

# **Technical Publications**

**Direction 2270669-100  
Revision 0.3**

***Advance<sup>TM</sup> 4.05***  
**CONFORMANCE STATEMENT**  
**for DICOM V3.0**

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**GE Medical Systems**

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# 1. INTRODUCTION

## 1.1 OVERVIEW

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

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

**Section 2 (Network Conformance Statement)**, which specifies the GEMS equipment compliance to DICOM requirements for the implementation of Networking Features.

**Section 3 (Positron Emission Tomography Image Information Object Implementation)**, which specifies the GEMS equipment compliance to DICOM requirements for the implementation of a Positron Emission Tomography Information Object.

**Section 4 (Standalone PET Curve Information Object Implementation)**, which specifies the GEMS equipment compliance to DICOM requirements for the implementation of a Stand Alone PET Curve Information Object.

**Section 5 (Patient Root Query/Retrieve Information Model)**, which specifies the information model used for the implementation of the Patient Root Query/Retrieve Information Model.

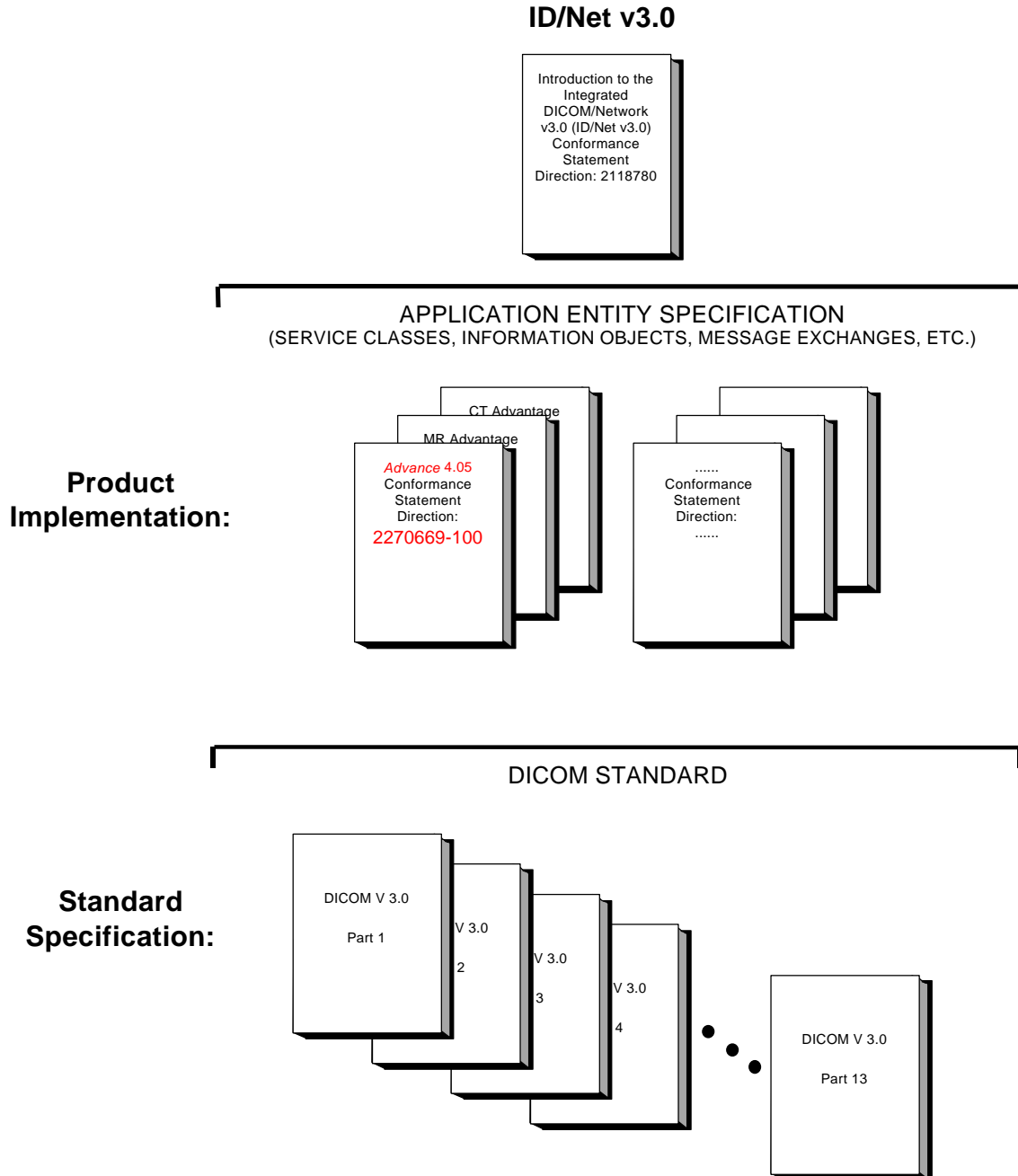
**Section 6 (Study Root Query/Retrieve Information Model)**, which specifies the information model used for the implementation of the Study Root Query/Retrieve Information Model.

**Section 7 (Stand Alone Curve Information Object Implementation)**, which specifies the GEMS equipment compliance to DICOM requirements for the implementation of a Stand Alone Curve Information Object.



### 1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

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



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

*Advance 4.05  
Conformance Statement for DICOM v3.0  
Direction 2270669-100*

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

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

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

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

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

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

*ID/Net v3.0 Conformance Statements  
Direction: 2117016*

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

NEMA Publication  
1300 North 17th Street  
Suite 1847  
Rosslyn, VA 22209  
USA  
Dat\_Wall@nema.org  
Phone: (703) 841-3200

### 1.3 INTENDED AUDIENCE

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

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

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

#### 1.4 SCOPE AND FIELD OF APPLICATION

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

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

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

#### 1.5 IMPORTANT REMARKS

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

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non-GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.
- **Validation** - Testing the complete range of possible interactions between any GE device and non-GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non-GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the

interface between the GE imaging equipment and the non-GE device and the stability of the image data for the intended applications.

