
Trigger Time	(0018,1060)	1C	Used / Copied
Frame Time	(0018,1063)	1C	Used / Copied
Low R-R Value	(0018,1081)	1C	Ignored / Copied
High R-R Value	(0018,1082)	1C	Ignored / Copied
Lossy Image Compression	(0028,2110)	1C	Ignored / Copied
Image Index	(0054,1330)	1	Used / Copied and Generated
Acquisition Date	(0008,0022)	2	Used / Copied
Acquisition Time	(0008,0032)	2	Used / Copied
Actual Frame Duration	(0018,1242)	2	Used / Copied
Nominal Interval	(0018,1062)	3	Ignored / Removed
Intervals Acquired	(0018,1083)	3	Used / Removed
Intervals Rejected	(0018,1084)	3	Used / Copied
Primary (Prompts) Counts Accumulated	(0054,1310)	3	Used / Copied
Secondary Counts Accumulated	(0054,1311)	3	Ignored / Removed
Slice Sensitivity Factor	(0054,1320)	3	Ignored / Copied

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Decay Factor	(0054,1321)	1C	Used / Copied
Dose Calibration Factor	(0054,1322)	3	Ignored / Copied
Scatter Fraction Factor	(0054,1323)	3	Ignored / Copied
Dead Time Factor	(0054,1324)	3	Ignored / Removed
Referenced Overlay Sequence	(0008,1130)	3	Ignored / Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Referenced Curve Sequence	(0008,1145)	3	Ignored / Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Anatomic Region Sequence	(0008,2218)	3	Ignored / Removed
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	3	
>Anatomic Region Modifier Sequence	(0008,2220)	3	Ignored / Removed
>>Code Value	(0008,0100)	1C	
>>Code Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	
Primary Anatomic Structure Sequence	(0008,2228)	3	Ignored / Removed
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	3	
>Primary Anatomic Structure Modifier Sequence	(0008,2230)	3	Ignored / Removed
>>Code Value	(0008,0100)	1C	
>>Code Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	

4.5.10.6 Image Type

Value 1 : DERIVED
Value 2 : SECONDARY
Value 3: SUMMED

4.5.10.7 Rescale Slope

The computed rescale slope will be the same for all images and for the images of summed over time bins, it's the maximum rescale slope of all the bins.

4.6 PRIVATE DATA

The following private elements are used/copied:

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**TABLE 4.6-20
PRIVATE ADVANTAGE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Private Creator	(0009, 00xx)	3	GE HEALTHCARE _PETD_01: Used / Removed
Scan Time	(0009, 100D)	3	Used / Copied
Tracer Activity	(0009, 1038)	3	Used / Copied
Measured Time	(0009, 1039)	3	Used / Copied
Administered Time	(0009, 103B)	3	Used / Copied
Post Injected Activity	(0009, 103C)	3	Used / Copied
Post Injected Time	(0009, 103D)	3	Used / Copied
Half Life	(0009, 103F)	3	Used / Copied

4.7 PET PRIVATE DATA

The following table describes the Private Elements used when saving the reformat images and 3D state.

**TABLE 4.7-21
PRIVATE CARDIQ PHYSIO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Application Version	(0057, 1042)	3	Used / Generated
Application Name	(0057, 1041)	3	Used/Generated (GE HEALTHCARE _CardIQ Physio)
Reformat Save Association	(0057, 1030)	3	Associating the Summed reformatted save with the corresponding GATED reformat.
CardIQ Physio Private Creator UID	(0057, 0010)	3	Generated
Save state of Normalization Data	(0057, 1013)	3	Used/Generated (The xml data for saving The state of Normalization)
Save state of Filter data	(0057, 1014)	3	Used/Generated (The xml data for saving The state of Filter data)
Save state of Reformat data	(0057, 1015)	3	Used/Generated (The xml data for saving the state of reformat data)

5. SC INFORMATION OBJECT IMPLEMENTATION

5.1 INTRODUCTION

This section specifies the use of the DICOM SC Image IOD to represent the information included in SC images produced by this implementation. Corresponding attributes are conveyed using the module construct. The contents of this section are:

[5.2 - IOD Description](#)

[5.3 - IOD Entity-Relationship Model](#)

[5.4 - IOD Module Table](#)

[5.5 - IOD Module Definition](#)

5.2 SC IOD DESCRIPTION

The Secondary Image (SC) Image Information Object Definition (IOD) specifies images that are converted from a non-DICOM format to a modality independent DICOM format.

