

Technical Publications

Direction: 5479282-1EN
Revision 2

CortexID Suite 2.1 DICOM CONFORMANCE STATEMENT

Copyright © 2015 By General Electric Co.

Do not duplicate

REVISION HISTORY

| Rev | Ver | Date | Author | Description of Change | Reason for Change |
|-----|-----|--------------|-----------------------|---|------------------------|
| 1 | 1 | 5 Jun 2014 | T. Lee | Initial version of document based on DOC1440190 | |
| 1 | 2 | 12 Feb 2015 | S. Singh B. Bridge | Document updated per review DOC1663617 Rev1. | Corrections per review |
| 2 | 1 | 3 April 2015 | B. Bridge | Updated according to DOC1663617 Rev 2. | Corrections per review |

CONFORMANCE STATEMENT OVERVIEW

CortexID Suite is a PET image display and analysis application developed for use on the GE Advantage Workstation and Advantage Workstation Enterprise Server. CortexID Suite does not provide or use any network services directly. CortexID Suite reads and displays PET CT and MR images from the workstation platform database. The images are stored on the Advantage Workstation database. All network services are provided by the workstation platform directly. For a complete description of the networking services refer to the workstation platform conformance statement. See section 1.6 for references. .

Table 0.1 provides an overview of the SOP Classes that are supported by CortexID Suite

Table 0.1 – APPLICATION USE

| SOP Classes | Reader | Writer |
|--|--------|--------|
| CT Image Storage | Yes | No |
| MR Image Storage | Yes | No |
| Secondary Capture Image Storage | No | Yes |
| Positron Emission Tomography Image Storage | Yes | Yes |
| Encapsulated PDF Image Storage | No | Yes |

TABLE OF CONTENTS

| | | |
|-------------|---|-----------|
| 1. | INTRODUCTION | 8 |
| 1.1 | OVERVIEW..... | 8 |
| 1.2 | OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE..... | 9 |
| 1.3 | INTENDED AUDIENCE | 10 |
| 1.4 | SCOPE AND FIELD OF APPLICATION..... | 10 |
| 1.5 | IMPORTANT REMARKS | 10 |
| 1.6 | REFERENCES | 11 |
| 1.7 | DEFINITIONS..... | 11 |
| 1.8 | SYMBOLS AND ABBREVIATIONS..... | 13 |
| 1.9 | TERMS DEFINITIONS | 14 |
| 2. | CONFORMANCE STATEMENT | 15 |
| 3. | CT INFORMATION OBJECT IMPLEMENTATION | 17 |
| 3.1 | Introduction..... | 17 |
| 3.2 | CT Entity-Relationship Model | 17 |
| 3.2.1 | ENTITY DESCRIPTIONS..... | 18 |
| 3.2.2 | Mapping of DICOM entities | 18 |
| 3.3 | IOD MODULE TABLE..... | 18 |
| 3.4 | INFORMATION MODULE DEFINITIONS..... | 19 |
| 3.4.1 | Common Patient Entity Modules | 20 |
| 3.4.1.1 | Patient Module | 20 |
| 3.4.2 | Common Study Entity Modules | 20 |
| 3.4.2.1 | General Study Module..... | 21 |
| 3.4.2.2 | Patient Study Module | 21 |
| 3.4.3 | Common Series Entity Modules..... | 22 |
| 3.4.3.1 | General Series Module | 22 |
| 3.4.4 | Common Frame Of Reference Entity Modules | 23 |
| 3.4.4.1 | Frame Of Reference Module..... | 23 |
| 3.4.5 | Common Equipment Entity Modules..... | 24 |
| 3.4.5.1 | General Equipment Module | 24 |
| 3.4.6 | Common Image Entity Modules | 24 |
| 3.4.6.1 | General Image Module | 24 |
| 3.4.6.1.1.1 | Lossy Image Compression..... | 25 |
| 3.4.6.2 | Image Plane Module | 25 |
| 3.4.6.2.1 | Image Position | 25 |
| 3.4.6.3 | Image Pixel Module..... | 25 |
| 3.4.7 | Common Lookup Table Modules..... | 27 |
| 3.4.7.1 | VOI LUT module..... | 27 |
| 3.4.8 | General Modules | 27 |
| 3.4.8.1 | SOP Common Module | 27 |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

| | | |
|-----------|--|----|
| 3.4.9 | CT Modules | 28 |
| 3.4.9.1 | CT Image Module | 28 |
| 3.5 | Private data | 29 |
| 4. | MR INFORMATION OBJECT IMPLEMENTATION | 30 |
| 4.1 | INTRODUCTION | 30 |
| 4.2 | MR IOD DESCRIPTION | 30 |
| 4.3 | MR ENTITY-RELATIONSHIP MODEL..... | 30 |
| 4.3.1 | Entity Descriptions | 31 |
| 4.4 | IOD MODULE TABLE..... | 31 |
| 4.5 | INFORMATION MODULE DEFINITIONS..... | 32 |
| 4.5.1 | Common Patient Entity Modules..... | 32 |
| 4.5.1.1 | Patient Module | 32 |
| 4.5.2 | Common Study Entity Modules | 33 |
| 4.5.2.1 | General Study Module..... | 34 |
| 4.5.2.2 | Patient Study Module | 34 |
| 4.5.3 | Common Series Entity Modules..... | 35 |
| 4.5.3.1 | General Series Module | 35 |
| 4.5.4 | Common Frame Of Reference Entity Modules | 36 |
| 4.5.4.1 | Frame Of Reference Module..... | 36 |
| 4.5.5 | Common Equipment Entity Modules..... | 36 |
| 4.5.5.1 | General Equipment Module | 36 |
| 4.5.6 | Common Image Entity Modules | 37 |
| 4.5.6.1 | General Image Module | 37 |
| 4.5.6.2 | Lossy Image Compression..... | 37 |
| 4.5.6.3 | Image Plane Module | 37 |
| 4.5.6.3.1 | Image Position | 38 |
| 4.5.6.4 | Image Pixel Module | 38 |
| 4.5.7 | Common Lookup Table Modules..... | 39 |
| 4.5.7.1 | VOI LUT module..... | 39 |
| 4.5.8 | General Modules | 40 |
| 4.5.8.1 | SOP Common Module..... | 40 |
| 4.5.9 | MR Modules | 40 |
| 4.5.9.1 | MR Image Module | 41 |
| 4.6 | PRIVATE DATA | 42 |
| 5. | PET INFORMATION OBJECT IMPLEMENTATION | 43 |
| 5.1 | INTRODUCTION | 43 |
| 5.2 | PET IOD DESCRIPTION | 43 |
| 5.3 | PET ENTITY-RELATIONSHIP MODEL..... | 43 |
| 5.3.1 | Entity Descriptions | 44 |
| 5.3.2 | CortexID Suite Mapping of DICOM entities..... | 44 |
| 5.4 | IOD MODULE TABLE..... | 44 |
| 5.5 | INFORMATION MODULE DEFINITIONS..... | 45 |
| 5.5.1 | Common Patient Entity Modules..... | 46 |
| 5.5.1.1 | Patient Module | 46 |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

| | | |
|-------------|---|-----------|
| 5.5.2 | Common Study Entity Modules | 46 |
| 5.5.2.1 | General Study Module..... | 47 |
| 5.5.2.2 | Patient Study Module | 47 |
| 5.5.3 | Common Series Entity Modules..... | 48 |
| 5.5.3.1 | General Series Module | 48 |
| 5.5.4 | Common Frame Of Reference Entity Modules | 49 |
| 5.5.4.1 | Frame Of Reference Module..... | 49 |
| 5.5.4.1.1 | Frame Of Reference UID | 50 |
| 5.5.5 | Common Equipment Entity Modules..... | 50 |
| 5.5.5.1 | General Equipment Module | 50 |
| 5.5.6 | Common Image Entity Modules | 50 |
| 5.5.6.1 | General Image Module | 50 |
| 5.5.6.1.1 | General Image Attribute Descriptions | 51 |
| 5.5.6.1.1.1 | Patient Orientation..... | 51 |
| 5.5.6.1.1.2 | Image Type..... | 51 |
| 5.5.6.2 | Image Plane Module | 52 |
| 5.5.6.2.1 | Image Position | 52 |
| 5.5.6.3 | Image Pixel Module..... | 52 |
| 5.5.7 | Common Lookup Table Modules..... | 53 |
| 5.5.7.1 | VOI LUT module..... | 53 |
| 5.5.8 | General Modules | 54 |
| 5.5.8.1 | SOP Common Module | 54 |
| 5.5.9 | PET Modules | 55 |
| 5.5.9.1 | PET Series | 55 |
| 5.5.9.2 | PET Isotope | 56 |
| 5.5.9.3 | PET Multi-gated Acquisition | 57 |
| 5.5.9.4 | NM/PET Patient Orientation | 57 |
| 5.5.9.5 | PET Image Module | 58 |
| 6. | SECONDARY CAPTURE INFORMATION OBJECT IMPLEMENTATION..... | 60 |
| 6.1 | Introduction..... | 60 |
| 6.2 | SC IOD Implementation..... | 60 |
| 6.3 | SC Entity-Relationship Model | 60 |
| 6.3.1 | ENTITY DESCRIPTIONS..... | 61 |
| 6.3.2 | Mapping of DICOM entities | 61 |
| 6.4 | IOD MODULE TABLE..... | 62 |
| 6.5 | INFORMATION MODULE DEFINITIONS..... | 62 |
| 6.5.1 | Common Patient Entity Modules | 63 |
| 6.5.1.1 | Patient Module | 63 |
| 6.5.2 | Common Study Entity Modules | 63 |
| 6.5.2.1 | General Study Module..... | 64 |
| 6.5.2.2 | Patient Study Module | 64 |
| 6.5.3 | Common Series Entity Modules..... | 65 |
| 6.5.3.1 | General Series Module | 65 |
| 6.5.3.1.1 | General Series Attribute Descriptions | 67 |
| 6.5.3.1.1.1 | Related Series Sequence | 67 |
| 6.5.4 | SC Modules | 67 |
| 6.5.4.1 | SC Equipment Module..... | 67 |
| 6.5.4.2 | SC Image Module | 67 |
| 6.5.5 | Common Equipment Entity Modules..... | 68 |
| 6.5.5.1 | General Equipment Module | 68 |
| 6.5.6 | Common Image Entity Modules | 68 |
| 6.5.6.1 | General Image Module | 68 |
| 6.5.6.1.1 | General Image Attribute Descriptions | 69 |

| | | |
|-------------|---|-----------|
| 6.5.6.1.1.1 | Patient Orientation | 69 |
| 6.5.6.1.1.2 | Image Date and Time | 69 |
| 6.5.6.1.1.3 | Image Type | 69 |
| 6.5.6.1.1.4 | Source Image Sequence | 70 |
| 6.5.6.1.1.5 | Lossy Image Compression | 70 |
| 6.5.6.2 | Image Pixel Module | 70 |
| 6.5.7 | Common Lookup Table Modules | 71 |
| 6.5.7.1 | VOI LUT module | 71 |
| 6.5.7.2 | Modality LUT module | 72 |
| 6.5.8 | General Modules | 73 |
| 6.5.8.1 | SOP Common Module | 73 |
| 6.6 | SC PRIVATE DATA | 75 |
| 7. | ENCAPSULATED PDF INFORMATION OBJECT IMPLEMENTATION | 77 |
| 7.1 | INTRODUCTION | 77 |
| 7.2 | ENCAPSULATED PDF IOD DESCRIPTION | 77 |
| 7.3 | ENCAPSULATED PDF ENTITY-RELATIONSHIP MODEL | 77 |
| 7.3.1 | Entity Descriptions | 78 |
| 7.3.2 | <i>CortexID Suite</i> Mapping of DICOM entities | 78 |
| 7.4 | IOD MODULE TABLE | 79 |
| 7.5 | INFORMATION MODULE DEFINITIONS | 79 |
| 7.5.1 | Common Patient Entity Modules | 79 |
| 7.5.1.1 | Patient Module | 79 |
| 7.5.2 | Common Study Entity Modules | 81 |
| 7.5.2.1 | General Study Module | 81 |
| 7.5.2.2 | Patient Study Module | 81 |
| 7.5.3 | Common Series Entity Modules | 82 |
| 7.5.3.1 | Encapsulated Document Series Module | 82 |
| 7.5.3.1.1 | General Series Attribute Descriptions | 83 |
| 7.5.4 | Common Equipment Entity Modules | 83 |
| 7.5.4.1 | General Equipment Module | 83 |
| 7.5.4.2 | SC Equipment Module | 83 |
| 7.5.5 | Encapsulated Document Entity Modules | 84 |
| 7.5.5.1 | Encapsulated Document | 84 |
| 7.5.5.2 | SOP Common Module | 85 |

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

Section 3 (CT Information Object Implementation), which specifies the GE HEALTHCARE equipment compliance to DICOM requirements for the implementation of a CT Information Object.

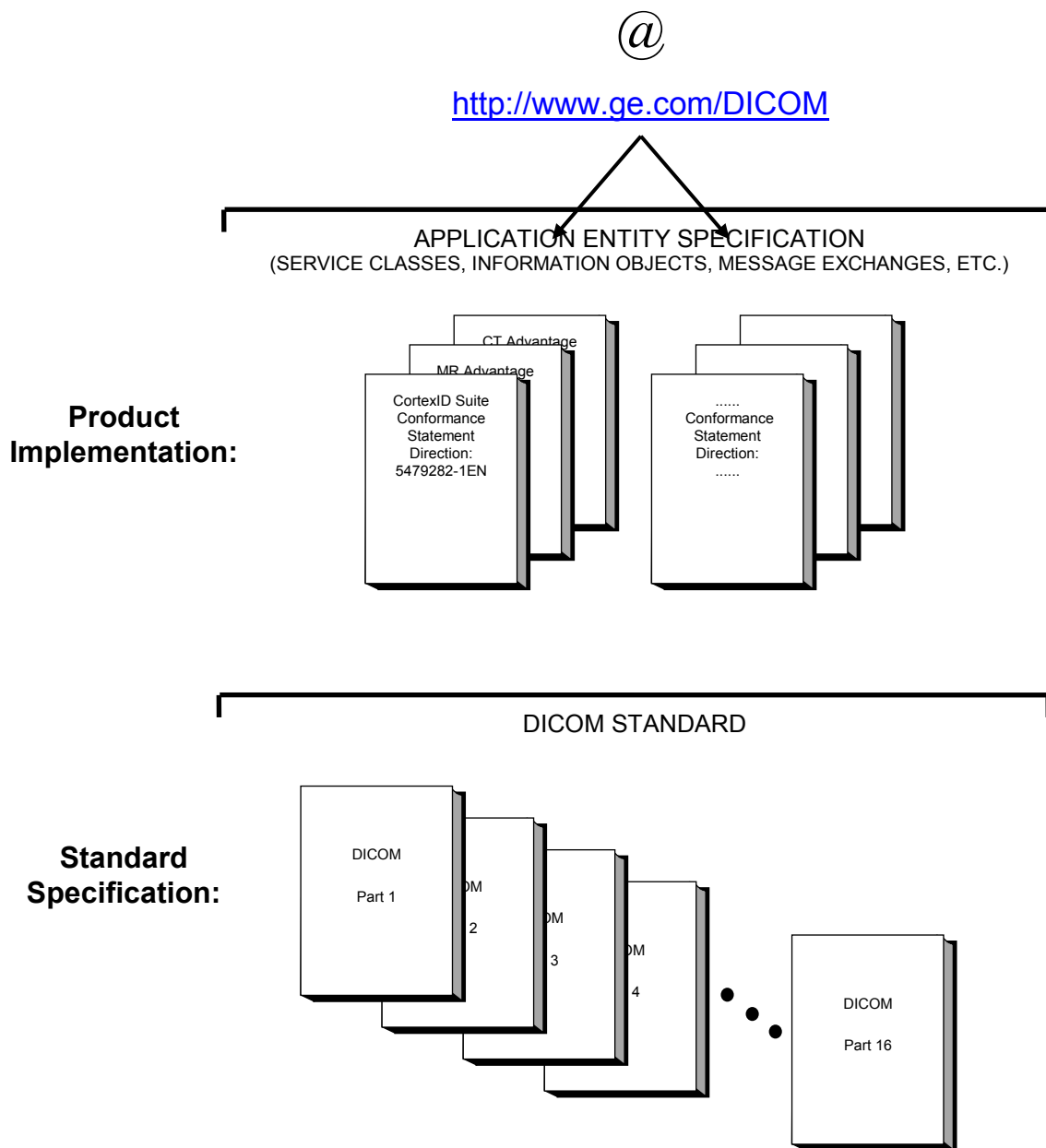
Section 4 (MR Information Object Implementation), which specifies the GE HEALTHCARE equipment compliance to DICOM requirements for the implementation of a MR Information Object.

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

Section 6 (Secondary Capture Information Object Implementation), which specifies the GE HEALTHCARE equipment compliance to DICOM requirements for the implementation of a Secondary Capture Information Object.

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

GEHC DICOM Conformance Statements



This document specifies the DICOM implementation. It is entitled:

CortexID Suite 2.1
Conformance Statement for DICOM
Direction: **5479282-1EN**

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 1752
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 Standard and with the terminology and concepts which are used in that Standard.

1.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document to provide an unambiguous specification for GEHC implementations. This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GEHC medical data exchanged using DICOM. The GEHC Conformance Statements are available to the public.

The reader of this DICOM Conformance Statement should be aware that different GEHC devices are capable of using different Information Object Definitions. For example, a GEHC 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 GEHC implementation. If the user encounters unspecified private data elements while parsing a GEHC 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 GEHC 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.
- **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

| | |
|-------------|--|
| NEMA PS3 | Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/ |
| AW 4.6 DCS | Advantage Workstation 4.6 DICOM Conformance Statement, direction number 5404296-100. |
| AWE 3.1 DCS | Advantage Workstation Enterprise Server DICOM Conformance Statement, direction number 5479929-1EN |

1.7 DEFINITIONS

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax - the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples : Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

Application Entity (AE) - an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title - the externally known name of an *Application Entity*, used to identify a DICOM application to other DICOM applications on the network.

Application Context - the specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.

Association – a network communication channel set up between *Application Entities*.

Attribute – a unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Information Object Definition (IOD) – the specified set of *Attributes* that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The *Attributes* may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG) – a set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)

Module – a set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of *Association* establishment that allows *Application Entities* to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an *Association*, as negotiated between *Application Entities*; includes *Abstract Syntaxes* and *Transfer Syntaxes*.

Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data

Service Class Provider (SCP) – role of an *Application Entity* that provides a DICOM network service; typically, a server that performs operations requested by another *Application Entity* (*Service Class User*). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – role of an *Application Entity* that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a *SOP Class*. Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is

odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: *JPEG* compressed (images), little endian explicit value representation.