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

- **Future Evolution** - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM v3.0 Standard. DICOM v3.0 will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEMS protocol is based on DICOM v3.0 as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM v3.0. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements.** The user should ensure that any non-GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.
- **To be informed of the evolution of the implementation described in this document, the User is advised to regularly check the GE Internet Server, accessible via anonymous ftp (GE Internet Server Address: ftp.med.ge.com, 192.88.230.11).**
- **Interaction** - It is the sole responsibility of the **non-GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

## 1.6 REFERENCES

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

The information object implementation refers to DICOM PS 3.3 (Information Object Definition). The Positron Emission Tomography Information Object Definition is provided as part of DICOM Supplement 12.

## 1.7 DEFINITIONS

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

## 1.8 SYMBOLS AND ABBREVIATIONS

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

## 2. NETWORK CONFORMANCE STATEMENT

### 2.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the compliance to DICOM conformance requirements for the relevant **Networking** features on this GEMS product. Note that the format of this section strictly follows the format defined in DICOM Standard PS 3.2 (Conformance). Please refer to that part of the standard while reading this section.

The *Advance*<sup>TM</sup> provides sophisticated image processing and storage functions on Positron Emission Tomography (PET) data. In view of the requirements to conform to a global standard that permits interoperability across equipment produced by different vendors, *Advance* will provide support for DICOM 3.0.

The ability to Receive DICOM CT/MR images onto the PET Advance scanner allows Advance users to co-register and fuse the anatomical detail of the CT/MR images with the Functional PET images. This leverages the strengths of both modalities and maximizes Patient Treatment planning and tracking.

This section details the roles and DICOM Service Classes supported by the *Advance* product.

The *Advance* DICOM implementation allows the user to send PET Image, PET Curve and GE Advance Data acquired through the acquisition system or received from any other DICOM Compliant system to another DICOM station. For example, the user may wish to send data to another *Advance* station. In this situation *Advance* is providing the DICOM C-STORE service as a service class user (SCU). Advance is capable of receiving DICOM Data Sets from another DICOM compliant station. *Advance* also allows query and retrieve of data stored in its local database from a remote station and can query and retrieve images stored in a remote DICOM station. In this situation *Advance* is providing the DICOM C-FIND and C-MOVE services as a service class provider (SCP) and that of a DICOM C-FIND and C-MOVE service class user (SCU).

The *Advance* DICOM implementation also provides a verification mechanism by which a remote application entity (AE) can verify application-level communication with the *Advance* DICOM Server. Also provided is a mechanism by which an *Advance* user can verify application-level communication with a remote DICOM AE. In these situations, the *Advance* provides the C-ECHO service both as a SCP and SCU, respectively.

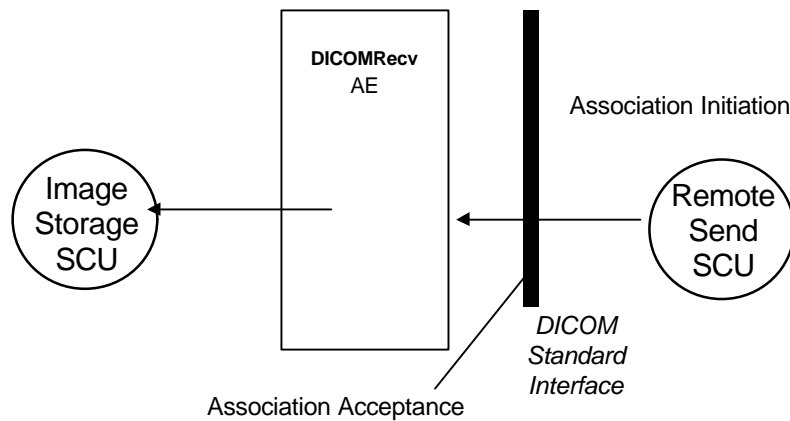
## 2.2 IMPLEMENTATION MODEL

All CT/MR DICOM Receive ( C-STORE SCP ) functionality on the PET Advance scanner is handled by the dicomRecv Server Application Entity ( AE). The DicomRecv server AE is listening to a pre-defined port ( 4050 ) for incoming connections. The Specific Application model for this device is shown in Ill 1.1.1.

All PET-DICOM / CT/MR DICOM Query functionality on the *Advance* product is logically provided by the ADVANCE\_DICOM Server AE. The ADVANCE\_DICOM Server AE is commanded to perform DICOM services through the use of the *Advance* Network Operations User Interface. The ADVANCE\_DICOM Server AE also listens on a pre-defined port for incoming connections from remote DICOM AEs.