Examples of types of equipment that create Secondary Capture Images include:

- a. Video interfaces that convert an analog video signal into a digital image.
- b. Digital interfaces that are commonly used to transfer non-DICOM digital images from an imaging device to a laser printer.
- c. Film digitizers that convert an analog film image to digital data

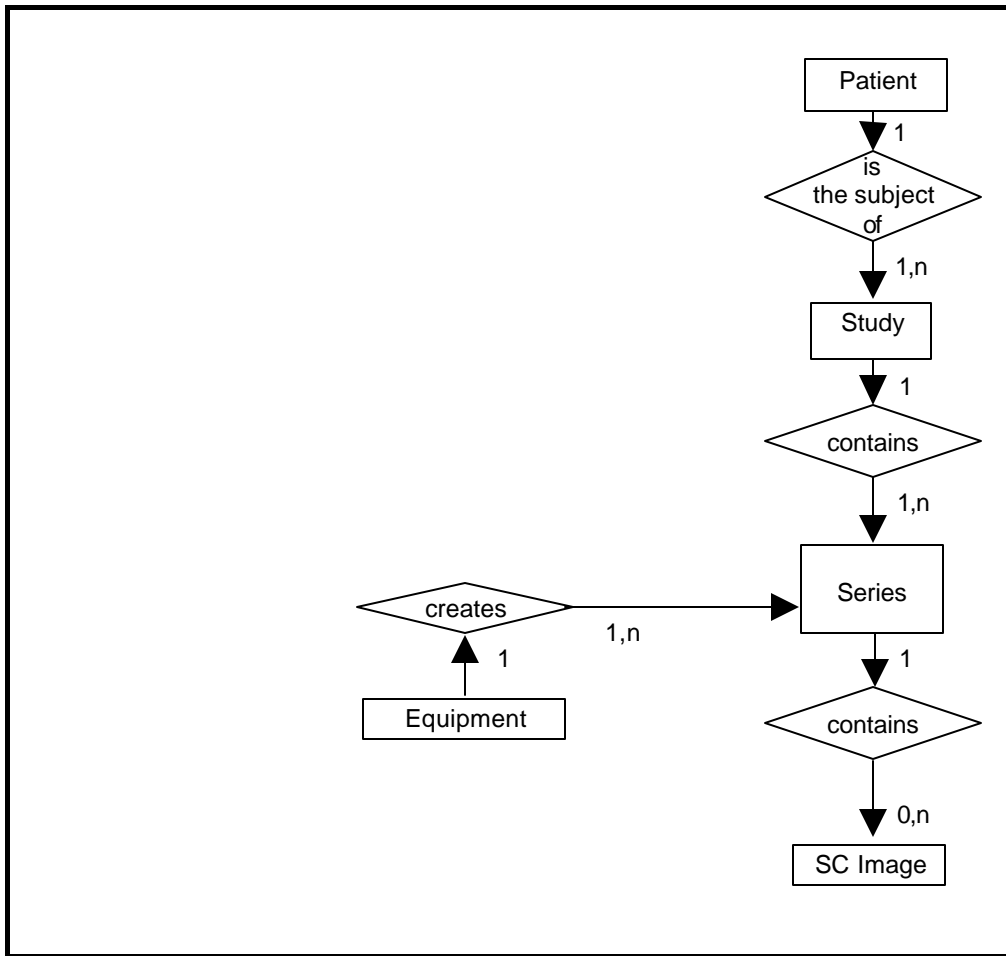
5.3 SC ENTITY RELATIONSHIP MODEL

The Entity-Relationship diagram for the SC Image interoperability schema is shown in Illustration 5.3-2. In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to n Images per Series, but the Patient to Study relationship has 1 Study for each Patient (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 5.3-2
 SC IMAGE ENTITY RELATIONSHIP DIAGRAM



5.3.1 Entity Descriptions

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities contained within the SC Information Object.