Unique Identifier (UID) – a globally unique “dotted decimal” string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person’s name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

1.8 SYMBOLS AND ABBREVIATIONS

| | |
|--------|---|
| CT | Computed Tomography |
| DICOM | Digital Imaging and Communications in Medicine |
| IOD | Information Object Definition |
| ISO | International Organization for Standards |
| IO | Intra-oral X-ray |
| JPEG | Joint Photographic Experts Group |
| LUT | Look-up Table |
| MAR | Medication Administration Record |
| MPEG | Moving Picture Experts Group |
| MPR | Multi-Plane Reformat |
| MR | Magnetic Resonance Imaging |
| NM | Nuclear Medicine |
| PACS | Picture Archiving and Communication System |
| PET | Positron Emission Tomography |
| SC | Secondary Capture |
| SCP | Service Class Provider |
| SCU | Service Class User |
| SOP | Service-Object Pair |
| SR | Structured Reporting |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| U | Unique (Key Attribute) |

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

- **Ignored:** the software will ignore the value of the tag. Data elements not present in the defined tables are assumed to be ignored.
- **Used:** the software might use at some point the value of this tag; the value could be use 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. CONFORMANCE STATEMENT

CortexID Suite is a software application developed for use on the Advantage Windows workstations. This means that networking and media storage features are inherited from the Advantage Windows platform.

CortexID Suite allows users to generate the following types of DICOM images to the DICOM Database:

1. Reformatted Images
2. Secondary Screen Capture
3. PDF Encapsulated

The generated images may be transferred to other DICOM stations or PACS, where they may be displayed in any application capable of displaying such DICOM images.

CortexID Suite application is an analysis and review application. The user is typically a physician or technologist. The PET, CT and MR studies exist in the platform database, typically transferred ahead of time. The application requires a PET image series for input, with CT and MR series being optional. The images are processed and viewed in the application. For the purpose of sharing images in a report or with the patient or referring physician, the user may manually select specific slices or views for saving to SC images. The content of the report then can be saved to the DICOM Image Database as an Encapsulated PDF type.

For a complete description of the media storage conformance, refer to the AW 4.6 and AWE 3.1 conformance statements as the platforms upon which CortexID Suite runs (see section 1.6 REFERENCES).

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

- The DICOM CT IODs that are required to reconstruct a 3-dimensional CT volume (section 3),
- The DICOM MR IODs that are required to reconstruct a 3-dimensional MR volume (section 4),
- The DICOM PET IODs that are required to reconstruct a 3-dimensional PET volume (section 5), DICOM PET IOD written by the application (section 5).
- The DICOM SC IODs written by the application (section 6).
- The DICOM PDF Encapsulated IODs written by the application (section 7).

SOP Classes Used as Input:

| Modality | SOP Class | Remarks |
|----------|-----------------------------|----------|
| CT | 1.2.840.10008.5.1.4.1.1.2 | Optional |
| PET | 1.2.840.10008.5.1.4.1.1.128 | Required |
| MR | 1.2.840.10008.5.1.4.1.1.4 | Optional |

SOP Classes Used as Output:

| Modality | SOP Class | Remarks |
|----------|-------------------------------|--------------------------|
| SC | 1.2.840.10008.5.1.4.1.1.7 | Secondary Screen Capture |
| PET | 1.2.840.10008.5.1.4.1.1.128 | PET Reformatted Images |
| DOC | 1.2.840.10008.5.1.4.1.1.104.1 | PDF Encapsulated Images |

Implementation Identifying Information

| Application Name | Implementation Class UID |
|------------------|--------------------------|
| CortexID Suite | 1.2.840.113619.6.381 |

Supported Character Sets

| Character Set | Comment |
|---------------------------------|--------------------------------------|
| ISO_IR 100 | Supported when running on AW and AWE |
| ISO_IR 144 | Supported when running on AWE |
| \ISO 2022 IR 87 | Supported when running on AWE |
| \ISO 2022 IR 149 | Supported when running on AWE |
| ISO IR 192 | Supported when running on AWE |
| GB18030 | Supported when running on AWE |
| ISO 2022 IR 13 \ ISO 2022 IR 87 | Supported when running on AWE |

Images with unsupported character sets will not be loaded.

3. CT INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

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

3.2 CT Entity-Relationship Model

3.3 IOD MODULE TABLE

3.4 INFORMATION MODULE DEFINITIONS

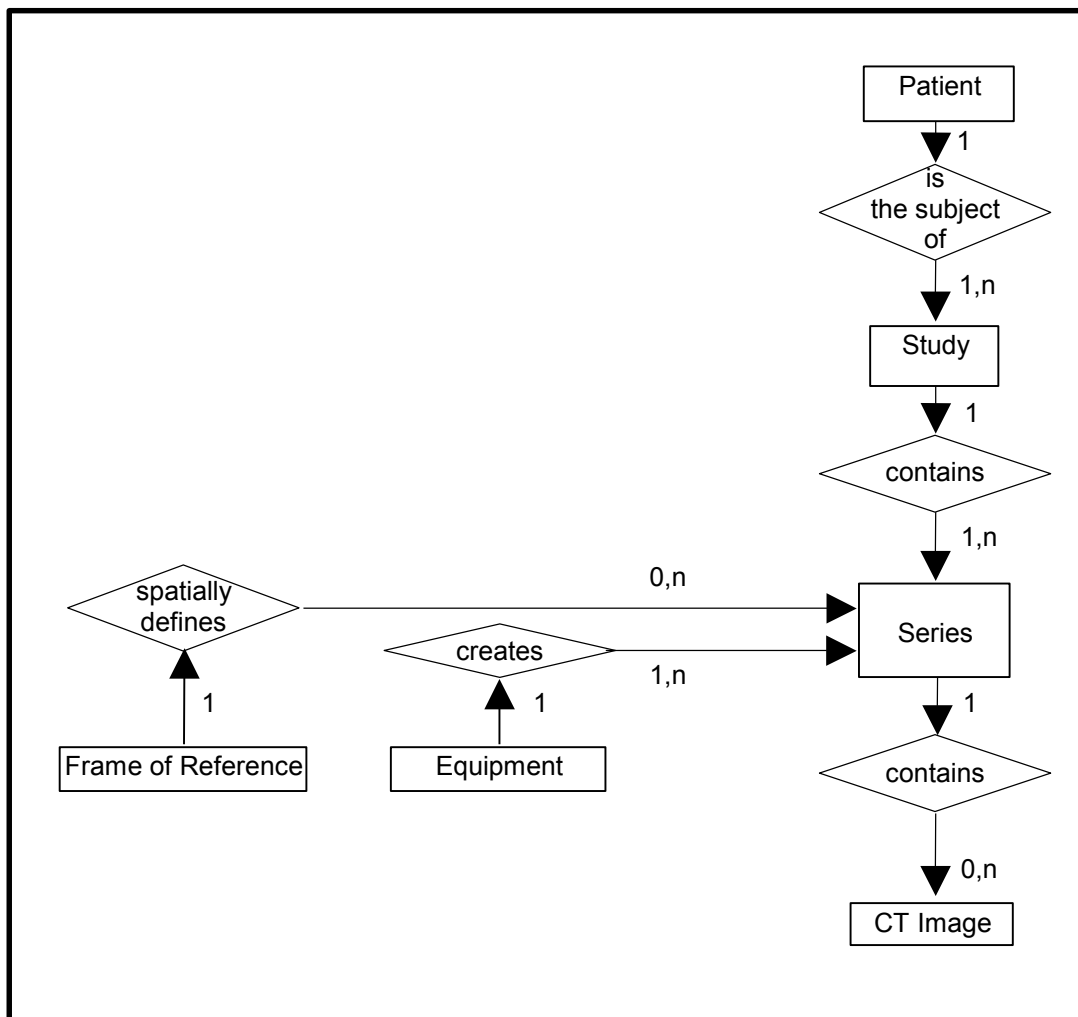
3.2 CT ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the CT Image interoperability schema is shown in Illustration 3.2-1. 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 Patient for each Study (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 3.2-1
 CT IMAGE ENTITY RELATIONSHIP DIAGRAM



3.2.1 ENTITY DESCRIPTIONS

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

3.2.2 Mapping of DICOM entities

TABLE 3.2-1
 MAPPING OF DICOM ENTITIES TO APPLICATION ENTITIES

| DICOM | Application Entity |
|---------|--------------------|
| Patient | Patient |
| Study | Exam |
| Series | Series |
| Image | Image |
| Frame | Not Applicable |

3.3 IOD MODULE TABLE

Within an entity of the DICOM v3.0 CT 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 3.3-1 identifies the defined modules within the entities which comprise the DICOM v3.0 CT IOD. Modules are identified by Module Name.

See DICOM v3.0 Part 3 for a complete definition of the entities, modules, and attributes.

TABLE 3.3-1
CT IMAGE IOD MODULES

| Entity Name | Module Name | Usage | Reference |
|--------------------|------------------------|----------|-----------|
| Patient | Patient | Used | 3.4.1.1 |
| | Clinical Trial Subject | Not Used | N/A |
| Study | General Study | Used | 3.4.2.1 |
| | Patient Study | Used | 3.4.2.2 |
| | Clinical Trial Study | Not Used | N/A |
| Series | General Series | Used | 3.4.3.1 |
| | Clinical Trial Series | Not Used | N/A |
| Frame of Reference | Frame of Reference | Used | 3.4.4.1 |
| Equipment | General Equipment | Used | 3.4.5.1 |
| Image | General Image | Used | 3.4.6.1 |
| | Image Plane | Used | 3.4.6.2 |
| | Image Pixel | Used | 3.4.6.3 |
| | Contrast/Bolus | Used | 3.4.6.3 |
| | Device | Not Used | N/A |
| | Specimen | Not Used | N/A |
| | CT Image | Used | 3.4.9.1 |
| | Overlay Plane | Not Used | N/A |
| | VOI LUT | Used | 3.4.7.1 |
| SOP Common | Used | 3.4.8.1 | |

3.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM v3.0 Standard Part 3 (Information Object Definitions) for a description of each of the entities and modules contained within the CT 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 from where these values are obtained. Associated tables contain expectations of the use of entities within the application. No CT images are generated by the application. It should be noted that they are the same ones as defined in the DICOM v3.0 Standard Part 3 (Information Object Definitions).

**GE HEALTHCARE
STATEMENT**

DIR 5479282-1EN REV 2

3.4.1 Common Patient Entity Modules

3.4.1.1 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 3.4-1
PATIENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|------------------------------|-------------|-------------|------------------------------|
| Patient's Name | (0010,0010) | 2 | Used |
| Patient ID | (0010,0020) | 2 | Used |
| Issuer of Patient ID | (0010,0021) | 3 | Used |
| Patient's Birth Date | (0010,0030) | 2 | Used |
| Patient's Sex | (0010,0040) | 2 | Used |
| Referenced Patient Sequence | (0008,1120) | 3 | Used |
| >Referenced SOP Class UID | (0008,1150) | 1C | Used |
| >Referenced SOP Instance UID | (0008,1155) | 1C | Used |
| Patient's Birth Time | (0010,0032) | 3 | Ignored |
| Other Patient IDs | (0010,1000) | 3 | Used |
| Other Patient IDs Sequence | (0010,1002) | 3 | Used |
| >Patient ID | (0010,0020) | 1 | Used |
| >Issuer of Patient ID | (0010,0021) | 1 | Used |
| >Type of Patient ID | (0010,0022) | 1 | Used |
| Other Patient Names | (0010,1001) | 3 | Used |
| Ethnic Group | (0010,2160) | 3 | Ignored |
| Patient Comments | (0010,4000) | 3 | Ignored |

3.4.2 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.

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

3.4.2.1 General Study Module

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

**TABLE 3.4-2
GENERAL STUDY MODULE ATTRIBUTES**

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

3.4.2.2 Patient Study Module

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

**TABLE 3.4-3
PATIENT STUDY MODULE ATTRIBUTES**

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

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

3.4.3 Common Series Entity Modules

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

3.4.3.1 General Series Module

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

**TABLE 3.4-4
GENERAL SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|--|-------------|------|--|
| Modality | (0008,0060) | 1 | Used Defined Terms: CT = Computed Tomography |
| Series Instance UID | (0020,000E) | 1 | Mandatory |
| Series Number | (0020,0011) | 2 | Used |
| Laterality | (0020,0060) | 2C | Ignored |
| Series Date | (0008,0021) | 3 | Used |
| Series Time | (0008,0031) | 3 | Used |
| Performing Physicians' Name | (0008,1050) | 3 | Ignored |
| Protocol Name | (0018,1030) | 3 | Ignored |
| Series Description | (0008,103E) | 3 | Used |
| Operators' Name | (0008,1070) | 3 | Ignored |
| Referenced Performed Procedure Step Sequence | (0008,1111) | 3 | Ignored |
| >Referenced SOP Class UID | (0008,1150) | 1C | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | |
| Related Series Sequence | (0008,1250) | 3 | Ignored |
| Body Part Examined | (0018,0015) | 3 | Ignored |
| Patient Position | (0018,5100) | 2C | Used 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 |
| Largest Pixel Value in Series | (0028,0109) | 3 | Ignored |
| Request Attributes Sequence | (0040,0275) | 3 | Ignored |
| >Requested Procedure ID | (0040,1001) | 1C | |
| >Accession Number | (0008,0050) | 3 | |
| >Study Instance UID | (0020,000D) | 3 | |
| >Referenced Study Sequence | (0008,1110) | 3 | |
| >>Referenced SOP Class UID | (0008,1150) | 1C | |

| | | | |
|---|-------------|----|---------|
| >>Referenced SOP Instance UID | (0008,1155) | 1C | |
| >Requested Procedure Description | (0032,1060) | 3 | |
| >Requested Procedure Code Sequence | (0032,1064) | 3 | |
| >>Code Value | (0008,0100) | 1C | |
| >>Code Scheme Designator | (0008,0102) | 1C | |
| >>Code Meaning | (0008,0104) | 1C | |
| >Reason for the Requested Procedure | (0040,1002) | 3 | |
| >Reason for Requested Procedure Code Sequence | (0040,100A) | 3 | |
| >>Code Value | (0008,0100) | 1C | |
| >>Code Scheme Designator | (0008,0102) | 1C | |
| >>Code Meaning | (0008,0104) | 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 | |
| >>Protocol Context Sequence | (0040,0440) | 3 | |
| >>Content Item Modifier Sequence | (0040,0441) | 3 | |
| Performed Procedure Step ID | (0040,0253) | 3 | Ignored |
| Performed Procedure Step Start Date | (0040,0244) | 3 | Ignored |
| Performed Procedure Step Start Time | (0040,0245) | 3 | Ignored |
| Performed Procedure Step Description | (0040,0254) | 3 | Ignored |
| Performed Protocol Code Sequence | (0040,0260) | 3 | Ignored |
| >Code Value | (0008,0100) | 1C | |
| >Code Scheme Designator | (0008,0102) | 1C | |
| >Code Meaning | (0008,0104) | 1C | |

3.4.4 Common Frame Of Reference Entity Modules

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

3.4.4.1 Frame Of Reference Module

CT images should share the same Frame Of Reference UID as a necessary condition to be in the same 3D model. However, this is not sufficient, because images have also to share the same geometry (be parallel with compatible centers), have the same size, the same pixel size, the same tilt, the same study ID, the same reconstruction algorithm, and the same patient name.

**TABLE 3.4-5
FRAME OF REFERENCE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|------------------------|-------------|-------------|------------------------------|
| Frame of Reference UID | (0020,0052) | 1 | Mandatory |

| | | | |
|------------------------------|-------------|---|---------|
| Position Reference Indicator | (0020,1040) | 2 | Ignored |
|------------------------------|-------------|---|---------|

3.4.5 Common Equipment Entity Modules

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

3.4.5.1 General Equipment Module

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

**TABLE 3.4-6
GENERAL EQUIPMENT MODULE ATTRIBUTES**

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

3.4.6 Common Image Entity Modules

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

3.4.6.1 General Image Module

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

**TABLE 3.4-7
GENERAL IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---------------------------|-------------|------|--------------------------------|
| Image Number | (0020,0013) | 2 | Used |
| Patient Orientation | (0020,0020) | 2C | Used |
| Image Date | (0008,0023) | 2C | Used |
| Image Time | (0008,0033) | 2C | Used |
| Image Type | (0008,0008) | 3 | Used (expect ORIGINAL\PRIMARY) |
| Acquisition Number | (0020,0012) | 3 | Used |
| Acquisition Date | (0008,0022) | 3 | Used |
| Acquisition Time | (0008,0032) | 3 | Used |
| Referenced Image Sequence | (0008,1140) | 3 | Ignored |

| | | | |
|-------------------------------|-------------|----|---------|
| >Referenced SOP Class UID | (0008,1150) | 1C | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | |
| Derivation Description | (0008,2111) | 3 | Ignored |
| Source Image Sequence | (0008,2112) | 3 | Ignored |
| >Referenced SOP Class UID | (0008,1150) | 1C | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | |
| Images in Acquisition | (0020,1002) | 3 | Ignored |
| Image Comments | (0020,4000) | 3 | Ignored |
| Quality Control Image | (0028,0300) | 3 | Ignored |
| Burned In Annotations | (0028,0301) | 3 | Ignored |
| Lossy Image Compression | (0028,2110) | 3 | Used |
| Lossy Image Compression Ratio | (0028,2112) | 3 | Ignored |

3.4.6.1.1.1 Lossy Image Compression

Application does not support reading compressed images.

3.4.6.2 Image Plane Module

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

**TABLE 3.4-8
IMAGE PLANE MODULE ATTRIBUTES**

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

3.4.6.2.1 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 MEDICAL SYSTEMS"). Otherwise the Image Position is treated as the position of the center of the first pixel of the image.