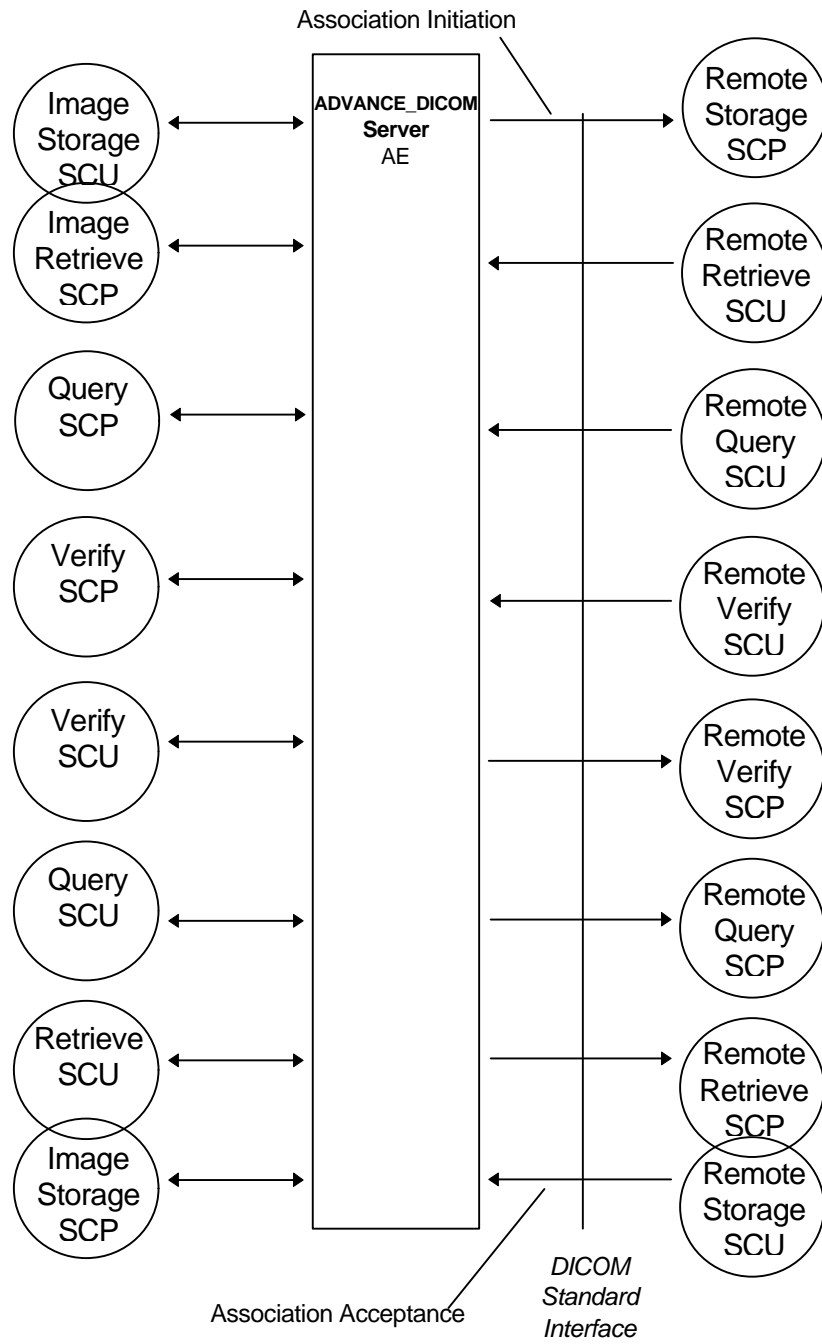
### 2.2.1 Application Data Flow Diagram

The Basic and Specific Application models for CT/MR Dicom Receive functionality are shown in the following Illustration :



There is no local real world event required for the DicomRecv AE to respond to an incoming CT/MR DICOM Store. The DicomRecv AE is always prepared to respond to a Image Store by any remote DicomRecv AE. The DicomRecv Server AE will perform the Real-World Activity Image Installation after the remote AE sends an image to the PET-Advance Scanner.

The Basic and Specific Application models for this device are shown in the following Illustration :



### 2.2.2 Functional Definition of AE's

The CT/MR Dicom Receive Server AE supports the following functions:

- Responds to DICOM associations transmitting images to be stored.

The ADVANCE\_DICOM Server AE initiates the following functions:

- *Store*: Initiates a DICOM association in order to send images, curves to a remote AE. If the remote AE accepts a presentation context applicable to the image(s), curve(s) being sent, the ADVANCE\_DICOM Server will send the images/curves data via the C-STORE service.
- *Verify*: Initiates a DICOM association in order to send a verification message to a remote AE via a C-ECHO-RQ message.
- *Query*: Initiates a DICOM association in order to query images on a remote AE. If the remote AE accepts a presentation context applicable to the query request(s) being sent, the ADVANCE\_DICOM Server will receive appropriate query responses via the C-FIND service.
- *Retrieve*: Initiates a DICOM association in order to fetch images/curves data from a remote AE. If the remote AE accepts a presentation context applicable to the retrieve request(s), the remote AE initiates a C-STORE-RQ to the ADVANCE\_DICOM Server AE. If this is acceptable to the ADVANCE\_DICOM Server AE, then, the image(s)/curve(s) data is(are) sent to the ADVANCE\_DICOM Server AE.

The ADVANCE\_DICOM Server AE responds to the following functions:

- *Store*: Responds to incoming C-STORE -RQ messages by storing the incoming data stream onto the disk.
- *Query*: Responds to incoming C-FIND-RQ messages by searching its local database for the requested attributes and returning a C-FIND-RSP message containing a match and a status of "pending." All other matches are also returned in C-FIND-RSP messages with status of "pending" until the last message which is returned with a status of "success." The remote AE can terminate the query by sending a C-CANCEL-FIND-RQ message.
- *Retrieve*: Responds to incoming C-MOVE-RQ messages by searching its local database for the requested image(s)/curve(s) data and returning each via a C-STORE-RQ message. The ADVANCE\_DICOM Server will return a C-MOVE -RSP message after each image is sent. The status returned is "pending" until the last image is sent, in which case the appropriate status is returned. The remote AE can terminate the retrieve by sending a C-CANCEL-MOVE-RQ message.
- *Verify*: Responds to incoming C-ECHO-RQ messages by returning a C-ECHO-RSP message with a status of "success."

### 2.2.3 Sequencing of Real-World Activities

Not Applicable.