5.3.2 CardIQ Physio Mapping of DICOM entities

TABLE 5.3-22
 MAPPING OF DICOM ENTITIES TO CARDIQ PHYSIO ENTITIES

DICOM	CardIQ Physio Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image
Frame	Not Applicable

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5.4 IOD MODULE TABLE

Within an entity of the DICOM SC IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 5.4-23 identifies the defined modules within the entities which comprise the DICOM SC IOD. Modules are identified by Module Name.

See DICOM Part 3 for a complete definition of the entities, modules, and attributes.

**TABLE 5.4-23
SC IMAGE IOD MODULES**

Entity Name	Module Name	Reference
Patient	Patient	5.5.1.1
Study	General Study	5.5.2.1
	Patient Study	5.5.2.2
Series	General Series	5.5.3.1
	General Equipment	5.5.4.1
Equipment	SC Equipment	5.5.9.1
	General Image	5.5.5.1
Image	Image Pixel	5.5.5.2
	SC Image	5.5.9.2
	Overlay Plane	5.5.6.1
	Modality LUT	5.5.7.2
	VOI LUT	5.5.7.1
	SOP Common	5.5.8.1

5.5 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities and modules contained within the SC Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

5.5.1 Common Patient Entity Modules

5.5.1.1 Patient Module

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This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

**TABLE 5.5-24
PATIENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Copied
Patient ID	(0010,0020)	2	Copied
Patient's Birth Date	(0010,0030)	2	Copied
Patient's Sex	(0010,0040)	2	Copied
Referenced Patient Sequence	(0008,1120)	3	Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient's Birth Time	(0010,0032)	3	Removed
Other Patient IDs	(0010,1000)	3	Removed
Other Patient Names	(0010,1001)	3	Removed
Ethnic Group	(0010,2160)	3	Removed
Patient Comments	(0010,4000)	3	Removed

5.5.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs which reference the Study IE. These Module contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

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5.5.2.1 General Study Module

This section specifies the Attributes which describe and identify the Study performed upon the Patient.

**TABLE 5.5-25
GENERAL STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Copied
Study Date	(0008,0020)	2	Copied
Study Time	(0008,0030)	2	Copied
Referring Physician's Name	(0008,0090)	2	Copied
Study ID	(0020,0010)	2	Copied
Accession Number	(0008,0050)	2	Copied
Study Description	(0008,1030)	3	Removed
Physician(s) of Record	(0008,1048)	3	Removed
Name of Physician(s) Reading Study	(0008,1060)	3	Removed
Referenced Study Sequence	(0008,1110)	3	Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Procedure Code Sequence	(0008,1032)	3	Removed
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	1C	

5.5.2.2 Patient Study Module

This section defines Attributes that provide information about the Patient at the time the Study was performed.

**TABLE 5.5-26
PATIENT STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Removed
Patient's Age	(0010,1010)	3	Copied
Patient's Size	(0010,1020)	3	Removed
Patient's Weight	(0010,1030)	3	Removed
Occupation	(0010,2180)	3	Removed
Additional Patient's History	(0010,21B0)	3	Removed

5.5.3 Common Series Entity Modules

The following Series IE Modules are common to all Composite Image IODs which reference the Series IE.

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5.5.3.1 General Series Module

This section specifies the Attributes that identify and describe general information about the Series within a Study.