3.4.6.3 Image Pixel Module

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

**TABLE 3.4-9
IMAGE PIXEL MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|----------------------------|-------------|------|-------------------------------------|
| Samples per Pixel | (0028,0002) | 1 | Ignored (expect "1") |
| Photometric Interpretation | (0028,0004) | 1 | Ignored (expect - "MONOCHROME2") |
| Rows | (0028,0010) | 1 | Mandatory (expect from 256 to 1024) |
| Columns | (0028,0011) | 1 | Mandatory (expect from 256 to 1024) |
| Bits Allocated | (0028,0100) | 1 | Ignored (expect "16") |
| Bits Stored | (0028,0101) | 1 | Ignored |

| | | | |
|---|-------------|----|----------------------|
| High Bit | (0028,0102) | 1 | Ignored |
| Pixel Representation | (0028,0103) | 1 | Ignored (expect "1") |
| Pixel Data | (7FE0,0010) | 1 | Used |
| Planar Configuration | (0028,0006) | 1C | Ignored |
| Pixel Aspect Ratio | (0028,0034) | 1C | Ignored |
| Smallest Image Pixel Value | (0028,0106) | 3 | Ignored |
| Largest Image Pixel Value | (0028,0107) | 3 | Ignored |
| Red Palette Color Lookup Table Descriptor | (0028,1101) | 1C | Ignored |
| Green Palette Color Lookup Table Descriptor | (0028,1102) | 1C | Ignored |
| Blue Palette Color Lookup Table Descriptor | (0028,1103) | 1C | Ignored |
| Red Palette Color Lookup Table Data | (0028,1201) | 1C | Ignored |
| Green Palette Color Lookup Table Data | (0028,1202) | 1C | Ignored |
| Blue Palette Color Lookup Table Data | (0028,1203) | 1C | Ignored |

**TABLE 3.4-10
CONTRAST/BOLUS MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|--|-------------|-------------|------------------------------|
| Contrast/Bolus Agent | (0018,0010) | 2 | Used |
| Contrast/Bolus Agent Sequence | (0018,0012) | 3 | Ignored |
| >Code Value | (0008,0100) | 1C | |
| >Coding Scheme Designator | (0008,0102) | 1C | |
| >Code Meaning | (0008,0104) | 3 | |
| Contrast/Bolus Route | (0018,1040) | 3 | Used |
| Contrast/Bolus Administration Route Sequence | (0018,0014) | 3 | Ignored |
| >Code Value | (0008,0100) | 1C | |
| >Coding Scheme Designator | (0008,0102) | 1C | |
| >Code Meaning | (0008,0104) | 3 | |
| >Additional Drug Sequence | (0018,002A) | 3 | |
| >>Code Value | (0008,0100) | 1C | |
| >>Coding Scheme Designator | (0008,0102) | 1C | |
| >>Code Meaning | (0008,0104) | 3 | |
| Contrast/Bolus Volume | (0018,1041) | 3 | Ignored |
| Contrast/Bolus Start Time | (0018,1042) | 3 | Ignored |
| Contrast/Bolus Stop Time | (0018,1043) | 3 | Ignored |
| Contrast/Bolus Total Dose | (0018,1044) | 3 | Ignored |
| Contrast Flow Rate(s) | (0018,1046) | 3 | Ignored |
| Contrast Flow Duration(s) | (0018,1047) | 3 | Ignored |
| Contrast/Bolus Ingredient | (0018,1048) | 3 | Ignored |
| Contrast/Bolus Ingredient Concentration | (0018,1049) | 3 | Ignored |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

3.4.7 Common Lookup Table Modules

3.4.7.1 VOI LUT module

This section specifies the Attributes that describe the VOI LUT.

**TABLE 3.4-11
VOI LUT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|-----------------------------------|-------------|------|----|---|
| VOI LUT Sequence | (0028,3010) | 3 | | Ignored |
| >LUT Descriptor | (0028,3002) | 1C | | |
| >LUT Explanation | (0028,3003) | 3 | | |
| >LUT Data | (0028,3006) | 1C | | |
| Window Center | (0028,1050) | 3 | | Ignored at load (an automatic W/L is computed on the whole series). |
| Window Width | (0028,1051) | 1C | | Ignored at load (an automatic W/L is computed on the whole series). |
| Window Center & Width Explanation | (0028,1055) | 3 | | Ignored |

3.4.8 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

3.4.8.1 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 3.4-12
SOP COMMON MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---------------------------------|-------------|------|--|
| SOP Class UID | (0008,0016) | 1 | Used |
| SOP Instance UID | (0008,0018) | 1 | Used |
| Specific Character Set | (0008,0005) | 1C | Used Supported Character sets: ISO_IR 100 ISO_IR 144 \ISO 2022 IR 87 \ISO 2022 IR 149 ISO IR 192 GB18030 ISO 2022 IR 13 \ ISO 2022 IR 87 See 3.4.8.1.1. |
| Instance Creation Date | (0008,0012) | 3 | Ignored |
| Instance Creation Time | (0008,0013) | 3 | Ignored |
| Instance Creator UID | (0008,0014) | 3 | Ignored |
| Time zone Offset From UTC | (0008,0201) | 3 | Ignored |
| Instance Number | (0020,0013) | 3 | Used |
| SOP Instance Status | (0100,0410) | 3 | Ignored |
| SOP Authorization Date and Time | (0100,0420) | 3 | Ignored |
| SOP Authorization Comment | (0100,0424) | 3 | Ignored |

| | | | |
|--|-------------|---|---------|
| Authorization Equipment Certification Number | (0100,0426) | 3 | Ignored |
|--|-------------|---|---------|

3.4.8.1.1 Supported Character Sets

Depending on the platform on which the product is installed only a subset of character sets may actually be supported. Please refer to the platform DCS for more information about the platform supported character sets (Refer to Section 2.)

3.4.9 CT Modules

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

3.4.9.1 CT Image Module

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

**TABLE 3.4-13
CT IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|-----------------------------|--------------|-------------|--------------------------------------|
| Image Type | (0008,0008) | 1 | Used (Expect ORIGINAL\PRIMARY) |
| Samples per Pixel | (0028,0002) | 1 | Shall be 1. |
| Photometric Interpretation | (0028,0004) | 1 | Ignored (expect "MONOCHROME2") |
| Bits Allocated | (0028,0100) | 1 | Shall be 16. |
| Bits Stored | (0028,0101) | 1 | Ignored (expect 16) |
| High Bit | (0028,0102) | 1 | Ignored (expect 15) |
| Rescale Intercept | (0028, 1052) | 1 | Used (default to -1024 if not found) |
| Rescale Slope | (0028,1053) | 1 | Used |
| KVP | (0018,0060) | 2 | Ignored |
| Acquisition Number | (0020,0012) | 2 | Ignored |
| Scan Options | (0018,0022) | 3 | Ignored |
| Data Collection Diameter | (0018,0090) | 3 | Ignored |
| Reconstruction Diameter | (0018,1100) | 3 | Used |
| Distance Source to Detector | (0018,1110) | 3 | Ignored |
| Distance Source to Patient | (0018,1111) | 3 | Ignored |
| Gantry/Detector Tilt | (0018,1120) | 3 | Used |
| Table Height | (0018,1130) | 3 | Used |
| Rotation Direction | (0018,1140) | 3 | Ignored |
| Exposure Time | (0018,1150) | 3 | Ignored |
| X-ray Tube Current | (0018,1151) | 3 | Ignored |
| Exposure | (0018,1152) | 3 | Ignored |
| Exposure in \square As | (0018,1152) | 3 | Ignored |
| Filter Type | (0018,1160) | 3 | Ignored |
| Generator Power | (0018,1170) | 3 | Ignored |
| Focal Spot | (0018,1190) | 3 | Ignored |
| Convolution Kernel | (0018,1210) | 3 | Ignored |

3.5 PRIVATE DATA

All private elements are ignored within the application.

4. MR INFORMATION OBJECT IMPLEMENTATION

4.1 INTRODUCTION

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

4.2 MR IOD DESCRIPTION

4.3 MR ENTITY-RELATIONSHIP MODEL

4.4 IOD MODULE TABLE

4.5 INFORMATION MODULE DEFINITIONS

4.2 MR IOD DESCRIPTION

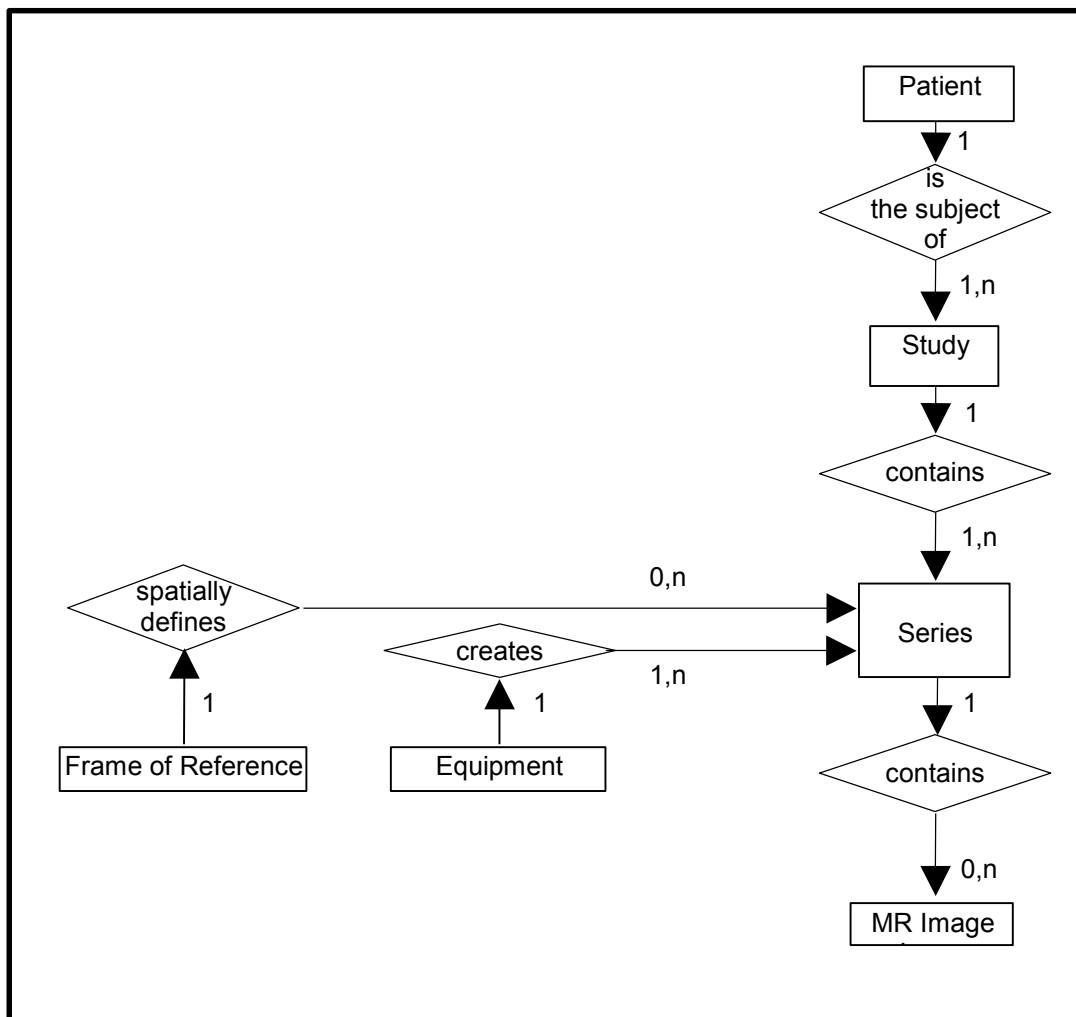
4.3 MR ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the MR 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 Patient for each Study (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
MR 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 MR Information Object.

TABLE 4.3-1
MAPPING OF DICOM ENTITIES TO APPLICATION ENTITIES

| DICOM | Application Entity |
|---------|--------------------|
| Patient | Patient |
| Study | Exam |
| Series | Series |
| Image | Image |
| Frame | Not Applicable |

4.4 IOD MODULE TABLE

Within an entity of the DICOM MR 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 MR IOD. Modules are identified by Module Name.

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

**TABLE 4.4-1
MR IMAGE IOD MODULES**

| Entity Name | Module Name | Usage | Reference |
|--------------------|------------------------|----------|-----------|
| Patient | Patient | Used | 4.5.1.1 |
| | Clinical Trial Subject | Not Used | N/A |
| Study | General Study | Used | 4.5.2.1 |
| | Patient Study | Used | 4.5.2.2 |
| | Clinical Trial Study | Not Used | N/A |
| Series | General Series | Used | 4.5.3.1 |
| | Clinical Trial Series | Not Used | N/A |
| Frame of Reference | Frame of Reference | Used | 4.5.4.1 |
| Equipment | General Equipment | Used | 4.5.5.1 |
| Image | General Image | Used | 4.5.6.1 |
| | Image Plane | Used | 4.5.6.3 |
| | Image Pixel | Used | 4.5.6.4 |
| | Contrast/Bolus | Used | 4.5.6.4 |
| | Device | Not Used | N/A |
| | Specimen | Not Used | N/A |
| | MR Image | Used | 4.5.9.1 |
| | Overlay Plane | Not Used | N/A |
| | VOI LUT | Used | 4.5.7.1 |
| | SOP Common | Used | 4.5.8.1 |

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 MR 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. Associated tables contain expectations of the use of entities within the application. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). No MR images are generated by the application.

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 4.5-1
PATIENT MODULE ATTRIBUTES

| Attribute Name | Tag | Type | Attribute Description |
|------------------------------|-------------|------|-----------------------|
| Patient's Name | (0010,0010) | 2 | Used |
| Patient ID | (0010,0020) | 2 | Used |
| Issuer of Patient ID | (0010,0021) | 3 | Used |
| Patient's Birth Date | (0010,0030) | 2 | Used |
| Patient's Sex | (0010,0040) | 2 | Used |
| Referenced Patient Sequence | (0008,1120) | 3 | Used |
| >Referenced SOP Class UID | (0008,1150) | 1C | Used |
| >Referenced SOP Instance UID | (0008,1155) | 1C | Used |
| Patient's Birth Time | (0010,0032) | 3 | Ignored |
| Other Patient IDs | (0010,1000) | 3 | Used |
| Other Patient IDs Sequence | (0010,1002) | 3 | Used |
| >Patient ID | (0010,0020) | 1 | Used |
| >Issuer of Patient ID | (0010,0021) | 1 | Used |
| >Type of Patient ID | (0010,0022) | 1 | Used |
| Other Patient Names | (0010,1001) | 3 | Used |
| Ethnic Group | (0010,2160) | 3 | Ignored |
| Patient Comments | (0010,4000) | 3 | Ignored |

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.

**GE HEALTHCARE
STATEMENT**

DIR 5479282-1EN REV 2

4.5.2.1 General Study Module

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

**TABLE 4.5-2
GENERAL STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|------------------------------------|-------------|------|-----------------------|
| Study Instance UID | (0020,000D) | 1 | Mandatory |
| Study Date | (0008,0020) | 2 | Used |
| Study Time | (0008,0030) | 2 | Used |
| Referring Physician's Name | (0008,0090) | 2 | Ignored |
| Study ID | (0020,0010) | 2 | Used |
| Accession Number | (0008,0050) | 2 | Ignored |
| Study Description | (0008,1030) | 3 | Used |
| Physician(s) of Record | (0008,1048) | 3 | Ignored |
| Name of Physician(s) Reading Study | (0008,1060) | 3 | Ignored |
| Referenced Study Sequence | (0008,1110) | 3 | Ignored |
| >Referenced SOP Class UID | (0008,1150) | 1C | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | |
| Procedure Code Sequence | (0008,1032) | 3 | Ignored |
| >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 4.5-3
PATIENT STUDY MODULE ATTRIBUTES**

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

**GE HEALTHCARE
STATEMENT**

DIR 5479282-1EN REV 2

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 4.5-4
GENERAL SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---------------------------------------|-------------|-------------|---|
| Modality | (0008,0060) | 1 | Used Defined Terms: MR = Magnetic Resonance |
| Series Instance UID | (0020,000E) | 1 | Mandatory |
| Series Number | (0020,0011) | 2 | Used |
| Laterality | (0020,0060) | 2C | Ignored |
| Series Date | (0008,0021) | 3 | Used |
| Series Time | (0008,0031) | 3 | Used |
| Performing Physicians' Name | (0008,1050) | 3 | Ignored |
| Protocol Name | (0018,1030) | 3 | Ignored |
| Series Description | (0008,103E) | 3 | Used |
| Operators' Name | (0008,1070) | 3 | Ignored |
| Referenced Study Component Sequence | (0008,1111) | 3 | Ignored |
| >Referenced SOP Class UID | (0008,1150) | 1C | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | |
| Body Part Examined | (0018,0015) | 3 | Ignored |
| Patient Position | (0018,5100) | 2C | Ignored |
| Smallest Pixel Value in Series | (0028,0108) | 3 | Ignored |
| Largest Pixel Value in Series | (0028,0109) | 3 | Ignored |
| Request Attributes Sequence | (0040,0275) | 3 | Ignored |
| >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 |
| Performed Procedure Step Start Date | (0040,0244) | 3 | Ignored |
| Performed Procedure Step Start Time | (0040,0245) | 3 | Ignored |
| Performed Procedure Step Description | (0040,0254) | 3 | Ignored |
| Performed Action Item Sequence | (0040,0260) | 3 | Ignored |
| >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.

4.5.4.1 Frame Of Reference Module

MR Images do not need to share the same Frame Of Reference UID with the PET or CT.

**TABLE 4.5-5
FRAME OF REFERENCE MODULE ATTRIBUTES**

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

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.

**TABLE 4.5-6
GENERAL EQUIPMENT MODULE ATTRIBUTES**

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

**GE HEALTHCARE
STATEMENT**

DIR 5479282-1EN REV 2

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 4.5-7
GENERAL IMAGE MODULE ATTRIBUTES**

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

4.5.6.2 Lossy Image Compression

Application does not support compressed images.

4.5.6.3 Image Plane Module

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

**TABLE 4.5-8
IMAGE PLANE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|-----------------------------|-------------|------|------------------------|
| Pixel Spacing | (0028,0030) | 1 | <i>Mandatory /Used</i> |
| Image Orientation (Patient) | (0020,0037) | 1 | <i>Mandatory</i> |
| Image Position (Patient) | (0020,0032) | 1 | <i>Mandatory</i> |

| | | | |
|-----------------|-------------|---|------|
| Slice Thickness | (0018,0050) | 2 | Used |
| Slice Location | (0020,1041) | 3 | Used |

4.5.6.3.1 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 MEDICAL SYSTEMS"), which software version (first value of Software Version) is earlier than 11.

The Image Position is treated as the position of the center of the first pixel of the image for images coming from other manufacturer than GE or MR GE systems that have MR 11.0 software (Excite II, ...) and above.