**2.3 AE SPECIFICATIONS**

**2.3.1 DICOMRecv AE Specification**

This Application Entity provides Standard Conformance to the following DICOM V3.0 SOP classes as an **SCP**:

SOP Class Name	SOP Class UID
Verification ( Echo )	1.2.840.10008.1.1
CT Image Information Storage - STORE	1.2.840.10008.5.1.4.1.1.2
MR Image Information Storage - STORE	1.2.840.10008.5.1.4.1.1.4

**2.3.2 ADVANCE\_DICOM AE Specification**

This Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID
PET Image Storage	1.2.840.10008.5.1.4.1.1.128
PET Curve Storage	1.2.840.10008.5.1.4.1.1.129
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Verification SOP Class – ECHO	1.2.840.10008.1.1

This Application Entity provides Standard Conformance to the following DICOM V3.0 SOP Classes as an **SCP** :

SOP Class Name	SOP Class UID
PET Image Storage	1.2.840.10008.5.1.4.1.1.128
PET Curve Storage	1.2.840.10008.5.1.4.1.1.129
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2
Verification SOP Class	1.2.840.10008.1.1

### 2.3.2.1 Association Establishment Policies

#### 2.3.2.1.1 General

The DICOM Application Context Name for DICOMRecv AE, which is supported, is :

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

The Maximum Length PDU offered by the DicomRecv AE is :

Maximum Length PDU	10Kbytes
--------------------	----------

The SOP class Extended Negotiation is not supported. The user info items supported by this product are :

- Maximum PDU Length and,
- Implementation UID

Note: Max PDU length is not configurable at run time.

The DICOM Application Context Name (ACN) for ADVANCE\_DICOM\_AE , which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

The Maximum Length PDU negotiation is included in all association establishment requests.

The maximum length PDU for an association initiated by the ADVANCE\_DICOM AE is:

Maximum Length PDU	4 Kbytes
--------------------	----------

Note- The ADVANCE\_DICOM\_AE does not support a PDU length of zero.

The SOP Class Extended Negotiation is not supported.

The maximum number of Presentation Context Items that will be proposed is 8. Note that the same Abstract Syntax may be offered multiple times with different Transfer Syntaxes.

The user information Items sent by this product are :

- Maximum PDU Length
- Implementation UID
- Implementation Version Name

### 2.3.2.1.2 Number of Associations

The DicomRecv AE can have a maximum of 4 DICOM associations open simultaneously to receive an image store or respond to an echo. It should be noted, however, that system response time for the association will degrade with increasing simultaneous incoming associations. The slow response could trigger timers in remote systems. The system administrator should be aware of this situation.

The ADVANCE\_DICOM Server AE (SCU) will initiate only one DICOM association at a time to perform an image store to a single remote AE. Only one association can be open at any point of time in order to perform Send, Query and Retrieve operations

The ADVANCE\_DICOM Server AE (SCP) can have a maximum of eight DICOM associations open simultaneously to service queries, retrieves or verifications.

### 2.3.2.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

### 2.3.2.1.4 Implementation Identifying Information

The Implementation UID for this DICOM v3.0 Implementation is:

<i>DicomRecv</i> Implementation UID	1.2.840.113619.6.8.1
<i>Advance</i> Implementation UID	1.2.840.113619.6.64

The Implementation Version Name for this DICOM v3.0 Implementation is:

<i>Advance</i> Implementation Version Name	“GE Advance 4.0”
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### 2.3.2.2 Association Initiation Policy

The DICOMRecv AE does not attempt to initiate new associations.

The ADVANCE\_DICOM AE initiates a new association

- Due to an image send operation being initiated from the *Advance’s* Network Operations User interface
- Due to a Verify operation initiated to determine whether the remote DICOM station is operational.
- Due to image data being Queried from a Remote AE, the query operation being initiated from the *Advance’s* Network Operations User interface.
- Due to image data being Retrieved from a Remote AE, the retrieve operation being initiated from the *Advance’s* Network Operations User interface.

### 2.3.2.2.1 Real-World Activity : Send/Image Store

#### 2.3.2.2.1.1 Associated Real-World Activity

The operator must select the image type of data to be included for the transfer data to be transferred from the Patient Listing, and select a destination from the Network Operations User Interface. Once these selections have been made, the operator pushes the "Transfer" button to initiate an Send operation. The ADVANCE\_DICOM Server will then initiate an association with the remote AE in order to send the selected data.

Note that for each send operation, typically one association is established. The exception to this is that, if a send fails, the current association may be closed and another is opened for sending the remaining data (image(s)/curve(s) data).

The Transfer In Progress Window (TIPW) and the Transfer Status textual string on the bottom left hand corner of the Network Operations User Interface in association with the Transfer Log indicates the status of the data being transferred. The associated error messages due to a failed operation can be one of the following. The *Advance's* Error Log utility provides more detailed information regarding the cause of the error. -

- "%s - Transfer completed"
- "%s - Error during transfer"
- "%s - Transfer completed with errors"
- "DICOM Transfer operation has been canceled"
- Error while initializing DCM...
- Error connecting to a remote station via DICOM ...
- Error while deinitializing DCM
- Error while reading from database
- Error while connecting to database
- Error while disconnecting from database
- Error during translation
- Invalid DICOM Dictionary
- Cannot transfer Polar Map Imagesets via DICOM for this release
- Cannot transfer SINOGRAM imagesets via DICOM for this release
- Data Already exists in the database. Database Write did not take place
- "Remote station %s is down"
- "Sinogram Imagesets are not currently supported via DICOM transfer"

and one warning

- Warning! Dataset does not match SOP Class or Coercion of Data Elements.

*Note* - The symbol “%s” denotes the station name of the remote DICOM AE. In some cases this symbol could also be replaced by a combination of the patient name, date and station name.