TABLE 5.5-27
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Copied Defined Terms: PT = PET
Series Instance UID	(0020,000E)	1	Generated
Series Number	(0020,0011)	2	Generated
Laterality	(0020,0060)	2C	Generated: ""
Series Date	(0008,0021)	3	Copied
Series Time	(0008,0031)	3	Copied
Performing Physicians' Name	(0008,1050)	3	Copied
Protocol Name	(0018,1030)	3	Removed
Series Description	(0008,103E)	3	Used / Generated
Operators' Name	(0008,1070)	3	Generated "Sdc_Account"
Referenced Study Component Sequence	(0008,1111)	3	Removed on AW
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Body Part Examined	(0018,0015)	3	Removed
Patient Position	(0018,5100)	2C	Mandatory The Defined Terms are: HFP = Head First-Prone HFS = Head First-Supine HFDR = Head First-Decubitus Right HFDL = Head First-Decubitus Left FFDR = Feet First-Decubitus Right FFDL = Feet First-Decubitus Left FFP = Feet First-Prone FFS = Feet First-Supine
Smallest Pixel Value in Series	(0028,0108)	3	Removed
Largest Pixel Value in Series	(0028,0109)	3	Removed
Request Attributes Sequence	(0040,0275)	3	Removed
>Requested Procedure ID	(0040,1001)	1C	
>Scheduled Procedure Step ID	(0040,0009)	1C	
>Scheduled Procedure Step Description	(0040,0007)	3	
>Scheduled Protocol Code Sequence	(0040,0008)	3	
>>Code Value	(0008,0100)	1C	
>>Code Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	1C	

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Performed Procedure Step ID	(0040,0253)	3	Ignored / Removed on AW
Performed Procedure Step Start Date	(0040,0244)	3	Ignored / Removed on AW
Performed Procedure Step Start Time	(0040,0245)	3	Ignored / Removed on AW
Performed Procedure Step Description	(0040,0254)	3	Ignored / Removed on AW
Performed Action Item Sequence	(0040,0260)	3	Ignored / Removed
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	1C	

5.5.4 Common Equipment Entity Modules

The following Equipment IE Module is common to all Composite Image IODs which reference the Equipment IE.

5.5.4.1 General Equipment Module

This section specifies the Attributes which identify and describe the piece of equipment which produced a Series of Images.

**TABLE 5.5-28
GENERAL EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Copied
Institution Name	(0008,0080)	3	Copied
Institution Address	(0008,0081)	3	Copied
Station Name	(0008,1010)	3	Copied
Institutional Department Name	(0008,1040)	3	Removed
Manufacturer's Model Name	(0008,1090)	3	Copied
Device Serial Number	(0018,1000)	3	Copied
Software Versions	(0018,1020)	3	Removed
Spatial Resolution	(0018,1050)	3	Removed
Date of Last Calibration	(0018,1200)	3	Removed
Time of Last Calibration	(0018,1201)	3	Removed
Pixel Padding Value	(0028,0120)	3	Copied

5.5.5 Common Image Entity Modules

The following Image IE Modules are common to all Composite Image IODs which reference the Image IE.

5.5.5.1 General Image Module

This section specifies the Attributes that identify and describe an image within a particular series.

**TABLE 5.5-29
GENERAL IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
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Image Number	(0020,0013)	2	Generated
Patient Orientation	(0020,0020)	2C	Copied
Image Date	(0008,0023)	2C	Copied
Image Time	(0008,0033)	2C	Generated (System Time)
Image Type	(0008,0008)	3	Generated. See 5.5.5.1.1.1
Acquisition Number	(0020,0012)	3	Copied
Acquisition Date	(0008,0022)	3	Copied
Acquisition Time	(0008,0032)	3	Copied
Referenced Image Sequence	(0008,1140)	3	Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Derivation Description	(0008,2111)	3	Removed
Source Image Sequence	(0008,2112)	3	Removed
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Images in Acquisition	(0020,1002)	3	Removed
Image Comments	(0020,4000)	3	Removed
Quality Control Image	(0028,0300)	3	Removed
Burned In Annotations	(0028,0301)	3	Generated
Lossy Image Compression Ratio	(0028,2112)	3	Removed
Lossy Image Compression	(0028,2110)	3	Removed

5.5.5.1.1 General Image Attribute Descriptions

5.5.5.1.1.1 Image Type

Value 1 has the following value:

- DERIVED identifies a Derived Image

Value 2 has the following value:

- SECONDARY identifies a Secondary Image

Value 3 has the following value:

- CAPTURE identifies a Screen Capture
- FC_STATE identifies a 3D state SC:

5.5.5.2 Image Pixel Module

This section specifies the Attributes that describe the pixel data of the image.