4.5.6.4 Image Pixel Module

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

**TABLE 4.5-9
IMAGE PIXEL MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|---|-------------|-------------|-------------------------------------|
| Samples per Pixel | (0028,0002) | 1 | Ignored (expect "1") |
| Photometric Interpretation | (0028,0004) | 1 | Ignored (expect "MONOCHROME2") |
| Rows | (0028,0010) | 1 | Mandatory (expect from 128 to 256) |
| Columns | (0028,0011) | 1 | Mandatory (expect from 128 to 256) |
| Bits Allocated | (0028,0100) | 1 | Ignored (expect "16") |
| Bits Stored | (0028,0101) | 1 | Ignored (expect "16") |
| High Bit | (0028,0102) | 1 | Ignored (expect "15") |
| Pixel Representation | (0028,0103) | 1 | Ignored (expect "1") |
| Pixel Data | (7FE0,0010) | 1 | Used |
| Planar Configuration | (0028,0006) | 1C | Ignored |
| Pixel Aspect Ratio | (0028,0034) | 1C | Ignored |
| Smallest Image Pixel Value | (0028,0106) | 3 | Used |
| Largest Image Pixel Value | (0028,0107) | 3 | Used |
| Red Palette Color Lookup Table Descriptor | (0028,1101) | 1C | Ignored |
| Green Palette Color Lookup Table Descriptor | (0028,1102) | 1C | Ignored |
| Blue Palette Color Lookup Table Descriptor | (0028,1103) | 1C | Ignored |
| Red Palette Color Lookup Table Data | (0028,1201) | 1C | Ignored |
| Green Palette Color Lookup Table Data | (0028,1202) | 1C | Ignored |
| Blue Palette Color Lookup Table Data | (0028,1203) | 1C | Ignored |

TABLE 4.5-10
CONTRAST/BOLUS MODULE ATTRIBUTES

| Attribute Name | Tag | Type | Attribute Description |
|--|-------------|------|-----------------------|
| Contrast/Bolus Agent | (0018,0010) | 2 | Ignored |
| Contrast/Bolus Agent Sequence | (0018,0012) | 3 | Ignored |
| >Code Value | (0008,0100) | 1C | |
| >Coding Scheme Designator | (0008,0102) | 1C | |
| >Code Meaning | (0008,0104) | 3 | |
| Contrast/Bolus Route | (0018,1040) | 3 | Ignored |
| Contrast/Bolus Administration Route Sequence | (0018,0014) | 3 | Ignored |
| >Code Value | (0008,0100) | 1C | |
| >Coding Scheme Designator | (0008,0102) | 1C | |
| >Code Meaning | (0008,0104) | 3 | |
| >Additional Drug Sequence | (0018,002A) | 3 | |
| >>Code Value | (0008,0100) | 1C | |
| >>Coding Scheme Designator | (0008,0102) | 1C | |
| >>Code Meaning | (0008,0104) | 3 | |
| Contrast/Bolus Volume | (0018,1041) | 3 | Ignored |
| Contrast/Bolus Start Time | (0018,1042) | 3 | Ignored |
| Contrast/Bolus Stop Time | (0018,1043) | 3 | Ignored |
| Contrast/Bolus Total Dose | (0018,1044) | 3 | Ignored |
| Contrast Flow Rate(s) | (0018,1046) | 3 | Ignored |
| Contrast Flow Duration(s) | (0018,1047) | 3 | Ignored |
| Contrast/Bolus Ingredient | (0018,1048) | 3 | Ignored |
| Contrast/Bolus Ingredient Concentration | (0018,1049) | 3 | Ignored |

4.5.7 Common Lookup Table Modules

4.5.7.1 VOI LUT module

This section specifies the Attributes that describe the VOI LUT.

TABLE 4.5-11
VOI LUT MODULE ATTRIBUTES

| Attribute Name | Tag | Type | Attribute Description |
|-----------------------------------|-------------|------|--|
| VOI LUT Sequence | (0028,3010) | 3 | Ignored |
| >LUT Descriptor | (0028,3002) | 1C | |
| >LUT Explanation | (0028,3003) | 3 | |
| >LUT Data | (0028,3006) | 1C | |
| Window Center | (0028,1050) | 3 | Ignored at load (an automatic W/L is computed on the whole series) |
| Window Width | (0028,1051) | 1C | Ignored at load (an automatic W/L is computed on the whole series) |
| Window Center & Width Explanation | (0028,1055) | 3 | Ignored |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

4.5.8 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

4.5.8.1 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 4.5-12
SOP COMMON MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|--|-------------|------|---|
| SOP Class UID | (0008,0016) | 1 | Used |
| SOP Instance UID | (0008,0018) | 1 | Used |
| Specific Character Set | (0008,0005) | 1C | Used Supported Character sets : ISO_IR 100 ISO_IR 144 \ISO 2022 IR 87 \ISO 2022 IR 149 ISO IR 192 GB18030 ISO 2022 IR 13 \ ISO 2022 IR 87 See 4.5.8.1.1. |
| Instance Creation Date | (0008,0012) | 3 | Ignored |
| Instance Creation Time | (0008,0013) | 3 | Ignored |
| Instance Creator UID | (0008,0014) | 3 | Ignored |
| Time zone Offset From UTC | (0008,0201) | 3 | Ignored |
| Instance Number | (0020,0013) | 3 | Used |
| SOP Instance Status | (0100,0410) | 3 | Ignored |
| SOP Authorization Date and Time | (0100,0420) | 3 | Ignored |
| SOP Authorization Comment | (0100,0424) | 3 | Ignored |
| Authorization Equipment Certification Number | (0100,0426) | 3 | Ignored |

4.5.8.1.1 Supported Character Sets

Depending on the platform on which the product is installed only a subset of character sets may actually be supported. Please refer to the platform DCS for more information about the platform supported character sets (Refer to Section 2.)

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

4.5.9 MR Modules

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

4.5.9.1 MR Image Module

The table in this Section contains IOD Attributes that describe MR Images.

**TABLE 4.5-13
MR IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Attribute Description |
|--------------------------------|-------------|-------------|--------------------------------|
| Image Type | (0008,0008) | 1 | Used (Expect ORIGINAL\PRIMARY) |
| Samples per Pixel | (0028,0002) | 1 | Ignored (expect "1") |
| Photometric Interpretation | (0028,0004) | 1 | Ignored (Expect "MONOCHROME2") |
| Bits Allocated | (0028,0100) | 1 | Ignored (expect "16") |
| Scanning Sequence | (0018,0020) | 1 | Ignored |
| Sequence Variant | (0018,0021) | 1 | Ignored |
| Scan Options | (0018,0022) | 2 | Ignored |
| MR Acquisition Type | (0018,0023) | 2 | Ignored |
| Repetition Time | (0018,0080) | 2C | Ignored |
| Echo Time | (0018,0081) | 2 | Ignored |
| Echo Train Length | (0018,0091) | 2 | Ignored |
| Inversion Time | (0018,0082) | 2C | Ignored |
| Trigger Time | (0018,1060) | 2C | Ignored |
| Sequence Name | (0018,0024) | 3 | Ignored |
| Angio Flag | (0018,0025) | 3 | Ignored |
| Number of Averages | (0018,0083) | 3 | Ignored |
| Imaging Frequency | (0018,0084) | 3 | Ignored |
| Imaged Nucleus | (0018,0085) | 3 | Ignored |
| Echo Number | (0018,0086) | 3 | Ignored |
| Magnetic Field Strength | (0018,0087) | 3 | Ignored |
| Spacing Between Slices | (0018,0088) | 3 | Used |
| Number of Phase Encoding Steps | (0018,0089) | 3 | Ignored |
| Percent Sampling | (0018,0093) | 3 | Ignored |
| Percent Phase Field of View | (0018,0094) | 3 | Ignored |
| Pixel Bandwidth | (0018,0095) | 3 | Ignored |
| Nominal Interval | (0018,1062) | 3 | Ignored |
| Beat Rejection Flag | (0018,1080) | 3 | Ignored |
| Low R-R Value | (0018,1081) | 3 | Ignored |
| High R-R Value | (0018,1082) | 3 | Ignored |
| Intervals Acquired | (0018,1083) | 3 | Ignored |
| Intervals Rejected | (0018,1084) | 3 | Ignored |
| PVC Rejection | (0018,1085) | 3 | Ignored |
| Skip Beats | (0018,1086) | 3 | Ignored |
| Heart Rate | (0018,1088) | 3 | Ignored |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

| | | | |
|------------------------------|-------------|---|---------|
| Cardiac Number of Images | (0018,1090) | 3 | Ignored |
| Trigger Window | (0018,1094) | 3 | Ignored |
| Reconstruction Diameter | (0018,1100) | 3 | Used |
| Receiving Coil | (0018,1250) | 3 | Ignored |
| Transmitting Coil | (0018,1251) | 3 | Ignored |
| Acquisition Matrix | (0018,1310) | 3 | Ignored |
| Phase Encoding Direction | (0018,1312) | 3 | Ignored |
| Flip Angle | (0018,1314) | 3 | Ignored |
| SAR | (0018,1316) | 3 | Ignored |
| Variable Flip Angle Flag | (0018,1315) | 3 | Ignored |
| dB/dt | (0018,1318) | 3 | Ignored |
| Temporal Position Identifier | (0020,0100) | 3 | Ignored |
| Number of Temporal Positions | (0020,0105) | 3 | Ignored |
| Temporal Resolution | (0020,0110) | 3 | Ignored |

4.6 PRIVATE DATA

The application ignores all private elements.

5. PET INFORMATION OBJECT IMPLEMENTATION

5.1 INTRODUCTION

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

5.2 PET IOD DESCRIPTION

5.3 PET ENTITY-RELATIONSHIP MODEL

5.4 IOD MODULE TABLE

5.5 INFORMATION MODULE DEFINITIONS

5.2 PET IOD DESCRIPTION

The Positron Emission Tomography (PET) Image Information Object Definition specifies an image which has been created by a Positron Tomography 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.

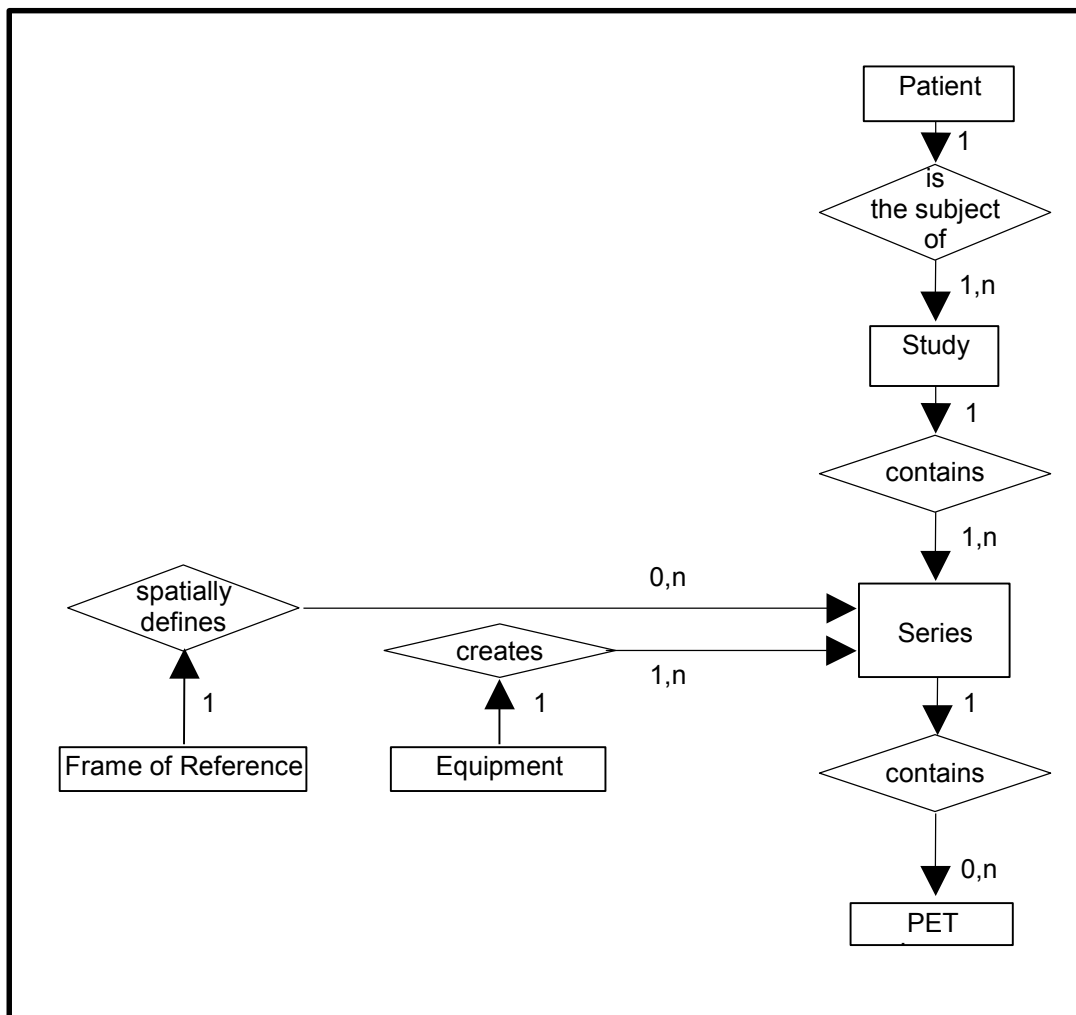
5.3 PET ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the PET Image interoperability schema is shown in. In this figure Illustration-5.3.1, 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 Patient for each Study (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 – 5.3-1
PET 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 PET Information Object.

5.3.2 CortexID Suite Mapping of DICOM entities

TABLE 5.3-1
MAPPING OF DICOM ENTITIES TO CORTEXID SUITE ENTITIES

| DICOM | CortexID Suite Entity |
|---------|-----------------------|
| Patient | Patient |
| Study | Exam |
| Series | Series |
| Image | Image |
| Frame | Not Applicable |

5.4 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 5.4-1 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 5.4-1
PET IMAGE IOD MODULES

| Entity Name | Module Name | Usage | Reference |
|--------------------|-----------------------------|----------|-----------|
| Patient | Patient | Used | 5.5.1.1 |
| | Clinical Trial Subject | Not Used | N/A |
| Study | General Study | Used | 5.5.2.1 |
| | Patient Study | Used | 5.5.2.2 |
| | Clinical Trial Study | Not Used | N/A |
| Series | General Series | Used | 5.5.3.1 |
| | Clinical Trial Series | Not Used | N/A |
| | PET Series | Used | 5.5.9.1 |
| | PET Isotope | Used | 5.5.9.2 |
| | PET Multi-gated Acquisition | Used | 5.5.9.3 |
| | NM/PET Patient Orientation | Used | 5.5.9.4 |
| Frame of Reference | Frame of Reference | Used | 5.5.4.1 |
| Equipment | General Equipment | Used | 5.5.5.1 |
| Image | General Image | Used | 5.5.6.1 |
| | Image Plane | Used | 5.5.6.2 |
| | Image Pixel | Used | 5.5.6.3 |
| | Device | Not Used | N/A |
| | Specimen | Not Used | N/A |
| | PET Image | Used | 5.5.9.5 |
| | Overlay Plane | Not Used | N/A |
| | VOI LUT | Used | 5.5.7.1 |
| | Acquisition Context | Not Used | N/A |
| | SOP Common | Used | 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 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. Associated tables contain expectations of the use of entities within the application. No PET images are generated by the application. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

**GE HEALTHCARE
STATEMENT**

DIR 5479282-1EN REV 2

5.5.1 Common Patient Entity Modules

5.5.1.1 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 5.5-1
PATIENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|------------------------------|-------------|------|----|-----------------------|
| Patient's Name | (0010,0010) | 2 | PN | Used / Copied |
| Patient ID | (0010,0020) | 2 | LO | Used / Copied |
| Issuer of Patient ID | (0010,0021) | 3 | LO | Ignored / Copied |
| Patient's Birth Date | (0010,0030) | 2 | DA | Used / Copied |
| Patient's Sex | (0010,0040) | 2 | CS | Used / Copied |
| Referenced Patient Sequence | (0008,1120) | 3 | SQ | Ignored / Removed |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Patient's Birth Time | (0010,0032) | 3 | TM | Ignored / Copied |
| Other Patient Ids | (0010,1000) | 3 | LO | Ignored / Copied |
| Other Patient IDs Sequence | (0010,1002) | 3 | SQ | Ignored / Copied |
| >Patient ID | (0010,0020) | 1 | UI | |
| >Issuer of Patient ID | (0010,0021) | 1 | LO | |
| >Type of Patient ID | (0010,0022) | 1 | CS | |
| Other Patient Names | (0010,1001) | 3 | PN | Ignored / Copied |
| Ethnic Group | (0010,2160) | 3 | SH | Ignored / Copied |
| Patient Comments | (0010,4000) | 3 | LT | Ignored / Copied |

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 Modules contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

5.5.2.1 General Study Module

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

**TABLE 5.5-2
GENERAL STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|--|-------------|------|----|-----------------------|
| Study Instance UID | (0020,000D) | 1 | UI | Mandatory / Copied |
| Study Date | (0008,0020) | 2 | DA | Used / Copied |
| Study Time | (0008,0030) | 2 | TM | Used / Copied |
| Referring Physician's Name | (0008,0090) | 2 | PN | Used / Copied |
| Referring Physician's Identification Sequence | (0008,0096) | 3 | SQ | Ignored / Removed |
| Study ID | (0020,0010) | 2 | SH | Used / Copied |
| Accession Number | (0008,0050) | 2 | SH | Used / Copied |
| Issuer of Accession Number Sequence | (0008,0051) | 3 | SQ | Ignored / Removed |
| Study Description | (0008,1030) | 3 | LO | Used / Copied |
| Physician(s) of Record | (0008,1048) | 3 | PN | Ignored / Copied |
| Physician(s) of Record Identification Sequence | (0008,1049) | 3 | SQ | Ignored / Removed |
| Name of Physician(s) Reading Study | (0008,1060) | 3 | PN | Used / Copied |
| Physician(s) Reading Study Identification Sequence | (0008,1062) | 3 | SQ | Ignored / Removed |
| Requesting Service Code Sequence | (0032,1034) | 3 | SQ | Ignored / Removed |
| Referenced Study Sequence | (0008,1110) | 3 | SQ | Ignored / Copied |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Procedure Code Sequence | (0008,1032) | 3 | SQ | Ignored / Copied |
| >Code Value | (0008,0100) | 1C | SH | |
| >Code Scheme Designator | (0008,0102) | 1C | SH | |
| >Code Meaning | (0008,0104) | 1C | LO | |
| Reason For Performed Procedure Code Sequence | (0040,1012) | 3 | SQ | Ignored / Copied |

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 5.5-3
PATIENT STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|---------------------------------|-------------|------|----|-----------------------|
| Admitting Diagnoses Description | (0008,1080) | 3 | LO | Ignored / Copied |
| Patient's Age | (0010,1010) | 3 | AS | Used / Copied |
| Patient's Size | (0010,1020) | 3 | DS | Ignored / Copied |

| | | | | |
|------------------------------|-------------|---|----|------------------|
| Patient's Weight | (0010,1030) | 3 | DS | Ignored / Copied |
| Occupation | (0010,2180) | 3 | SH | Ignored / Copied |
| Additional Patient's History | (0010,21B0) | 3 | LT | Ignored / Copied |