### 2.3.2.2.1.2 Proposed Presentation Context Table

The following table shows the proposed presentation contexts for the ADVANCE\_DICOM AE, after the real-world activity “Send”

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

#### 2.3.2.2.1.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

This implementation can perform multiple C-STORE operations over a single association.

Upon receiving a C-STORE confirmation containing a Successful status, this implementation will perform the next C-STORE operation. The association will be maintained if possible.

Upon receiving a C-STORE confirmation containing a Refused status, this implementation will terminate the association.

Upon receiving a C-STORE confirmation containing a status other than Successful or Refused, this implementation will consider the current request to be a failure but will continue to attempt to send any remaining images in the request on a different association.

Each C-STORE operation supports a configurable “Association Timer.” This timer starts when the association request is sent or received and stops when the association is established. The default time-out value is 100 seconds.

Each C-STORE operation supports a configurable “Session Timer.” This timer starts when an association is established and stops when the association is ended. The default time-out value is 11400 seconds.

*Note* - A Session Timer of this duration is required to provide a mechanism for the transfer of a complete database between 2 Advance stations. The session timer starts with the transfer of the first image and terminates after the time-out value is reached.

If any of the above timers expires, the association is closed and the operation in progress is considered to be failed.

Following are the status codes that are more specifically processed when receiving messages from a **Storage** SCP equipment :

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Refused	A700	Out of resources	The message “NetDicom: Possible Memory Allocation Failure in Remote. Status <a700>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0902)
	A710	Image not written into remote SCP’s database.	The message “NetDicom: Remote system unable to write data into temporary file. Status <a710>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0902)
	A711	Internal Error in the remote SCP	The message “NetDicom: Remote system unable to post buffer to receive events. Status <a711>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0902)
	A712	Remote SCP could not determine size of total data buffer received from the SCU.	The message “NetDicom: Remote system unable to access-determine filesize of incoming data. Status <a712>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0902)
	A713	Remote SCP could not determine header data offset for Data IOD transmission	The message “NetDicom: Remote system unable to determine data offset in temporary file. Status <a713>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0902)
	A714	Remote SCP received invalid DICOM P-DATA packet from the SCU.	The message “NetDicom: Remote System received invalid data packet. Status <a714>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0902)
	A715	Remote SCP could not open temporary file in which it stored data received from the SCU.	The message “NetDicom: Remote System could not re-open temporary file for processing. Status <a715>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0902)

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
	A716	Remote SCP could not read data received from the SCU.	The message “NetDicom: Remote System could not read IOD. Status <a715>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0902)
Error	C000	Cannot Understand	The message “NetDicom: Remote system Error - Cannot Understand Error. Status <c000>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0901) (0000,0902)
	C001	Remote System failed to Parse DICOM Stream.	The message “NetDicom: Remote system could not parse DICOM stream. Translation Failed. Status <c001>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0901) (0000,0902)
	C002	Database Write Failed.	The message “NetDicom: Remote system error - Database write failed. Status <c002>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0901) (0000,0902)
	C003	Image already exists on the remote SCP.	The message “NetDicom: Remote system error - Duplicate Transmission! Image already exists. Status <c003>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0901) (0000,0902)
	A9xx	Data Set does not match SOP Class	The message “NetDicom: Remote system error - Data did not match SOP Class” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0901) (0000,0902)
Warning	B000	Coercion of Data Elements	The message “NetDicom: Remote system warning - Coercion of Data Elements. Status <b000>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0901) (0000,0902)
	B007	Data Set does not match SOP Class	The message “NetDicom: Remote system warning - IOD does not match SOP Class. Status <b007>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0901) (0000,0902)
	B006	Elements Discarded	The message “NetDicom: Remote system warning. Data elements discarded. Status <b006>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0901) (0000,0902)
Success	0000		The message “Transfer DB completed successfully” is posted onto the Transfer Log Window.;	None

*Note -The error codes A700-A716 and C001-C003 are Advance Private Status Codes. Advance stations will return one of the above mentioned status codes (Refused and Error) in case of Image Send Failure . DICOM PS3.4 provides the flexibility of returning private status codes. Advance uses them to provide more information to the Advance user in case of an Image Send failure.*

**2.3.2.2.2 Real-World Activity: Verify**

**2.3.2.2.2.1 Associated Real-World Activity**

Service personnel invoke the utility “DICOMping” from the UNIX command line. The ADVANCE\_DICOM server will initiate an association with the remote DICOM AE in order to verify communication at the application level. The success or failure of the verification process is displayed to the user.

**2.3.2.2.2.2 Proposed Presentation Context Table**

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

**2.3.2.2.2.2.1 SOP Specific DICOM Conformance Statement for Verification SOP Class**

The ADVANCE\_DICOM Server AE provides standard conformance to the DICOM Verification Service Class.

**2.3.2.2.3 Real-World Activity: Query**

**2.3.2.2.3.1 Associated Real-World Activity**

The *Advance* implements the query operation in two levels. The first level of query provides query results pertaining to the Patient & Study Tables only. The second level of query provides results regarding the Series table for a given Patient.

The operator must select a DICOM AE as the Source Station on the Advance’s Network Operations UI in order to initiate the DICOM Query operation. The ADVANCE\_DICOM Server will the initiate an association with the remote AE in order to query the remote AE. The Advance initiates a Universal Match (wild card query) for the study level query. The results of the query operation are indicated on the Level A box of the Network Operations UI. The status of the operation in case of a failure/warning is available through the *Advance*’s Error Log Utility.

The Second Level Query operation is initiated by the selection of one of the query results on the Level A box. With, the selection of one of these results a query operation is automatically initiated with no other user intervention. The ADVANCE\_DICOM Server will then initiate an association with the remote AE in order to query the remote AE for the given query result. The status of the operation in case of a failure/warning is available through the Advance’s Error Log Utility.