TABLE 5.5-30
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Generated <ul style="list-style-type: none"> • “1” for black and white images • “3” for color images

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Photometric Interpretation	(0028,0004)	1	Generated <ul style="list-style-type: none"> • “MONOCHROME2” or “MONOCHROME1” for black and white images • “RGB” for color images
Rows	(0028,0010)	1	Generated (256, 512, 1024)
Columns	(0028,0011)	1	Generated (256, 512, 1024)
Bits Allocated	(0028,0100)	1	Generated <ul style="list-style-type: none"> • “16” for black and white images • “8” for color images
Bits Stored	(0028,0101)	1	Generated <ul style="list-style-type: none"> • “16” for black and white images • “8” for color images
High Bit	(0028,0102)	1	Generated <ul style="list-style-type: none"> • “15” for black and white images • “7” for color images
Pixel Representation	(0028,0103)	1	Generated <ul style="list-style-type: none"> • “1” for black and white images • “0” for color images
Pixel Data	(7FE0,0010)	1	
Planar Configuration	(0028,0006)	1C	Generated <ul style="list-style-type: none"> • Removed for black and white images • “0” for color images
Pixel Aspect Ratio	(0028,0034)	1C	Removed
Smallest Image Pixel Value	(0028,0106)	3	Removed
Largest Image Pixel Value	(0028,0107)	3	Removed
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Removed
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Removed
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Removed
Red Palette Color Lookup Table Data	(0028,1201)	1C	Removed
Green Palette Color Lookup Table Data	(0028,1202)	1C	Removed
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Removed

5.5.6 Common Overlay Modules**5.5.6.1 Overlay plane module**

This section contains Attributes that describe characteristics of an Overlay Plane.

This module is not currently supported by products.

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TABLE 5.5-31
OVERLAY PLANE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Overlay Rows	(60xx,0010)	1	Unsupported module
Overlay Columns	(60xx,0011)	1	Unsupported module
Overlay Type	(60xx,0040)	1	Unsupported module
Origin	(60xx,0050)	1	Unsupported module
Overlay Bits Allocated	(60xx,0100)	1	Unsupported module
Bit Position	(60xx,0102)	1	Unsupported module
Overlay Data	(60xx,3000)	1C	Unsupported module
Overlay Description	(60xx,0022)	3	Unsupported module
Overlay Subtype	(60xx,0045)	3	Unsupported module
Overlay Label	(60xx,1500)	3	Unsupported module
ROI Area	(60xx,1301)	3	Unsupported module
ROI Mean	(60xx,1302)	3	Unsupported module
ROI Standard Deviation	(60xx,1303)	3	Unsupported module
Overlay Descriptor - Gray	(60xx,1100)	3	Unsupported module
Overlay Descriptor - Red	(60xx,1101)	3	Unsupported module
Overlay Descriptor - Green	(60xx,1102)	3	Unsupported module
Overlay Descriptor - Blue	(60xx,1103)	3	Unsupported module
Overlays - Gray	(60xx,1200)	3	Unsupported module
Overlays - Red	(60xx,1201)	3	Unsupported module
Overlays - Green	(60xx,1202)	3	Unsupported module
Overlays - Blue	(60xx,1203)	3	Unsupported module

5.5.7 Common Lookup Table Modules

5.5.7.1 VOI LUT module

This section specifies the Attributes that describe the VOI LUT.

This module is not saved for color (“RGB”) images.