5.5.3 Common Series Entity Modules

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

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 5.5-4
GENERAL SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|--|--------------|-------------|-----------|---|
| Modality | (0008,0060) | 1 | CS | Used / Copied Defined Terms: PT = Positron Emission Tomography |
| Series Instance UID | (0020,000E) | 1 | UI | Mandatory / Generated |
| Series Number | (0020,0011) | 2 | IS | Used / Generated (Value = User's Input) |
| Laterality | (0020,0060) | 2C | CS | Ignored / Generated (Value is empty as the software cannot know semantically the laterality) |
| Series Date | (0008,0021) | 3 | DA | Used / Copied |
| Series Time | (0008,0031) | 3 | TM | Used / Copied |
| Performing Physicians' Name | (0008,1050) | 3 | PM | Ignored / Copied |
| Protocol Name | (0018,1030) | 3 | LO | Ignored / Copied |
| Series Description | (0008,103E) | 3 | LO | Used / Generated (Value = User's Input) |
| Operators' Name | (0008,1070) | 3 | PN | Used / Generated |
| Referenced Performed Procedure Step Sequence | (0008,1111) | 3 | SQ | Ignored / Removed |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Related Series Sequence | (0008,1250) | 3 | SQ | Ignored / Removed |
| Body Part Examined | (0018,0015) | 3 | CS | Ignored / Copied |
| Patient Position | (0018,5100) | 2C | CS | Used / Copied |
| Smallest Pixel Value in Series | (0028,0108) | 3 | US or SS | Ignored / Removed |
| Largest Pixel Value in Series | (0028,0109) | 3 | US or SS | Ignored / Removed |
| Request Attributes Sequence | (0040,0275) | 3 | SQ | Ignored / Removed |
| >Requested Procedure ID | (0040,1001) | 1C | SH | |
| >Accession Number | (0008,0050) | 3 | SH | |
| >Study Instance UID | (0020, 000D) | 3 | UI | |
| >Referenced Study Sequence | (0008,1110) | 3 | SQ | |

| | | | | |
|---|-------------|----|----|-------------------|
| >>Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >>Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| >Requested Procedure Description | (0032,1060) | 3 | LO | |
| >Requested Procedure Code Sequence | (0032,1064) | 3 | SQ | |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 1C | LO | |
| >Reason for the Requested Procedure | (0040,1002) | 3 | LO | |
| >Reason for Requested Procedure Code Sequence | (0040,100A) | 3 | SQ | |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 1C | LO | |
| >Scheduled Procedure Step ID | (0040,0009) | 1C | SH | |
| >Scheduled Procedure Step Description | (0040,0007) | 3 | LO | |
| >Scheduled Protocol Code Sequence | (0040,0008) | 3 | SQ | |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 1C | LO | |
| >>Protocol Context Sequence | (0040,0440) | 3 | SQ | |
| >>Content Item Modifier Sequence | (0040,0441) | 3 | SQ | |
| Performed Procedure Step ID | (0040,0253) | 3 | SH | Ignored / Removed |
| Performed Procedure Step Start Date | (0040,0244) | 3 | DA | Ignored / Removed |
| Performed Procedure Step Start Time | (0040,0245) | 3 | TM | Ignored / Removed |
| Performed Procedure Step Description | (0040,0254) | 3 | LO | Ignored / Removed |
| Performed Protocol Code Sequence | (0040,0260) | 3 | SQ | Ignored / Removed |
| >Code Value | (0008,0100) | 1C | SH | |
| >Code Scheme Designator | (0008,0102) | 1C | SH | |
| >Code Meaning | (0008,0104) | 1C | LO | |

5.5.4 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.

5.5.4.1 Frame Of Reference Module

**TABLE 5.5-5
FRAME OF REFERENCE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|------------------------------|-------------|-------------|-----------|------------------------------|
| Frame of Reference UID | (0020,0052) | 1 | UI | Mandatory / Copied |
| Position Reference Indicator | (0020,1040) | 2 | LO | Ignored / Removed |

5.5.4.1.1 Frame Of Reference UID

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

5.5.5 Common Equipment Entity Modules

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

5.5.5.1 General Equipment Module

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

**TABLE 5.5-6
GENERAL EQUIPMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|-------------------------------|-------------|------|----------|---|
| Manufacturer | (0008,0070) | 2 | LO | Used / Generated (Value = GE Medical Systems) |
| Institution Name | (0008,0080) | 3 | LO | Used / Generated |
| Institution Address | (0008,0081) | 3 | ST | Ignored / Generated |
| Station Name | (0008,1010) | 3 | SH | Ignored / Generated |
| Institutional Department Name | (0008,1040) | 3 | LO | Ignored / Generated |
| Manufacturer's Model Name | (0008,1090) | 3 | LO | Used / Generated (Value = CortexID Suite) |
| Device Serial Number | (0018,1000) | 3 | LO | Ignored / Generated |
| Software Versions | (0018,1020) | 3 | LO | Used / Generated |
| Spatial Resolution | (0018,1050) | 3 | DS | Ignored / Removed |
| Date of Last Calibration | (0018,1200) | 3 | DA | Ignored / Removed |
| Time of Last Calibration | (0018,1201) | 3 | TM | Ignored / Removed |
| Pixel Padding Value | (0028,0120) | 3 | US or SS | Ignored / Removed |

5.5.6 Common Image Entity Modules

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

5.5.6.1 General Image Module

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

**TABLE 5.5-7
GENERAL IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|---------------------|-------------|------|----|-------------------------------------|
| Instance Number | (0020,0013) | 2 | IS | Used / Derived |
| Patient Orientation | (0020,0020) | 2C | CS | Used / Generated See 5.5.6.1.1.1 |
| Content Date | (0008,0023) | 2C | DA | Used / Generated |
| Content Time | (0008,0033) | 2C | TM | Used / Generated |

| | | | | |
|-------------------------------|-------------|----|----|---------------------------------------|
| Image Type | (0008,0008) | 3 | CS | Used / Generated See 5.5.6.1.1.2 |
| Acquisition Number | (0020,0012) | 3 | IS | Ignored / Copied |
| Acquisition Date | (0008,0022) | 3 | DA | Used / Copied |
| Acquisition Time | (0008,0032) | 3 | TM | Used / Copied |
| Referenced Image Sequence | (0008,1140) | 3 | SQ | Ignored / Removed |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Derivation Description | (0008,2111) | 3 | ST | Ignored / Removed |
| Source Image Sequence | (0008,2112) | 3 | SQ | Ignored / Generated |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Images in Acquisition | (0020,1002) | 3 | IS | Ignored / Removed |
| Image Comments | (0020,4000) | 3 | LT | Ignored / Removed |
| Quality Control Image | (0028,0300) | 3 | CS | Ignored / Removed |
| Burned In Annotations | (0028,0301) | 3 | CS | Ignored / Generated (Value = "NO") |
| Lossy Image Compression | (0028,2110) | 3 | CS | Used / Copied |
| Lossy Image Compression Ratio | (0028,2112) | 3 | DS | Ignored / Removed |

5.5.6.1.1 General Image Attribute Descriptions

5.5.6.1.1.1 Patient Orientation

The application uses Image Orientation Patient (0020,0037) and Image Position Patient (0020,0032).

This field will be filled for 2D reformatted and 3D views, and will be empty (zero length) for other views

The precision depth could be up to 3 characters, for example "LAF\FAR ", but can be less if the view is oriented along a baseline, like "L\FA" or "L\F".

5.5.6.1.1.2 Image Type

The expected image type for used images is

Value 1 has the following value:

- ORIGINAL all images used are original images from the PET image acquisition system. Application does not support source data (raw scan data).

Value 2 has the following value:

- PRIMARY assumes all images used are part of initial patient examination.

Value 3 has the following value:

- AXIAL assumes all images used contain a transaxial orientation as part of initial patient examination.

For Reformate Images, the values are generated as follows:

Value 1 has the following value:

- DERIVED images shall be derived from original PET images generated using image acquisition system

Value 2 has the following value:

- PRIMARY images shall be created by the application

Value 3 has the following value:

- REFORMATTED Images can have Axial, Sagittal, Coronal or Oblique orientation

5.5.6.2 Image Plane Module

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

**TABLE 5.5-8
IMAGE PLANE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|-----------------------------|-------------|------|----|---------------------------------------|
| Pixel Spacing | (0028,0030) | 1 | DS | Mandatory /Generated |
| Image Orientation (Patient) | (0020,0037) | 1 | DS | Mandatory /Generated |
| Image Position (Patient) | (0020,0032) | 1 | DS | Mandatory /Generated See 5.5.6.2.1 |
| Slice Thickness | (0018,0050) | 2 | DS | Used / Generated |
| Slice Location | (0020,1041) | 3 | DS | Ignored / Generated |

5.5.6.2.1 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 MEDICAL SYSTEMS") 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.

5.5.6.3 Image Pixel Module

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

**TABLE 5.5-9
IMAGE PIXEL MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|----------------------------|-------------|------|----|--|
| Samples per Pixel | (0028,0002) | 1 | US | Ignored / Generated (Value - '1') |
| Photometric Interpretation | (0028,0004) | 1 | CS | Ignored / Generated (Value - "MONOCHROME2") |
| Rows | (0028,0010) | 1 | US | Mandatory / Generated (expect from 64 to 256) |
| Columns | (0028,0011) | 1 | US | Mandatory / Generated (expect from 64 to 256) |
| Bits Allocated | (0028,0100) | 1 | US | Ignored / Generated (Value = 16) |
| Bits Stored | (0028,0101) | 1 | US | Ignored / Generated (Value = 16) |

| | | | | |
|--|-------------|----|-------------|--|
| High Bit | (0028,0102) | 1 | US | Used / Generated (used when Pixel Representation is 0) (expect value = 15) |
| Pixel Representation | (0028,0103) | 1 | US | Mandatory / Generated (expect value = 0 or 1) |
| Pixel Data | (7FE0,0010) | 1 | OW | Used / Derived |
| Planar Configuration | (0028,0006) | 1C | US | Ignored / Removed |
| Pixel Aspect Ratio | (0028,0034) | 1C | IS | Ignored / Removed |
| Smallest Image Pixel Value | (0028,0106) | 3 | US or SS | Ignored / Removed |
| Largest Image Pixel Value | (0028,0107) | 3 | US or SS | Ignored / Removed |
| Red Palette Color Lookup Table Descriptor | (0028,1101) | 1C | US or SS | Ignored / Removed |
| Green Palette Color Lookup Table Descriptor | (0028,1102) | 1C | US or SS | Ignored / Removed |
| Blue Palette Color Lookup Table Descriptor | (0028,1103) | 1C | US or SS | Ignored / Removed |
| Red Palette Color Lookup Table Data | (0028,1201) | 1C | OW | Ignored / Removed |
| Green Palette Color Lookup Table Data | (0028,1202) | 1C | OW | Ignored / Removed |
| Blue Palette Color Lookup Table Data | (0028,1203) | 1C | OW | Ignored / Removed |

5.5.7 Common Lookup Table Modules

5.5.7.1 VOI LUT module

This section specifies the Attributes that describe the VOI LUT.

**TABLE 5.5-10
VOI LUT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|-----------------------------------|-------------|-------------|-------------|--|
| VOI LUT Sequence | (0028,3010) | 3 | SQ | Ignored / Removed |
| >LUT Descriptor | (0028,3002) | 1C | US or SS | |
| >LUT Explanation | (0028,3003) | 3 | LO | |
| >LUT Data | (0028,3006) | 1C | US or OW | |
| Window Center | (0028,1050) | 3 | DS | Ignored at load (an automatic W/L is computed on the whole series) / Generated |
| Window Width | (0028,1051) | 1C | DS | Ignored at load (an automatic W/L is computed on the whole series) / Generated |
| Window Center & Width Explanation | (0028,1055) | 3 | LO | Ignored / Removed |

The SOP Common Module is mandatory for all DICOM IODs.

5.5.8.1 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 5.5-11
SOP COMMON MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|--|--------------|------|----|---|
| SOP Class UID | (0008,0016) | 1 | UI | Used / Generated |
| SOP Instance UID | (0008,0018) | 1 | UI | Used / Generated |
| Specific Character Set | (0008,0005) | 1C | CS | Used / Generated Supported Character sets : ISO_IR 100 ISO_IR 144 \ISO 2022 IR 87 \ISO 2022 IR 149 ISO IR 192 GB18030 ISO 2022 IR 13 \ ISO 2022 IR 87 See 5.5.8.1.1. |
| Instance Creation Date | (0008,0012) | 3 | DA | Ignored / Generated (Value = Current Date) |
| Instance Creation Time | (0008,0013) | 3 | TM | Ignored / Generated (Value = Current Time) |
| Instance Creator UID | (0008,0014) | 3 | UI | Ignored / Removed |
| Time zone Offset From UTC | (0008,0201) | 3 | SH | Ignored / Removed |
| Instance Number | (0020,0013) | 3 | IS | Used / Derived |
| SOP Instance Status | (0100,0410) | 3 | CS | Ignored / Removed |
| SOP Authorization Date and Time | (0100,0420) | 3 | DT | Ignored / Removed |
| SOP Authorization Comment | (0100,0424) | 3 | LT | Ignored / Removed |
| Authorization Equipment Certification Number | (0100,0426) | 3 | LO | Ignored / Removed |
| Contributing Equipment Sequence | (0018, A001) | 3 | SQ | Ignored / Copied and updated with current equipment and copy of source image equipment. |
| >Purpose of Reference Code Sequence | (0040,A170) | 1 | SW | Ignored / Generated Following triplets are used when generating: (109102, DCM, Processing Equipment) |
| >>Code Value | (0008,0100) | 1C | SH | Ignored / Generated (Value = 109102) |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | Ignored / Generated (Value = DCM) |
| >>Code Meaning | (0008,0104) | 1C | LO | Ignored / Generated(Value - Processing Equipment) |
| >Manufacturer | (0008,0070) | 1 | LO | Used / Generated (Value = GE Medical System) |

| | | | | |
|----------------------------|-------------|---|----|--|
| >Institution Name | (0008,0080) | 3 | LO | Used / Generated |
| >Institution Address | (0008,0081) | 3 | ST | Ignored / Generated |
| >Station Name | (0008,1010) | 3 | LO | Ignored / Generated |
| >Manufacturer's Model Name | (0008,1090) | 3 | LO | Ignored / Generated (Value = CortexID Suite) |
| >Device Serial Number | (0018,1000) | 3 | LO | Ignored / Generated |
| >Software Versions | (0018,1020) | 3 | LO | Ignored / Generated Application Version = #.#.# |

5.5.8.1.1 Supported Character Sets

Depending on the platform on which the product is installed only a subset of character sets may actually be supported. Please refer to the platform DCS for more information about the platform supported character sets (Refer to Section 2.)

5.5.9 PET Modules

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

5.5.9.1 PET Series

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

**TABLE 5.5-12
PET SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|-------------------------------|-------------|-------------|-----------|--|
| Series Date | (0008,0021) | 1 | DA | Used / copied |
| Series Time | (0008,0031) | 1 | TM | Used / copied |
| Units | (0054,1001) | 1 | CS | Used / Copied |
| Counts Source | (0054,1002) | 1 | CS | Ignored / Copied |
| Series Type | (0054,1000) | 1 | CS | Used / Copied (Only 'Static' & 'Dynamic' Series Types are supported) |
| Reprojection Method | (0054,1004) | 2C | CS | Ignored / Removed |
| Number of R-R Intervals | (0054,0061) | 1C | US | Ignored / Removed |
| Number of Time Slots | (0054,0071) | 1C | US | Ignored / Removed |
| Number of Time Slices | (0054,0101) | 1C | US | Ignored / Removed |
| Number of Slices | (0054,0081) | 1 | US | Used / Generated |
| Corrected Image | (0028,0051) | 2 | CS | Ignored / Copied |
| Randoms Correction Method | (0054,1100) | 3 | CS | Ignored / Copied |
| Attenuation Correction Method | (0054,1101) | 3 | LO | Ignored / Copied |
| Scatter Correction Method | (0054,1105) | 3 | LO | Ignored / Copied |
| Decay Correction | (0054,1102) | 1 | CS | Used / Copied |
| Reconstruction Diameter | (0018,1100) | 3 | DS | Used / Copied |
| Convolution Kernel | (0018,1210) | 3 | SH | Ignored / Copied |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

| | | | | |
|--|-------------|---|----|------------------|
| Reconstruction Method | (0054,1103) | 3 | LO | Ignored / Copied |
| Detector Lines of Response Used | (0054,1104) | 3 | LO | Ignored / Copied |
| Acquisition Start Condition | (0018,0073) | 3 | CS | Ignored / Copied |
| Acquisition Start Condition Data | (0018,0074) | 3 | IS | Ignored / Copied |
| Acquisition Termination Condition | (0018,0071) | 3 | CS | Ignored / Copied |
| Acquisition Termination Condition Data | (0018,0075) | 3 | IS | Ignored / Copied |
| Field of View Shape | (0018,1147) | 3 | CS | Ignored / Copied |
| Field of View Dimensions | (0018,1149) | 3 | IS | Ignored / Copied |
| Gantry/Detector Tilt | (0018,1120) | 3 | DS | Used / Copied |
| Gantry/Detector Slew | (0018,1121) | 3 | DS | Ignored / Copied |
| Type of Detector Motion | (0054,0202) | 3 | CS | Ignored / Copied |
| Collimator Type | (0018,1181) | 2 | CS | Ignored / Copied |
| Collimator/Grid Name | (0018,1180) | 3 | SH | Ignored / Copied |
| Axial Acceptance | (0054,1200) | 3 | DS | Ignored / Copied |
| Axial Mash | (0054,1201) | 3 | IS | Ignored / Copied |
| Transverse Mash | (0054,1202) | 3 | IS | Ignored / Copied |
| Detector Element Size | (0054,1203) | 3 | DS | Ignored / Copied |
| Coincidence Window Width | (0054,1210) | 3 | DS | Ignored / Copied |
| Energy Window Range Sequence | (0054,0013) | 3 | SQ | Ignored / Copied |
| >Energy Window Lower Limit | (0054,0014) | 3 | DS | |
| >Energy Window Upper Limit | (0054,0015) | 3 | DS | |
| Secondary Counts Type | (0054,1220) | 3 | CS | Ignored / Copied |