The *Advance* makes use of the Study Root Query Model to initiate a Search/Query operation. Details of this model are provided in Section 5 of this document.



Note that for each query operation, typically one association is established. The exception to this is that, if a query fails, the current association is closed and a new query operation is re-initiated automatically. If this fails as well, the operation terminates with a failure status and the appropriate errors are logged and are accessible through the *Advance*'s Error Log Utility.

The UI indicates the status of the on-going Query operation through a textual status on the bottom left hand corner of the Network Operations UI.

**2.3.2.2.3.2 Proposed Presentation Context Table**

The following table shows the proposed presentation contexts for the ADVANCE\_DICOM AE, after the real-world activity "Query"

Presentation Context Table – Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

**2.3.2.2.3.2.1 SOP Specific DICOM Conformance Statement for the Study Root Query/Retrieve Information Model - FIND SOP Class**

This implementation can perform multiple C-FIND operations over a single association.

Upon receiving a C-FIND confirmation containing a Successful status, this implementation will perform the next C-FIND operation. The association will be maintained if possible.

Upon receiving a C-FIND confirmation containing a Pending status, this implementation will wait for further C-FIND responses from the remote DICOM AE.

Upon receiving a C-FIND confirmation containing a Refused status, this implementation will terminate the association.

Upon receiving a C-FIND confirmation containing a status other than Successful, Pending or Refused, this implementation will consider the current request to be a failure but will continue to attempt to send any remaining images in the request on a different association.

Each C-FIND operation supports a configurable "Association Timer." This timer starts when the association request is sent or received and stops when the association is established. The default time-out value is 100 seconds.

Each C-FIND operation supports a configurable “Session Timer.” This timer starts when an association is established and stops when the association is ended. The default time-out value is 10800 seconds.

*Note* - A Session Timer of this duration is required to provide a mechanism for the transfer of a complete database between 2 Advance stations. The session timer starts with the transfer of the first image and terminates after the time-out value is reached.

If any of the above timers expires, the association is closed and the operation in progress is considered to be failed.

Following are the status codes that are more specifically processed when receiving messages from a **Query** SCP equipment :

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Refused	A700	Out of resources	The message “NetDicom: Possible Memory Allocation Failure in Remote. Status <a700>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0902)
Failed	A900	Identifier does not match SOP Class	The message “NetDicom: Remote system error - Data did not match SOP Class” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0901) (0000,0902)
	Cxxx	Unable to process	The message “NetDicom: Remote system Error - Cannot Understand Error. Status <cxix>” is posted onto the Error Log Utility on the <i>Advance</i> .	(0000,0901) (0000,0902)
Cancel	FE00	Matching terminated due to cancel	The message “Canceling DICOM Query” is posted on the bottom left hand corner of the Network Operations UI. This message persists as long as the Query is not canceled. Once the query operation is canceled, this message disappears.	None
Success	0000	Matching is complete - No final identifier is supplied	The message “Querying Remote station via DICOM” is posted on the bottom left hand corner of the Network Operations UI when the query operation is in progress. This message disappears once the query operation is complete.	None
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	The message “Querying Remote station via DICOM” is posted on the bottom left hand corner of the Network Operations UI. This message persists as long as the query operation is in progress.	Identifier
	FF01	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or	- No user visible output -	Identifier

	matching for this Identifier		
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#### 2.3.2.2.4 Real-World Activity: Retrieve

##### 2.3.2.2.4.1 Associated Real-World Activity

The *Advance* operator can fetch data from a remote DICOM AE in the following manner.

The second mechanism involves invocation of the Fetch/Transfer operation by the selection of one or more search results (Study/Series/Image results) on the Level A or Level B boxes on the Network Operations UI, and then pushing the "Transfer" button to initiate the operation. This mechanism assumes that the operator has preceded the Fetch with a Query operation. (The Query operation is automatically kicked off when the user selects a DICOM station as the Source Station from the Network Operations UI). The ADVANCE\_DICOM Server will then initiate an association with the remote AE in order to fetch DICOM imagesets from the remote AE for the given Study/Series/Image selection. The status of the operation is logged onto the Transfer Log.

The *Advance* makes use of the Study Root Query Model to initiate a Fetch/Retrieve operation. Details of this model are provided in Section 5 of this document.

Note that for each retrieve operation, typically one association is established. The exception to this is that, if a retrieve fails, the current association is closed and another is opened for retrieving the remaining data (image(s), curves data).

The UI indicates the status of the on-going Retrieve/Fetch/Transfer operation through the Transfer in Progress Window and a textual status on the bottom left hand corner of the Network Operations UI, which indicates the status of the Retrieve operation. Typical error messages that may appear on the Transfer Log after the completion of a Retrieve operation can be one of the following -

- "%s - Transfer completed"
- "%s - Error during transfer"
- "%s - Transfer completed with errors"
- "DICOM Transfer operation has been canceled"
- Error while initializing DCM...
- Error connecting to a remote station via DICOM ...
- Error while deinitializing DCM
- Error during translation
- Invalid DICOM Dictionary
- "%s - Error while fetching from remote station"

- "%s - Fetched from remote station"
- "DICOM Fetch completed on remote station"
- "DICOM Fetch completed with errors. %d items not fetched"
- "DICOM Fetch completed because of user cancel. %d items not fetched"
- "Selected exams have no imagesets to transfer"
- "Remote station %s is down"
- "Sinogram Imagesets are not currently supported via DICOM transfer"
- "PolarMap/BullsEye Imagesets are not currently supported via DICOM transfer"
- "Already exists in the local database. Not fetching from remote"

*Note* - The symbol “%s” denotes the station name of the remote DICOM AE. In some cases this symbol could also be replaced by a combination of the patient name, date and station name. The symbol “%d” denotes an integer value.