TABLE 5.5-32
VOI LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
VOI LUT Sequence	(0028,3010)	3	Removed
>LUT Descriptor	(0028,3002)	1C	
>LUT Explanation	(0028,3003)	3	
>LUT Data	(0028,3006)	1C	
Window Center	(0028,1050)	3	Removed
Window Width	(0028,1051)	1C	Removed
Window Center & Width Explanation	(0028,1055)	3	Removed

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5.5.7.2 Modality LUT module

This section specifies the Attributes that describe the Modality LUT.

This module is not saved for color (“RGB”) images.

TABLE 5.5-33
MODALITY LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality LUT Sequence	(0028,3000)	3	Removed
>LUT Descriptor	(0028,3002)	1C	Specify values created or supported.
>LUT Explanation	(0028,3003)	3	
>Modality LUT Type	(0028,3004)	1C	Specify Defined Terms used: OD = Optical density US = Unspecified
>LUT Data	(0028,3006)	1C	
Rescale Intercept	(0028,1052)	1C	Removed
Rescale Slope	(0028,1053)	1C	Removed
Rescale Type	(0028,1054)	1C	Removed

5.5.8 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

5.5.8.1 SOP Common Module

This section defines the Attributes which are required for proper functioning and identification of the associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

TABLE 5.5-34
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Generated
SOP Instance UID	(0008,0018)	1	Generated To generate a unique ID, the process concatenates the Implementation Root UID, serial number, the process ID number, the timestamp and a counter incremented each time.
Specific Character Set	(0008,0005)	1C	Copied Only the “ISO_IR 100” character set is supported.
Instance Creation Date	(0008,0012)	3	Generated: current date
Instance Creation Time	(0008,0013)	3	Generated: current time
Instance Creator UID	(0008,0014)	3	Removed
Time zone Offset From UTC	(0008,0201)	3	Removed
Instance Number	(0020,0013)	3	Generated
SOP Instance Status	(0100,0410)	3	Removed
SOP Authorization Date and Time	(0100,0420)	3	Removed
SOP Authorization Comment	(0100,0414)	3	Removed

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Authorization Equipment Certification Number	(0100,0416)	3	Removed
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5.5.9 SC Modules

This Section describes SC Equipment, and Image Modules. These Modules contain Attributes that are specific to SC Image IOD.

5.5.9.1 SC Equipment Module

This Module describes equipment used to convert images into a DICOM format.

TABLE 5.5-35
SC IMAGE EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Conversion Type	(0008,0064)	1	Generated: WSD = Workstation
Modality	(0008,0060)	3	Generated See 5.5.3.1 for Enumerated Values.
Secondary Capture Device ID	(0018,1010)	3	Generated from gethostname()
Secondary Capture Device Manufacturer	(0018,1016)	3	Generated "GE Medical Systems"
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	3	Generated: GEHC-CardIQ Physio
Secondary Capture Device Software Version	(0018,1019)	3	Generated: CardIQ Physio version "2.021d"
Video Image Format Acquired	(0018,1022)	3	Removed
Digital Image Format Acquired	(0018,1023)	3	Removed

5.5.9.2 SC Image Module

The table in this Section contains IOD Attributes that describe SC images.

TABLE 5.5-36
SC IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Date of Secondary Capture	(0018,1012)	3	Generated: current date
Time of Secondary Capture	(0018,1014)	3	Generated: current time

5.6 SC PRIVATE DATA

Note that state of the application is saved in a SC image and is read only if the Image Type(0008,0008) has FC_STATE in value 3 (Refer section 5.5.5.1.1.1).

Following private tags are used to save and restore the state of the application. Application saves the state of reformat, Normalization, and Filter operations.

Table 5.5-37
SC PRIVATE DATA

Application Version	(0057, 1042)	3	Used / Generated
Application Name	(0057,1041)	3	Used/Generated (GE HEALTHCARE _CardIQ Physio)

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CardIQ Physio Private Creator UID	(0057,0010)	3	Generated
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