5.5.9.2 PET Isotope

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

**TABLE 5.5-13
PET ISOTOPE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|--|-------------|-------------|-----------|---|
| Radiopharmaceutical Information Sequence | (0054,0016) | 2 | SQ | Used / Copied |
| >Radionuclide Code Sequence | (0054,0300) | 2 | SQ | Ignored / Copied |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 3 | LO | |
| >Radiopharmaceutical Route | (0018,1070) | 3 | LO | Ignored / Copied |
| >Administration Route Code Sequence | (0054,0302) | 3 | SQ | Ignored / Copied |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 3 | LO | |
| >Radiopharmaceutical Volume | (0018,1071) | 3 | DS | Ignored / Copied |
| >Radiopharmaceutical Start Time | (0018,1072) | 3 | TM | Used / Copied Used if (0018, 1078) is not present. |
| >Radiopharmaceutical Stop Time | (0018,1073) | 3 | TM | Used / Copied |

| | | | | |
|--|-------------|----|----|------------------|
| >Radionuclide Total Dose | (0018,1074) | 3 | DS | Used / Copied |
| >Radionuclide Half Life | (0018,1075) | 3 | DS | Used / Copied |
| >Radionuclide Positron Fraction | (0018,1076) | 3 | DS | Ignored / Copied |
| >Radiopharmaceutical Specific Activity | (0018,1077) | 3 | DS | Ignored / Copied |
| >Radiopharmaceutical | (0018,0031) | 3 | LO | Used / Copied |
| >Radiopharmaceutical Code Sequence | (0054,0304) | 3 | SQ | Used / Copied |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 3 | LO | |
| Intervention Drug Information Sequence | (0018,0026) | 3 | SQ | Ignored / Copied |
| >Intervention Drug Name | (0018,0034) | 3 | LO | |
| >Intervention Drug Code Sequence | (0018,0029) | 3 | SW | |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 3 | LO | |
| >Intervention Drug Start Time | (0018,0035) | 3 | TM | |
| >Intervention Drug Stop Time | (0018,0027) | 3 | TM | |
| >Intervention Drug Dose | (0018,0028) | 3 | DS | |

5.5.9.3 PET Multi-gated Acquisition

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

**TABLE 5.5-14
PET MULTI-GATED ACQUISITION MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|------------------------|-------------|-------------|-----------|------------------------------|
| Beat Rejection Flag | (0018,1080) | 2 | CS | Ignored / Removed |
| Trigger Source or Type | (0018,1061) | 3 | LO | Ignored / Removed |
| PVC Rejection | (0018,1085) | 3 | LO | Ignored / Removed |
| Skip Beats | (0018,1086) | 3 | IS | Ignored / Removed |
| Heart Rate | (0018,1088) | 3 | IS | Ignored / Removed |
| Cardiac Framing Type | (0018,1064) | 3 | IS | Ignored / Removed |

5.5.9.4 NM/PET Patient Orientation

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

**TABLE 5.5-15
NM/PET PATIENT ORIENTATION MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | Type | Attribute Description |
|-----------------------------------|-------------|-------------|-------------|------------------------------|
| Patient Orientation Code Sequence | (0054,0410) | 2 | SQ | Ignored / Copied |
| > Code Value | (0008,0100) | 1C | SH | |
| > Coding Scheme Designator | (0008,0102) | 1C | SH | |
| > Code Meaning | (0008,0104) | 3 | LO | |

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

5.5.9.5 PET Image Module

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

**TABLE 5.5-16
PET IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|--------------------------------------|-------------|------|----|---|
| Image Type | (0008,0008) | 1 | CS | Used / Generated (Value = "DERIVED\PRIMARY\REFORMATTED") |
| Samples per Pixel | (0028,0002) | 1 | US | Ignored / Generated (Expected Value = 1) |
| Photometric Interpretation | (0028,0004) | 1 | CS | Ignored / Generated (expect "MONOCHROME2") |
| Bits Allocated | (0028,0100) | 1 | US | Ignored/Generated (Value = 16) |
| Bits Stored | (0028,0101) | 1 | US | Ignored/Generated (Value = 16) |
| High Bit | (0028,0102) | 1 | US | Ignored/Generated (Value = 15) |
| Rescale Intercept | (0028,1052) | 1 | DS | Used / Generated |
| Rescale Slope | (0028,1053) | 1 | DS | Used / Generated |
| Frame Reference Time | (0054,1300) | 1 | DS | Used / Copied |
| Trigger Time | (0018,1060) | 1C | DS | Ignored / Removed |
| Frame Time | (0018,1063) | 1C | DS | Ignored / Removed |
| Low R-R Value | (0018,1081) | 1C | IS | Ignored / Removed |
| High R-R Value | (0018,1082) | 1C | IS | Ignored / Removed |
| Lossy Image Compression | (0028,2110) | 1C | CS | Used / Copied |
| Image Index | (0054,1330) | 1 | US | Used / Generated |
| Acquisition Date | (0008,0022) | 2 | DA | Used / Copied |
| Acquisition Time | (0008,0032) | 2 | TM | Used / Copied |
| Actual Frame Duration | (0018,1242) | 2 | IS | Used / Copied |
| Nominal Interval | (0018,1062) | 3 | SQ | Ignored / Removed |
| Intervals Acquired | (0018,1083) | 3 | IS | Ignored / Removed |
| Intervals Rejected | (0018,1084) | 3 | IS | Ignored / Removed |
| Primary (Prompts) Counts Accumulated | (0054,1310) | 3 | IS | Ignored / Removed |
| Secondary Counts Accumulated | (0054,1311) | 3 | IS | Ignored / Removed |
| Slice Sensitivity Factor | (0054,1320) | 3 | DS | Ignored / Removed |
| Decay Factor | (0054,1321) | 1C | DS | Used / Copied |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

| | | | | |
|---|-------------|----|----|-------------------|
| Dose Calibration Factor | (0054,1322) | 3 | DS | Ignored / Removed |
| Scatter Fraction Factor | (0054,1323) | 3 | DS | Ignored / Removed |
| Dead Time Factor | (0054,1324) | 3 | DS | Ignored / Removed |
| Anatomic Region Sequence | (0008,2218) | 3 | SQ | Ignored / Copied |
| >Code Value | (0008,0100) | 1C | SH | |
| >Code Scheme Designator | (0008,0102) | 1C | SH | |
| >Code Meaning | (0008,0104) | 3 | LO | |
| >Anatomic Region Modifier Sequence | (0008,2220) | 3 | SQ | |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 3 | LO | |
| Primary Anatomic Structure Sequence | (0008,2228) | 3 | SQ | Ignored / Copied |
| >Code Value | (0008,0100) | 1C | SH | |
| >Code Scheme Designator | (0008,0102) | 1C | SH | |
| >Code Meaning | (0008,0104) | 3 | LO | |
| >Primary Anatomic Structure Modifier Sequence | (0008,2230) | 3 | SQ | |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 3 | LO | |
| View Code Sequence | (0054,0220) | 3 | SQ | Ignored / Removed |
| > Code Value | (0008,0100) | 1C | SH | |
| > Coding Scheme Designator | (0008,0102) | 1C | SH | |
| > Code Meaning | (0008,0104) | 3 | LO | |
| Slice Progression Direction | (0054,0500) | 3 | CS | Ignored / Removed |

6. SECONDARY CAPTURE INFORMATION OBJECT IMPLEMENTATION

6.1 INTRODUCTION

This section specifies the use of the DICOM SC Image IOD to represent the information included in SC images produced by this implementation. This implementation does not use (load) general DICOM SC images. Corresponding attributes are conveyed using the module construct. The contents of this section are:

- 6.2 SC IOD Implementation
- 6.3 SC Entity-Relationship Model
- 6.4 IOD MODULE TABLE
- 6.5 INFORMATION MODULE DEFINITIONS

6.2 SC IOD IMPLEMENTATION

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

In the CortexID Suite application, displays PET, CT and MR image volumes in MPR (Multi-Plane Reformat) views. It also provides viewing of PET and CT fused, or PET and MR fused images. To allow for results of the analysis to be shared with a other physicians, the application provides a feature for the user to save a view of a particular image or screen layout as a DICOM Secondary Capture IOD. The images are saved to the AW/AW Server. Once in the database, any network function provided by the AW is available for the images, such as viewing or filming in the viewer or Filmer, archival to a PACS, or storage on a DICOM removable media.

Secondary Capture Images are also used to store the internal state/results of the CortexID Suite application, called Save Results. This type of object can be read or written by the application, using the private fields. Actual data are retrieved from the original images that the Save Results points to. The value of Image Type is DERIVED\SECONDARY\CAPTURE\CORTEXID_RESULTS. See table 6.2-17 for the description of private tags used for Secondary Capture images.

In addition to directly creating the Secondary Capture images, the CortexID Suite application can send views of images to the AW/AW Server filmer directly. From the AW/AW Server filmer they can be filmed or saved to the AW/AW Server database.

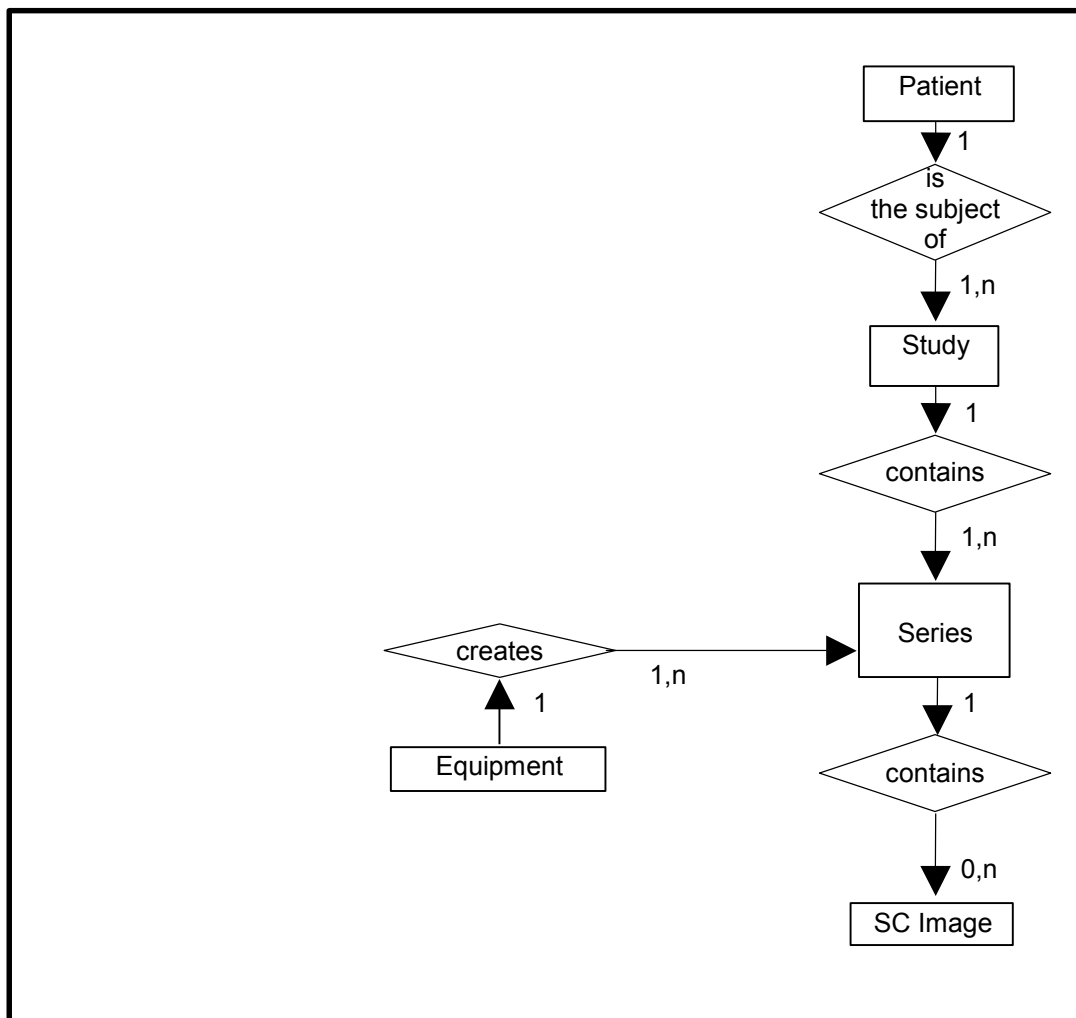
6.3 SC ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the SC Image interoperability schema is shown in Illustration 6.3-1. 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 Patient for each Study (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 6.3-1
SC IMAGE ENTITY RELATIONSHIP DIAGRAM



6.3.1 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.

6.3.2 Mapping of DICOM entities

TABLE 6.3-1
MAPPING OF DICOM ENTITIES TO APPLICATION ENTITIES

| DICOM | Application Entity |
|---------|--------------------|
| Patient | Patient |
| Study | Exam |
| Series | Series |
| Image | Image |
| Frame | Not Applicable |

6.4 IOD MODULE TABLE

Within an entity of the DICOM v3.0 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 6.4-1 identifies the defined modules within the entities which comprise the DICOM v3.0 SC IOD. Modules are identified by Module Name.

See DICOM v3.0 Part 3 for a complete definition of the entities, modules, and attributes.

All elements described as “Copied” are copied from the originating series for PET, MR or CT secondary captures, respectively. For the creation of a fused image secondary capture or full screen capture, the application copies all elements from the originating PET image series.

TABLE 6.4-1
SC IMAGE IOD MODULES

| Entity Name | Module Name | Usage | Reference |
|-------------|------------------------|----------|-----------|
| Patient | Patient | Used | 6.5.1.1 |
| | Clinical Trial Subject | Not Used | N/A |
| Study | General Study | Used | 6.5.2.1 |
| | Patient Study | Used | 6.5.2.2 |
| | Clinical Trial Study | Not Used | N/A |
| Series | General Series | Used | 6.5.3.1 |
| | Clinical Trial Series | Not Used | N/A |
| Equipment | General Equipment | Used | 6.5.5.1 |
| | SC Equipment | Used | 6.5.4.1 |
| Image | General Image | Used | 6.5.6.1 |
| | Image Pixel | Used | 6.5.6.2 |
| | Device | Not Used | N/A |
| | Specimen | Not Used | N/A |
| | SC Image | Used | 6.5.4.2 |
| | Overlay Plane | Not Used | N/A |
| | Modality LUT | Used | 6.5.7.2 |
| | VOI LUT | Used | 6.5.7.1 |
| | ICC Profile | Not Used | N/A |
| | SOP Common | Used | 6.5.8.1 |

6.5 INFORMATION MODULE DEFINITIONS

Please refer to DICOM v3.0 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 v3.0 Standard Part 3 (Information Object Definitions).

6.5.1 Common Patient Entity Modules

6.5.1.1 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 6.5-1
PATIENT MODULE ATTRIBUTES

| Attribute Name | Tag | Type | VR | Attribute Description |
|------------------------------|-------------|------|----|-----------------------|
| Patient's Name | (0010,0010) | 2 | PN | Copied |
| Patient ID | (0010,0020) | 2 | LO | Copied |
| Issuer of Patient ID | (0010,0021) | 3 | LO | Copied |
| Patient's Birth Date | (0010,0030) | 2 | DA | Copied |
| Patient's Sex | (0010,0040) | 2 | CS | Copied |
| Referenced Patient Sequence | (0008,1120) | 3 | CS | Removed |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Patient's Birth Time | (0010,0032) | 3 | TM | Copied |
| Other Patient IDs | (0010,1000) | 3 | LO | Copied |
| Other Patient IDs Sequence | (0010,1002) | 3 | SQ | Copied |
| >Patient ID | (0010,0020) | 1 | LO | |
| >Issuer of Patient ID | (0010,0021) | 1 | LO | |
| >Type of Patient ID | (0010,0022) | 1 | CS | |
| Other Patient Names | (0010,1001) | 3 | PN | Copied |
| Ethnic Group | (0010,2160) | 3 | SH | Copied |
| Patient Comments | (0010,4000) | 3 | LT | Copied |

6.5.2 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.

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

6.5.2.1 General Study Module

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

**TABLE 6.5-2
GENERAL STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|--|-------------|------|----|-----------------------|
| Study Instance UID | (0020,000D) | 1 | UI | Copied |
| Study Date | (0008,0020) | 2 | DA | Copied |
| Study Time | (0008,0030) | 2 | TM | Copied |
| Referring Physician's Name | (0008,0090) | 2 | PN | Copied |
| Referring Physician's Identification Sequence | (0008,0096) | 3 | SQ | Removed |
| Study ID | (0020,0010) | 2 | SH | Copied |
| Accession Number | (0008,0050) | 2 | SH | Copied |
| Issuer of Accession Number Sequence | (0008,0051) | 3 | SQ | Removed |
| Study Description | (0008,1030) | 3 | LO | Copied |
| Physician(s) of Record | (0008,1048) | 3 | PN | Copied |
| Physician(s) of Record Identification Sequence | (0008,1049) | 3 | SQ | Removed |
| Name of Physician(s) Reading Study | (0008,1060) | 3 | PN | Copied |
| Physician(s) Reading Study Identification Sequence | (0008,1062) | 3 | SQ | Removed |
| Referenced Study Sequence | (0008,1110) | 3 | SQ | Copied |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Procedure Code Sequence | (0008,1032) | 3 | SQ | Copied |
| >Code Value | (0008,0100) | 1C | SH | |
| >Code Scheme Designator | (0008,0102) | 1C | SH | |
| >Code Meaning | (0008,0104) | 1C | LO | |
| Reason For Performed Procedure Code Sequence | (0040,1012) | 3 | SQ | Copied |

6.5.2.2 Patient Study Module

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

**TABLE 6.5-3
PATIENT STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|---------------------------------|-------------|------|----|-----------------------|
| Admitting Diagnoses Description | (0008,1080) | 3 | LO | Copied |
| Patient's Age | (0010,1010) | 3 | AS | Copied |
| Patient's Size | (0010,1020) | 3 | DS | Copied |
| Patient's Weight | (0010,1030) | 3 | DS | Copied |
| Occupation | (0010,2180) | 3 | SH | Copied |
| Additional Patient's History | (0010,21B0) | 3 | LT | Copied |