**2.3.2.2.4.2 Proposed Presentation Context Table**

The following table shows the proposed presentation contexts for the ADVANCE\_DICOM AE, after the real-world activity “Retrieve”

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

**2.3.2.2.4.2.1 SOP Specific DICOM Conformance Statement for the Study Root Query/Retrieve Information Model - MOVE SOP Class**

This implementation can perform multiple C-MOVE operations over a single association.

Upon receiving a C-MOVE confirmation containing a Successful status, this implementation will perform the next C-MOVE operation. The association will be maintained if possible.

Upon receiving a C-MOVE confirmation containing a Pending status, this implementation will wait for further C-MOVE responses from the remote DICOM AE.

Upon receiving a C-MOVE confirmation containing a Refused status, this implementation will terminate the association.

Upon receiving a C-MOVE confirmation containing a status other than Successful, Pending or Refused, this implementation will consider the current request to be a failure but will continue to attempt to send any remaining images in the request on a different association.

Each C-MOVE operation supports a configurable “Association Timer.” This timer starts when the association request is sent or received and stops when the association is established. The default time-out value is 100 seconds.

Each C-MOVE operation supports a configurable “Session Timer.” This timer starts when an association is established and stops when the association is ended. The default time-out value is 10800 seconds.

**Note** - A Session Timer of this duration is required to provide a mechanism for the transfer of a complete database between 2 Advance stations. The session timer starts with the transfer of the first image and terminates after the time-out value is reached.

If any of the above timers expires, the association is closed and the operation in progress is considered to be failed.

Following are the status codes that are more specifically processed when receiving messages from a **Retrieve SCP** equipment :

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Refused	A701	Out of resources - Unable to calculate number of matches	The message “Error! Remote station could not send data” is posted on the Transfer Log on the Network Operations UI.	(0000,0902)
	A702	Out of resources - Unable to perform sub-operations	The message “Error! Remote station could not send data” is posted on the Transfer Log on the Network Operations UI.	(0000,1021) (0000,1022) (0000,1023)
	A801	Move Destination Unknown	The message “Error! Remote station is not configured to send data to local station” is posted on the Transfer Log on the Network Operations UI.	(0000,0902)
Failed	A900	Identifier does not match SOP Class	The message “Error! Remote station could not match identifier with SOP Class” is posted on the Transfer Log on the Network Operations UI.	(0000,0901) (0000,0902)
	Cxxx	Unable to process	The message “Error! Remote station failed in processing data” is posted on the Transfer Log on the Network Operations UI.	(0000,0901) (0000,0902)
Cancel	FE00	Sub-operations terminated due to a Cancel indication	The message “DICOM Fetch completed because of user cancel. N items not fetched.” is posted on the	(0000,1020) (0000,1021) (0000,1022)

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
			Transfer Log on the Network Operations UI.	(0000,1023)
Warning	B000	Sub-operations Complete - One or more Failures.	The message “Warning status received from remote DICOM station during fetch” is posted on the Transfer Log on the Network Operations UI.	(0000,1021) (0000,1022) (0000,1023)
Success	0000	Sub-operations Complete - No Failure.	The message “DICOM Fetch completed on remote station” is posted on the Transfer Log on the Network Operations UI.	(0000,1021) (0000,1022) (0000,1023)
Pending	FF00	Sub-operations are continuing -	The message “Transfer DB started” is posted on the Transfer Log on the Network Operations UI.	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

### 2.3.2.3 Association Acceptance Policy

The DICOMRecv AE Server does not place any limitation on whom may connect to it.

The ADVANCE\_DICOM Server AE places limitation on whom may connect to it depending on its configuration.

The ADVANCE\_DICOM Server AE responds to image store operations from remote AE's. Any Remote AE can request and receive a list of images located in the local *Advance* database. Any Remote AE can send images (PET Image/Stand alone Curve/PET Curve/GE Advance Data) to the *Advance* to be stored in the local database.

Any remote AE can open an association to the ADVANCE\_DICOM Server AE for the purpose of application level communication verification.

The ADVANCE\_DICOM Server AE responds to query requests from remote AE's and responds with matching responses if remote AE is configured in PET Advance. Remote AE can also request the ADVANCE\_DICOM Server AE to retrieve image data from the *Advance*, and to store this data in the database of the remote AE.

#### 2.3.2.3.1 Real-World Activity - Image Store SCP

##### 2.3.2.3.1.1 Associated Real-World Activity

When the DICOMRecv Server AE accepts an association, it will receive DICOM CT or MR images transmitted on that association and store the images on disk. This AE is indefinitely listening for associations. No operator action is required to receive an image. The Real world activity associated with the C-STORE operation is a two-step storage of the DICOM CT/MR image received into the PET Advance Scanner Database. First, DICOM CT/MR images are received and written to a Unix file (one file

per image). A second process reads these Unix file, translates the data into the PET Advance Database format and then writes the image into the PET Advance Database.

The DICOM Server AE is always listening for associations. No operator action is required to respond to a Store request.

The real-world activity associated with the Store request is to store the image data in the local database and send a C-STORE -RSP message with the status of “success” for each image that can be stored in the local database. A C-STORE-RSP message with the status “failed” is sent for each image that cannot be stored in the local database.

**2.3.2.3.1.2 Accepted Presentation Context Table**

The following are the Presentation Context supported by DICOMRecv AE Server.