**GE HEALTHCARE
STATEMENT**

DIR 5479282-1EN REV 2

6.5.3 Common Series Entity Modules

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

6.5.3.1 General Series Module

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

**TABLE 6.5-4
GENERAL SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|---|-------------|------|----|--|
| Modality | (0008,0060) | 1 | CS | Copied/Generated Defined Terms: PT = Positron Emission Tomography CT = Computed Tomography MR = Magnetic Resonance OT = Other for Fused viewports |
| Series Instance UID | (0020,000E) | 1 | UI | Generated |
| Series Number | (0020,0011) | 2 | IS | Generated (value = Starting at 3000) |
| Laterality | (0020,0060) | 2C | CS | Generated: "" (empty as the software cannot know semantically the laterality) |
| Series Date | (0008,0021) | 3 | DA | Generated: (Value = Current Date) |
| Series Time | (0008,0031) | 3 | TM | Generated: (Value = Current Time) |
| Performing Physicians' Name | (0008,1050) | 3 | PN | Copied |
| Protocol Name | (0018,1030) | 3 | LO | Copied |
| Series Description | (0008,103E) | 3 | LO | Generated |
| Operators' Name | (0008,1070) | 3 | PN | Generated |
| Referenced Performed Procedure Sequence | (0008,1111) | 3 | SQ | Removed |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Related Series Sequence | (0008,1250) | 3 | SQ | Removed Refer to Section 6.5.3.1.1.1 |
| >Study Instance UID | (0020,000D) | 1C | UI | |
| >Series Instance UID | (0020,000E) | 1C | UI | |
| >Purpose of Reference Code Sequence | (0040,A170) | 2 | SQ | |
| >>Code Value | (0008,0100) | 1 | SH | |
| >>Coding Scheme Designator | (0008,0102) | 1 | SH | |
| >>Coding Scheme Version | (0008,0103) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 1 | LO | |
| >>Includes Code Sequence Macro | | | | |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

| | | | | |
|---|--------------|----|----|---|
| Body Part Examined | (0018,0015) | 3 | CS | Copied |
| Patient Position | (0018,5100) | 2C | CS | 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 | SS | Removed |
| Largest Pixel Value in Series | (0028,0109) | 3 | SS | Removed |
| Request Attributes Sequence | (0040,0275) | 3 | SQ | Removed |
| >Requested Procedure ID | (0040,1001) | 1C | SH | |
| >Accession Number | (0008,0050) | 3 | SH | |
| >Study Instance UID | (0020, 000D) | 3 | UI | |
| >Referenced Study Sequence | (0008,1110) | 3 | SQ | |
| >>Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >>Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| >Requested Procedure Description | (0032,1060) | 3 | LO | |
| >Requested Procedure Code Sequence | (0032,1064) | 3 | SQ | |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 1C | LO | |
| >Reason for the Requested Procedure | (0040,1002) | 3 | LO | |
| >Reason for Requested Procedure Code Sequence | (0040,100A) | 3 | SQ | |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 1C | LO | |
| >Scheduled Procedure Step ID | (0040,0009) | 1C | SH | |
| >Scheduled Procedure Step Description | (0040,0007) | 3 | LO | |
| >Scheduled Protocol Code Sequence | (0040,0008) | 3 | SQ | |
| >>Code Value | (0008,0100) | 1C | SH | |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | |
| >>Code Meaning | (0008,0104) | 1C | LO | |
| >>Protocol Context Sequence | (0040,0440) | 3 | SQ | |
| >>Content Item Modifier Sequence | (0040,0441) | 3 | SQ | |
| Performed Procedure Step ID | (0040,0253) | 3 | SH | Removed |
| Performed Procedure Step Start Date | (0040,0244) | 3 | DA | Removed |
| Performed Procedure Step Start Time | (0040,0245) | 3 | TM | Removed |
| Performed Procedure Step Description | (0040,0254) | 3 | LO | Removed |
| Performed Protocol Code Sequence | (0040,0260) | 3 | SQ | Removed |
| >Code Value | (0008,0100) | 1C | SH | |
| >Code Scheme Designator | (0008,0102) | 1C | SH | |
| >Code Meaning | (0008,0104) | 1C | LO | |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

6.5.3.1.1 General Series Attribute Descriptions

6.5.3.1.1.1 Related Series Sequence

This sequence is only present if Image Type (0008,0008) has CORTEXID_RESULT in value 4 (Refer to Section 6.5.6.1.1.3).

6.5.4 SC Modules

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

6.5.4.1 SC Equipment Module

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

**TABLE 6.5-5
SC IMAGE EQUIPMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|--|-------------|------|----|---|
| Conversion Type | (0008,0064) | 1 | CS | Generated: WSD = Workstation |
| Modality | (0008,0060) | 3 | CS | Generated Defined Terms: PT = Positron Emission Tomography CT = Computed Tomography MR = Magnetic Resonance OT = Other for Fused viewports |
| Secondary Capture Device ID | (0018,1010) | 3 | LO | Generated (Value = System ID) |
| Secondary Capture Device Manufacturer | (0018,1016) | 3 | LO | Generated (Generated Value = GE Medical System) |
| Secondary Capture Device Manufacturer's Model Name | (0018,1018) | 3 | LO | Generated The name of the application. (Value = CortexID Suite) |
| Secondary Capture Device Software Version | (0018,1019) | 3 | LO | Generated Application Version. (Value = #.#.#.#) |
| Video Image Format Acquired | (0018,1022) | 3 | SH | Removed |
| Digital Image Format Acquired | (0018,1023) | 3 | LO | Removed |

6.5.4.2 SC Image Module

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

**TABLE 6.5-6
SC IMAGE MODULE ATTRIBUTES**

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

6.5.5 Common Equipment Entity Modules

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

6.5.5.1 General Equipment Module

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

**TABLE 6.5-7
GENERAL EQUIPMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|-------------------------------|-------------|------|----------|--|
| Manufacturer | (0008,0070) | 2 | LO | Generated (Value = GE Medical Systems) |
| Institution Name | (0008,0080) | 3 | LO | Generated |
| Institution Address | (0008,0081) | 3 | ST | Generated |
| Station Name | (0008,1010) | 3 | SH | Generated |
| Institutional Department Name | (0008,1040) | 3 | LO | Generated |
| Manufacturer's Model Name | (0008,1090) | 3 | LO | Generated (Value = CortexID Suite) |
| Device Serial Number | (0018,1000) | 3 | LO | Generated |
| Software Versions | (0018,1020) | 3 | LO | Generated |
| Spatial Resolution | (0018,1050) | 3 | DS | Removed |
| Date of Last Calibration | (0018,1200) | 3 | DA | Removed |
| Time of Last Calibration | (0018,1201) | 3 | TM | Removed |
| Pixel Padding Value | (0028,0120) | 3 | US or SS | Removed |

6.5.6 Common Image Entity Modules

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

6.5.6.1 General Image Module

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

**TABLE 6.5-8
GENERAL IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|---------------------------|-------------|------|----|----------------------------|
| Image Number | (0020,0013) | 2 | IS | Generated |
| Patient Orientation | (0020,0020) | 2C | CS | Generated. See 6.5.6.1.1.1 |
| Image Date | (0008,0023) | 2C | DA | Empty. See 6.5.6.1.1.2 |
| Image Time | (0008,0033) | 2C | TM | Empty. See 6.5.6.1.1.2 |
| Image Type | (0008,0008) | 3 | CS | Generated. See 6.5.6.1.1.3 |
| Acquisition Number | (0020,0012) | 3 | IS | Copied |
| Acquisition Date | (0008,0022) | 3 | DA | Copied |
| Acquisition Time | (0008,0032) | 3 | TM | Copied |
| Referenced Image Sequence | (0008,1140) | 3 | SQ | Copied |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |

| | | | | |
|-------------------------------|-------------|----|----|--|
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Derivation Description | (0008,2111) | 3 | ST | Generated Defined Terms: SCREEN CAPTURE CORTEXID PROCESSED RESULTS |
| Source Image Sequence | (0008,2112) | 3 | SQ | Generated. See 6.5.6.1.1.4 |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Images in Acquisition | (0020,1002) | 3 | IS | Removed |
| Image Comments | (0020,4000) | 3 | LT | Removed |
| Quality Control Image | (0028,0300) | 3 | CS | Removed |
| Burned In Annotations | (0028,0301) | 3 | CS | Generated The Defined Terms are: YES = Annotations burned in NO = Annotations not burned in |
| Lossy Image Compression Ratio | (0028,2112) | 3 | DS | Removed See 6.5.6.1.1.5 |
| Lossy Image Compression | (0028,2110) | 3 | CS | Copied See 6.5.6.1.1.5 |

6.5.6.1.1 General Image Attribute Descriptions

6.5.6.1.1.1 Patient Orientation

Since Secondary Captures do not include the patient orientation, this field must be present. This field will be filled for 2D reformatted and 3D views, and will be empty (zero length) for other views.

The precision depth could be up to 3 characters, for example "LAF\FAR ", but can be less if the view is oriented along a baseline, like "L\FA" or "L\F ".

6.5.6.1.1.2 Image Date and Time

When the application is saving a secondary capture:

- the condition to set these tags should be used if the image are temporally related, but is not clearly met for reformatted images ; anyway, since most AE will expect this tag to be present, we have decided to set this tag
- Application might set this content date to the time the reformatted image is created, but then might move away from the purpose of this date which is linked to the acquisition
- Application might set it to the original image date, but it does not make sense for reformatted images which are derived from several images

For these reasons, the application will set an empty tag to avoid possible ambiguities.

6.5.6.1.1.3 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 Screen Capture Image

Value 4 has the following value:

- * CORTEXID_RESULTS identifies a 3D state SC Capture from CortexID Suite

6.5.6.1.1.4 Source Image Sequence

When Image Type (0008,0008) has CORTEXID_RESULTS in value 4 (Refer to Section 6.5.6.1.1.3), then this sequence will contain the instances for the images loaded into the application to create the save state.

6.5.6.1.1.5 Lossy Image Compression

The application does not use compression when saving images, nor does it decompress images. The application will ignore these tags.

6.5.6.2 Image Pixel Module

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

**TABLE 6.5-9
IMAGE PIXEL MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|----------------------------|-------------|------|----|---|
| Samples per Pixel | (0028,0002) | 1 | US | Generated <ul style="list-style-type: none"> • "1" for grayscale images • "3" for color images |
| Photometric Interpretation | (0028,0004) | 1 | CS | Generated <ul style="list-style-type: none"> • "MONOCHROME2" or "MONOCHROME1" for grayscale images • "RGB" for color images |
| Rows | (0028,0010) | 1 | US | Generated (256, 512, 1024) |
| Columns | (0028,0011) | 1 | US | Generated (256, 512, 1024) |
| Bits Allocated | (0028,0100) | 1 | US | Generated <ul style="list-style-type: none"> • "16" for grayscale images • "8" for color images |
| Bits Stored | (0028,0101) | 1 | US | Generated <ul style="list-style-type: none"> • "16" for grayscale images • "8" for color images |
| High Bit | (0028,0102) | 1 | US | Generated <ul style="list-style-type: none"> • "15" for grayscale images • "7" for color images |
| Pixel Representation | (0028,0103) | 1 | US | Generated <ul style="list-style-type: none"> • "1" for grayscale images • "0" for color images |
| Pixel Data | (7FE0,0010) | 1 | | Generated |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

| | | | | |
|---|-------------|----|----------|--|
| Planar Configuration | (0028,0006) | 1C | US | Generated <ul style="list-style-type: none"> Removed for grayscale images "0" for color images |
| Pixel Aspect Ratio | (0028,0034) | 1C | IS | Removed |
| Smallest Image Pixel Value | (0028,0106) | 3 | US or SS | Removed |
| Largest Image Pixel Value | (0028,0107) | 3 | US or SS | Removed |
| Red Palette Color Lookup Table Descriptor | (0028,1101) | 1C | US or SS | Removed |
| Green Palette Color Lookup Table Descriptor | (0028,1102) | 1C | US or SS | Removed |
| Blue Palette Color Lookup Table Descriptor | (0028,1103) | 1C | US or SS | Removed |
| Red Palette Color Lookup Table Data | (0028,1201) | 1C | OW | Removed |
| Green Palette Color Lookup Table Data | (0028,1202) | 1C | OW | Removed |
| Blue Palette Color Lookup Table Data | (0028,1203) | 1C | OW | Removed |

6.5.7 Common Lookup Table Modules

6.5.7.1 VOI LUT module

This section specifies the Attributes that describe the VOI LUT.

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

**TABLE 6.5-10
VOI LUT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|-----------------------------------|-------------|------|----------|---|
| VOI LUT Sequence | (0028,3010) | 3 | SQ | Removed |
| >LUT Descriptor | (0028,3002) | 1C | US or SS | |
| >LUT Explanation | (0028,3003) | 3 | LO | |
| >LUT Data | (0028,3006) | 1C | US or OW | |
| Window Center | (0028,1050) | 3 | DS | Generated from the current value used in the saved view |
| Window Width | (0028,1051) | 1C | DS | Generated from the current value used in the saved view |
| Window Center & Width Explanation | (0028,1055) | 3 | LO | Removed |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

6.5.7.2 Modality LUT module

This section specifies the Attributes that describe the Modality LUT.

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

**TABLE 6.5-11
MODALITY LUT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|-----------------------|-------------|------|----------|--|
| Modality LUT Sequence | (0028,3000) | 3 | SQ | Removed |
| >LUT Descriptor | (0028,3002) | 1C | US or SS | Specify values created or supported. |
| >LUT Explanation | (0028,3003) | 3 | LO | Removed |
| >Modality LUT Type | (0028,3004) | 1C | LO | Specify Defined Terms used: OD = Optical density US = Unspecified |
| >LUT Data | (0028,3006) | 1C | US or OW | Removed |
| Rescale Intercept | (0028,1052) | 1C | DS | Generated |
| Rescale Slope | (0028,1053) | 1C | DS | Generated "1" |
| Rescale Type | (0028,1054) | 1C | LO | Generated <ul style="list-style-type: none"> • "HU" for CT • "US" for other modalities |

STATEMENT

DIR 5479282-1EN REV 2

6.5.8 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

6.5.8.1 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 6.5-12
SOP COMMON MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|-------------------------------------|-------------|-------------|-----------|--|
| SOP Class UID | (0008,0016) | 1 | UI | Generated 1.2.840.10008.5.1.4.1.1.7 |
| SOP Instance UID | (0008,0018) | 1 | UI | 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 | CS | Copied Supported Character sets: ISO_IR 100 ISO_IR 144 \ISO 2022 IR 87 \ISO 2022 IR 149 ISO IR 192 GB18030 ISO 2022 IR 13 \ ISO 2022 IR 87 See 6.5.8.1.1. |
| Instance Creation Date | (0008,0012) | 3 | DA | Generated: current date |
| Instance Creation Time | (0008,0013) | 3 | TM | Generated: current time |
| Instance Creator UID | (0008,0014) | 3 | UI | Removed |
| Time zone Offset From UTC | (0008,0201) | 3 | SH | Generated |
| Contributing Equipment Sequence | (0018,A001) | 3 | SQ | Copied and updated with current equipment and copy of source image equipment. |
| >Purpose of Reference Code Sequence | (0040,A170) | 1 | SQ | Generated Following triplets are used when generating: (109102, DCM, Processing Equipment) |
| >>Code Value | (0008,0100) | 1C | SH | Generated (Value = 109102) |
| >>Coding Scheme Designator | (0008,0102) | 1C | SH | Generated (Value = DCM) |
| >>Code Meaning | (0008,0104) | 1C | LO | Generated (Value - Processing Equipment) |
| >Manufacturer | (0008,0070) | 1 | LO | Generated (Generated Value = GE Medical Systems) |
| >Institution Name | (0008,0080) | 3 | LO | Generated |
| >Institution Address | (0008,0081) | 3 | ST | Generated |
| >Station Name | (0008,1010) | 3 | SH | Generated |
| >Institutional Department Name | (0008,1040) | 3 | LO | Generated |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

| | | | | |
|--|-------------|---|----|--|
| >Manufacturer's Model Name | (0008,1090) | 3 | LO | Generated (Value = CortexID Suite) |
| >Device Serial Number | (0018,1000) | 3 | LO | Generated |
| >Software Versions | (0018,1020) | 3 | LO | Generated Application Version. (Value = #.#.#) |
| >Spatial Resolution | (0018,1050) | 3 | DS | Generated |
| >Date of Last Calibration | (0018,1200) | 3 | DA | Generated |
| >Time of Last Calibration | (0018,1201) | 3 | TM | Generated |
| >Contribution DateTime | (0018,A002) | 3 | DT | Removed |
| >Contribution Description | (0018,A003) | 3 | ST | Removed |
| Instance Number | (0020,0013) | 3 | IS | Generated |
| SOP Instance Status | (0100,0410) | 3 | CS | Removed |
| SOP Authorization Date and Time | (0100,0420) | 3 | DT | Removed |
| SOP Authorization Comment | (0100,0424) | 3 | LT | Removed |
| Authorization Equipment Certification Number | (0100,0426) | 3 | LO | Removed |

6.5.8.1.1 Supported Character Sets

Depending on the platform on which the product is installed only a subset of character sets may actually be supported. Please refer to the platform DCS for more information about the platform supported character sets (Refer to Section 2.)

STATEMENT

DIR 5479282-1EN REV 2

6.6 SC PRIVATE DATA

The processed results state of the application is saved in a SC image and is read only if the Image Type(0008,0008) has CORTEXID_RESULTS in value 4 (Refer to Section 6.5.6.1.1.3).

The following private tags are used to save and restore the state of the application.

**TABLE 6.6-13
SC PRIVATE DATA ATTRIBUTES**

| Attribute Name | Tag | Type | VR | VM | Attribute Description |
|---------------------------------|-------------|------|----|----|---|
| CortexID Private Tag | (0025,0010) | 3 | LO | 1 | Generated defines the private group, GEMS_CIDSTATE_001 |
| CortexID Software Version | (0025,1070) | 3 | LO | 1 | Generated Application Version. M Ext m.b (Where M = Major Release, M = minor release B = Build ID) |
| CortexID Template Version | (0025,1071) | 3 | LO | 1 | Generated |
| CortexID PET-MR Transform | (0025,1072) | 3 | ST | 1 | Generated |
| CortexID PET-PET Transform | (0025,1073) | 3 | ST | 1 | Generated |
| CortexID Manual Transform | (0025,1074) | 3 | ST | 1 | Generated |
| CortexID Anatomic Transform | (0025,1075) | 3 | OB | 1 | Generated |
| CortexID Tracer | (0025,1076) | 3 | LO | 1 | Generated |
| CortexID Include MR | (0025,1077) | 3 | LO | 1 | Generated |
| CortexID Compare Mode | (0025,1078) | 3 | LO | 1 | Generated |
| CortexID Current Patient age | (0025,1079) | 3 | LO | 1 | Generated |
| CortexID Prior Patient Age | (0025,107a) | 3 | LO | 1 | Generated |
| CortexID Loaded Volume Sequence | (0025,107b) | 3 | SQ | 1 | Generated from source series. Repeated for each loaded series. |
| >Referenced Instance Sequence | (0008,114a) | 3 | SQ | 1 | Generated from source series |
| >>Reference SOP Class UID | (0008,1150) | 3 | UI | 1 | Generated from source series. Repeat for each image in the original series. |
| >> Reference SOP Instance UID | (0008,1155) | 3 | UI | 1 | Generated from source. Repeat for each image in the original series. |
| >Study Instance UID | (0020,000d) | 3 | UI | 1 | Generated from source Series. |
| >Series Instance UID | (0020,000e) | 3 | UI | 1 | Generated from source Series. |
| >CortexID Loaded Volume Type | (0025,107c) | 3 | CS | 1 | Generated Defined Terms: PET – Loaded Current PET Series PET-PRIOR – Loaded Prior PET Series CT – Loaded CTAC Series MR – Loaded MR Series |
| >Reference Study Description | (0025,107d) | 3 | LO | 1 | Generated from source series |
| >Reference Study Date Time | (0025,107e) | 3 | DT | 1 | Generated from source series |
| >Referenced Series Description | (0025,107f) | 3 | LO | 1 | Copied from source series |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

| | | | | | |
|------------------------------|--------------|---|----|---|---------------------------|
| >Referenced Series Date Time | (0025, 1080) | 3 | DT | 1 | Copied from source series |
|------------------------------|--------------|---|----|---|---------------------------|

7. ENCAPSULATED PDF INFORMATION OBJECT IMPLEMENTATION

7.1 INTRODUCTION

This section specifies the use of Encapsulated PDF IOD used to represent the information included in the PDF document. Corresponding attributes are conveyed using the module construct. The contents of this section are:

7.2 ENCAPSULATED PDF IOD DESCRIPTION

7.3 ENCAPSULATED PDF ENTITY-RELATIONSHIP MODEL

7.4 IOD MODULE TABLE

7.5 INFORMATION MODULE DEFINITIONS

7.2 ENCAPSULATED PDF IOD DESCRIPTION

Encapsulated PDF IOD description specifies a document generated by the application in a PDF file format.

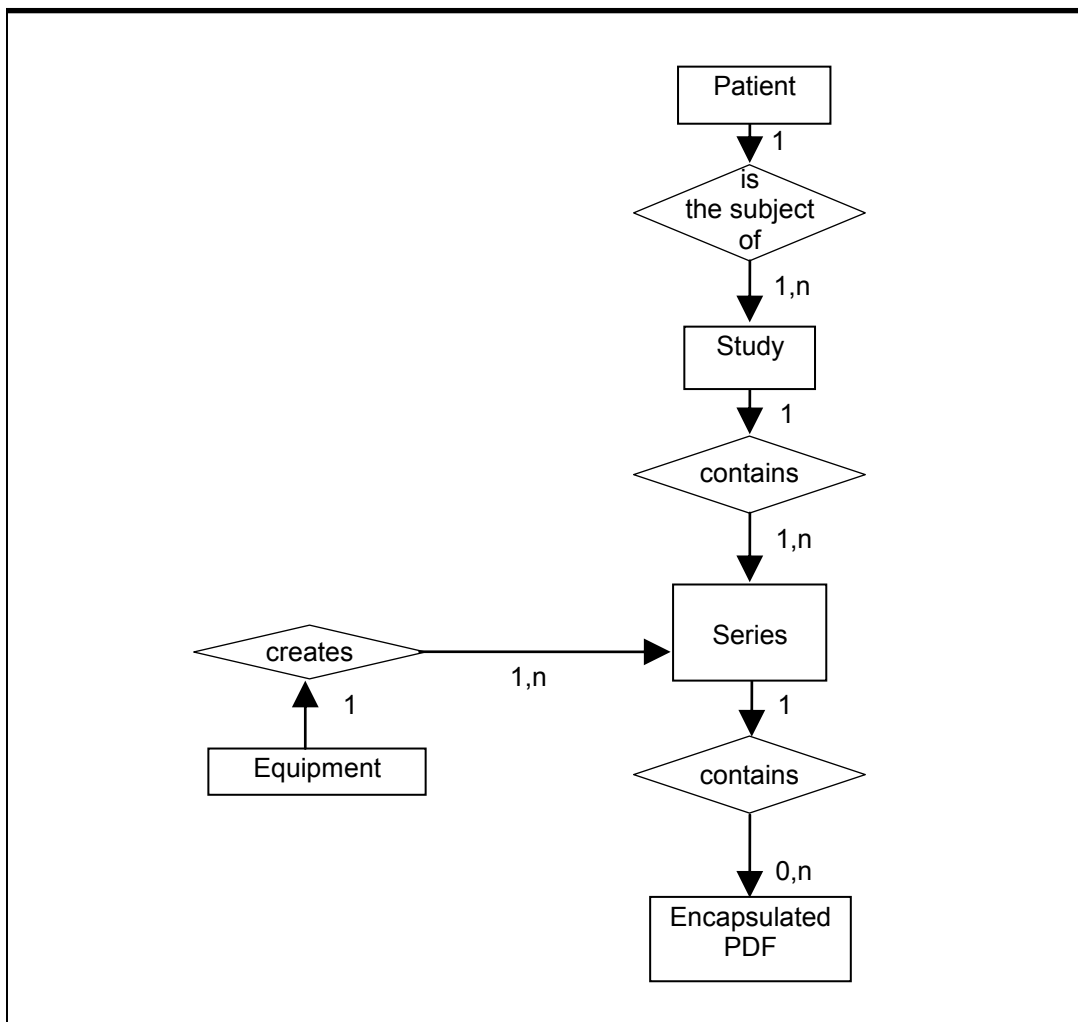
7.3 ENCAPSULATED PDF ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Encapsulated PDF interoperability schema is shown in. In this figure Illustration-7.3.1, 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 7.3-1. In other words, the relationship between Series and encapsulated PDF can have up to n documents per Series, but the Patient to Study relationship has 1 Patient for each Study (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 – 7.3-1
ENCAPSULATED PDF IMAGE ENTITY RELATIONSHIP DIAGRAM



7.3.1 Entity Descriptions

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

7.3.2 CortexID Suite Mapping of DICOM entities

TABLE 7.3-1
MAPPING OF DICOM ENTITIES TO CORTEXID SUITE ENTITIES

| DICOM | CortexID Suite Entity |
|------------------|-----------------------|
| Patient | Patient |
| Study | Exam |
| Series | Series |
| Image | Image |
| Encapsulated PDF | Encapsulated PDF |
| Frame | Not Applicable |

Within an entity of the Encapsulated PDF 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 7.4-1 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 7.4-1
ENCAPSULATED PDF IOD MODULES**

| Entity Name | Module Name | Usage | Reference |
|-----------------------|------------------------------|----------|-----------|
| Patient | Patient | Used | 7.5.1.1 |
| | Clinical Trial Subject | Not Used | N/A |
| Study | General Study | Used | 7.5.2.1 |
| | Patient Study | Used | 7.5.2.2 |
| | Clinical Trial Study | Not Used | N/A |
| Series | Encapsulated Document Series | Used | 7.5.3.1 |
| | Clinical Trial Series | Not Used | N/A |
| Equipment | General Equipment | Used | 7.5.4.1 |
| | SC Equipment | Used | 7.5.4.2 |
| Encapsulated Document | Encapsulated Document | Used | 7.5.5.1 |
| | SOP Common | Used | 7.5.5.2 |

7.5 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. Associated tables contain expectations of the use of entities within the application.

7.5.1 Common Patient Entity Modules

7.5.1.1 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 document and are common for all studies performed on the patient.

TABLE 7.5-1
 □PATIENT MODULE ATTRIBUTES

| Attribute Name | Tag | Type | VR | Attribute Description |
|------------------------------|-------------|------|----|-----------------------|
| Patient's Name | (0010,0010) | 2 | PN | Copied |
| Patient ID | (0010,0020) | 2 | LO | Copied |
| Issuer of Patient ID | (0010,0021) | 3 | LO | Copied |
| Patient's Birth Date | (0010,0030) | 2 | DA | Copied |
| Patient's Sex | (0010,0040) | 2 | CS | Copied |
| Referenced Patient Sequence | (0008,1120) | 3 | SQ | Removed |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Patient's Birth Time | (0010,0032) | 3 | TM | Copied |
| Other Patient Ids | (0010,1000) | 3 | LO | Copied |
| Other Patient IDs Sequence | (0010,1002) | 3 | SQ | Copied |
| >Patient ID | (0010,0020) | 1 | LO | |
| >Issuer of Patient ID | (0010,0021) | 1 | LO | |
| >Type of Patient ID | (0010,0022) | 1 | CS | |
| Other Patient Names | (0010,1001) | 3 | PN | Copied |
| Ethnic Group | (0010,2160) | 3 | SH | Copied |
| Patient Comments | (0010,4000) | 3 | LT | Copied |

GE HEALTHCARE

STATEMENT

DIR 5479282-1EN REV 2

7.5.2 Common Study Entity Modules

7.5.2.1 General Study Module

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

**TABLE 7.5-2
GENERAL STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|--|-------------|-------------|-----------|------------------------------|
| Study Instance UID | (0020,000D) | 1 | UI | Copied |
| Study Date | (0008,0020) | 2 | DA | Copied |
| Study Time | (0008,0030) | 2 | TM | Copied |
| Referring Physician's Name | (0008,0090) | 2 | PN | Copied |
| Referring Physician's Identification Sequence | (0008,0096) | 3 | SQ | Removed |
| Study ID | (0020,0010) | 2 | SH | Copied |
| Accession Number | (0008,0050) | 2 | SH | Copied |
| Issuer of Accession Number Sequence | (0008,0051) | 3 | SQ | Removed |
| Study Description | (0008,1030) | 3 | LO | Copied |
| Physician(s) of Record | (0008,1048) | 3 | PN | Copied |
| Physician(s) of Record Identification Sequence | (0008,1049) | 3 | SQ | Removed |
| Name of Physician(s) Reading Study | (0008,1060) | 3 | PN | Copied |
| Physician(s) Reading Study Identification Sequence | (0008,1062) | 3 | SQ | Removed |
| Referenced Study Sequence | (0008,1110) | 3 | SQ | Copied |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Procedure Code Sequence | (0008,1032) | 3 | SQ | Copied |
| >Code Value | (0008,0100) | 1C | SH | |
| >Code Scheme Designator | (0008,0102) | 1C | SH | |
| >Code Meaning | (0008,0104) | 1C | LO | |
| Reason For Performed Procedure Code Sequence | (0040,1012) | 3 | SQ | Removed |

7.5.2.2 Patient Study Module

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

**TABLE 7.5-3
PATIENT STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|---------------------------------|-------------|-------------|-----------|------------------------------|
| Admitting Diagnoses Description | (0008,1080) | 3 | LO | Copied |
| Patient's Age | (0010,1010) | 3 | AS | Copied |
| Patient's Size | (0010,1020) | 3 | DS | Copied |
| Patient's Weight | (0010,1030) | 3 | DS | Copied |
| Occupation | (0010,2180) | 3 | SH | Copied |
| Additional Patient's History | (0010,21B0) | 3 | LT | Copied |

7.5.3.1 Encapsulated Document Series Module

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

**TABLE 7.5-4
ENCAPSULATED DOCUMENT SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|---|-------------|------|----|---|
| Modality | (0008,0060) | 1 | CS | Generated Defined Terms: DOC = Document |
| Series Instance UID | (0020,000E) | 1 | UI | Generated |
| Series Number | (0020,0011) | 2 | IS | Generated |
| Referenced Performed Procedure Step Sequence | (0008,1111) | 3 | SQ | Removed |
| >Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| Series Description | (0008,103E) | 3 | LO | Generated |
| Series Description Code Sequence | (0008,103F) | 3 | SQ | Removed |
| Request Attributes Sequence | (0040,0275) | 3 | SQ | Removed |
| >Requested Procedure ID | (0040,1001) | 1C | SH | |
| >Accession Number | (0008,0050) | 3 | SH | |
| >Issuer of Accession Number Sequence | (0008,0051) | 3 | SQ | |
| >>Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >>Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| >Study Instance UID | (0020,000D) | 3 | UI | |
| >Referenced Study Sequence | (0008,1110) | 3 | SQ | |
| >>Referenced SOP Class UID | (0008,1150) | 1C | UI | |
| >>Referenced SOP Instance UID | (0008,1155) | 1C | UI | |
| >Requested Procedure Description | (0032,1060) | 3 | LO | |
| >Requested Procedure Code Sequence | (0032,1064) | 3 | SQ | |
| >Reason for the Requested Procedure | (0040,1002) | 3 | LO | |
| >Reason for the Requested Procedure Code Sequence | (0040,100A) | 3 | SQ | |
| >Scheduled Procedure Step ID | (0040,0009) | 1C | SH | |
| >Scheduled Procedure Step Description | (0040,0007) | 3 | LO | |
| >Scheduled Protocol Code Sequence | (0040,0008) | 3 | SQ | |
| >>Protocol Context Sequence | (0040,0440) | 3 | SQ | |
| >>>Content Item Modifier Sequence | (0040,0441) | 3 | SQ | |
| Performed Procedure Step ID | (0040,0253) | 3 | SH | Generated |
| Performed Procedure Step Start Date | (0040,0244) | 3 | DA | Generated |
| Performed Procedure Step Start Time | (0040,0245) | 3 | TM | Generated |
| Performed Procedure Step Description | (0040,0254) | 3 | LO | Generated |

| | | | | |
|---|-------------|---|----|-----------|
| Performed Protocol Code Sequence | (0040,0260) | 3 | SQ | Removed |
| >Protocol Context Sequence | (0040,0440) | 3 | SQ | |
| >>Content Item Modifier Sequence | (0040,0441) | 3 | SQ | |
| Comment on the Performed Procedure Step | (0040,0280) | 3 | ST | Generated |

7.5.3.1.1 General Series Attribute Descriptions

7.5.4 Common Equipment Entity Modules

7.5.4.1 General Equipment Module

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

**TABLE 7.5-5
GENERAL EQUIPMENT MODULE ATTRIBUTES**

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

7.5.4.2 SC Equipment Module

This section specifies the Attributes that identify and describe the piece of equipment that produced the encapsulated PDF document.

**TABLE 7.5-6
SC EQUIPMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|--|-------------|------|----|---|
| Conversion Type | (0008,0064) | 2 | CS | Generated (Value = Workstation[WSD]) |
| Modality | (0008,0060) | 3 | CS | Generated (Value = DOC) |
| Secondary Capture Device ID | (0018,1010) | 3 | LO | Generated (Value = System ID) |
| Secondary Capture Device Manufacturer | (0018,1016) | 3 | LO | Generated (Generated Value = GE Medical System) |
| Secondary Capture Device Manufacturer's Model Name | (0018,1018) | 3 | LO | Generated (Value = CortexID Suite) |

| | | | | |
|---|-------------|---|----|---|
| Secondary Capture Device Software Version | (0018,1019) | 3 | LO | Generated Application Version. (Value = #.#.#.#) |
| Video Image Format Acquired | (0018,1022) | 3 | SH | Removed |
| Digital Image Format Acquired | (0018,1023) | 3 | LO | Removed |

7.5.5 Encapsulated Document Entity Modules

7.5.5.1 Encapsulated Document

This section specifies the Attributes that identify and describe encapsulated PDF document within a particular series.

**TABLE 7.5-7
GENERAL ENCAPSULATED DOCUMENT MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|------------------------------------|-------------|------|----|---|
| Instance Number | (0020,0013) | 1 | IS | Derived |
| Content Date | (0008,0023) | 2 | DA | Generated (Value = Current Date) |
| Content Time | (0008,0033) | 2 | TM | Generated (Value = Current Time) |
| Acquisition DateTime | (0008,002A) | 2 | DT | Copied |
| Image Laterality | (0020,0062) | 3 | CS | Generated (value is empty as the software cannot know semantically the laterality) |
| Burned In Annotations | (0028,0301) | 1 | CS | Generated (Value = Yes) |
| Recognizable Visual Features | (0028,0302) | 3 | | Removed |
| Source Instance Sequence | (0042,0013) | 1C | SQ | Generated |
| >Referenced SOP Class UID | (0008,1150) | 1 | UI | |
| > Referenced SOP Instance UID | (0008,1155) | 1 | UI | |
| Document Title | (0042,0010) | 2 | ST | Generated (Value = CortexID Exam Summary) |
| Concept Name Code Sequence | (0040,A043) | 2 | SQ | Generated |
| Document Class Code Sequence | (0040,E008) | 3 | SQ | Removed |
| Verification Flag | (0040,A493) | 3 | CS | Removed |
| HL7 Instance Identifier | (0040,E001) | 1C | ST | removed |
| MIME Type of Encapsulated Document | (0042,0012) | 1 | LO | Generated (Value = application/pdf) |
| List of MIME Types | (0042,0014) | 1C | LO | Removed |
| Encapsulated Document | (0042,0011) | 1 | | Generated |

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 7.5-8
SOP COMMON MODULE ATTRIBUTES**

| Attribute Name | Tag | Type | VR | Attribute Description |
|--|--------------|------|----|--|
| SOP Class UID | (0008,0016) | 1 | UI | Generated Value = '1.2.840.10008.5.1.4.1.1.104.1' |
| SOP Instance UID | (0008,0018) | 1 | UI | Generated |
| Specific Character Set | (0008,0005) | 1C | CS | Copied |
| Instance Creation Date | (0008,0012) | 3 | DA | Generated (Value = Current Date) |
| Instance Creation Time | (0008,0013) | 3 | TM | Generated (Value = Current Time) |
| Instance Creator UID | (0008,0014) | 3 | UI | Removed |
| Time zone Offset From UTC | (0008,0201) | 3 | SH | Removed |
| Instance Number | (0020,0013) | 3 | IS | Derived |
| SOP Instance Status | (0100,0410) | 3 | CS | Removed |
| SOP Authorization Date and Time | (0100,0420) | 3 | DT | Removed |
| SOP Authorization Comment | (0100,0424) | 3 | LT | Removed |
| Authorization Equipment Certification Number | (0100,0426) | 3 | LO | Removed |
| Contributing Equipment Sequence | (0018, A001) | 3 | SQ | Generated |
| >Purpose of Reference Code Sequence | (0040,A170) | 1 | SW | Generated Following triplets are used when generating: (109102, DCM, Processing Equipment) |
| >>Code Value | (0008,0100) | 1C | SH | Generated (Value = 109102) |
| >>Code Scheme Designator | (0008,0102) | 1C | SH | Generated (Value = DCM) |
| >>Code Meaning | (0008,0104) | 1C | LO | Generated(Value - Processing Equipment) |
| >Manufacturer | (0008,0070) | 1 | LO | Generated (Generated Value = GE Medical System) |
| >Institution Name | (0008,0080) | 3 | LO | Generated |
| >Institution Address | (0008,0081) | 3 | ST | Generated |
| >Station Name | (0008,1010) | 3 | LO | Generated |
| >Manufacturer's Model Name | (0008,1090) | 3 | LO | Generated (Value = CortexID Suite) |
| >Device Serial Number | (0018,1000) | 3 | LO | Generated |
| >Software Versions | (0018,1020) | 3 | LO | Generated Application Version. (Value = #.#.#.#) |