<b>Presentation Context Table – Accepted</b>					
<b>Abstract Syntax</b>		<b>Transfer Syntax</b>		<b>Role</b>	<b>Extended Negotiation</b>
<b>Name</b>	<b>UID</b>	<b>Name List</b>	<b>UID List</b>		
Verification	1.2.840.10008.1.1	Little Endian	1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Little Endian	1.2.840.10008.1.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Little Endian	1.2.840.10008.1.2	SCP	None

The following are the Presentation Context supported by ADVANCE\_DICOM\_AE Server :

<b>Presentation Context Table – Accepted</b>					
<b>Abstract Syntax</b>		<b>Transfer Syntax</b>		<b>Role</b>	<b>Extended Negotiation</b>
<b>Name</b>	<b>UID</b>	<b>Name List</b>	<b>UID List</b>		
PET Image Storage	1.2.840.10008.5.1.4.1.1.128	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
PET Curve Storage	1.2.840.10008.5.1.4.1.1.129	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Standalone Curve Storage	1.2.840.10008.5.1.4.1.1.9	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

		Explicit VR Big Endian			
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**2.3.2.3.1.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes**

The DICOMRecv AE Server provides standard conformance to the DICOM Verification Service Class. The DICOMRecv AE conforms to the SOP's of the Storage Service Class at Level 0 ( local ). A list of attributes saved can be found in the Appendix A.

The *Advance* provides Level 1 Storage support as defined in the DICOM Standards. (Refer DICOM PS3.4 for further details on level of conformance). Following are the status codes the application may send back to the SCU Equipment after performing the requested **Storage** :

Service Status	Status Codes	Further Meaning	Status Code sending explanation	Related Fields sent back to the SCU
Refused	A700	Out of resources	Insufficient memory to carry out further operations.	(0000,0902)
	A710	Image not written into SCP's database.	Unable to write incoming image data into temporary file. Mainly due to non-availability of system resources.	(0000,0902)
	A711	Internal Error in the SCP	Unable to post a buffer to receive events from the SCU.	(0000,0902)
	A712	SCP could not determine size of total data buffer received from the SCU.	Unable to access-determine filesize of incoming data.	(0000,0902)
	A713	SCP could not determine header data offset for Data IOD transmission	Unable to determine data offset in temporary file.	(0000,0902)
	A714	SCP received invalid DICOM P-DATA packet from the SCU.	Received invalid data packet from SCU.	(0000,0902)
	A715	SCP could not open temporary file in which it stored data received from the SCU.	Could not re-open temporary file for processing..	(0000,0902)
	A716	SCP could not read data received from the SCU.	Cold not read IOD received from the SCU.	(0000,0902)
Error	C000	Cannot Understand	Cannot Understand Error.	(0000,0901) (0000,0902)
	C001	System failed to Parse DICOM Stream.	Could not parse DICOM stream. Translation Failed..	(0000,0901) (0000,0902)
	C002	Database Write Failed.	Database write failed.	(0000,0901) (0000,0902)
	C003	Image already exists on the SCP.	Duplicate Transmission! Image already exists in the local database.	(0000,0901) (0000,0902)
	A9xx	Data Set does not match SOP	Data did not match SOP Class	(0000,0901)

Service Status	Status Codes	Further Meaning	Status Code sending explanation	Related Fields sent back to the SCU
		Class		(0000,0902)
Warning	B000	Coercion of Data Elements	Coercion of Data Elements.	(0000,0901) (0000,0902)
	B007	Data Set does not match SOP Class	IOD does not match SOP Class.	(0000,0901) (0000,0902)
	B006	Elements Discarded	Data elements discarded.	(0000,0901) (0000,0902)
Success	0000			None

*Note -The error codes A700-A716 and C001-C003 are Advance Private Status Codes. Advance stations will return one of the above mentioned status codes (Refused and Error) in case of Image Send Failure . DICOM PS3.4 provides the flexibility of returning private status codes. Advance uses them to provide more information to the Advance user in case of an Image Send failure.*

**2.3.2.3.1.3 Presentation Context Acceptance Criterion**

The Presentation Context accepted by the ADVANCE\_DICOM Server has to be one supported by the ADVANCE\_DICOM Server and to which the remote Image Store SCU has accorded the highest priority.

**2.3.2.3.1.4 Transfer Syntax Selection Policies**

No specific Transfer Syntax selection policy is applied for a given presentation context. The first transfer syntax to be proposed amongst a set of transfer syntax for a given SOP class, by the SCU, will be considered for negotiation by the ADVANCE\_DICOM Server. However, if the ADVANCE\_DICOM Server fails to support this transfer syntax, it shall then negotiate with the next transfer syntax proposed by the remote SCU, for the specific SOP class in question and so on. If the ADVANCE\_DICOM Server does not support any of the transfer syntax proposed by the SCU, the association negotiation shall fail.

**2.3.2.3.2 Real-World Activity: Query SCP**

**2.3.2.3.2.1 Associated Real-World Activity**

The ADVANCE\_DICOM Server AE is always listening for associations. No operator action is required to respond to Query request.

The real-world activity associated with the Query request is to search the local database for all entries that match the request and send a C-FIND-RSP message with the status of “pending” for each matching entry. The exception to this is the last message which is sent with a status of “success.”

2.3.2.3.2.2 Accepted Presentation Context Table

Presentation Context Table - Accepted					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

Note that this implementation does not support extended negotiation for the C-FIND Service, including that for relational-queries..SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model - FIND , Study Root Query/Retrieve Information Model - FIND and Patient/Study Only Query/Retrieve Information Model - FIND SOP Classes

Following are the status codes the Application may send back to the SCU Equipment after performing the requested **Query** :

Service Status	Status Codes	Further Meaning	Status Code sending explanation	Related Fields Processed if received
Refused	A700	Out of resources	Returned if the DICOM Server runs out of resources (e.g. memory); error logged.	(0000,0902)
Failed	A900	Identifier does not match SOP Class	Returned if the incoming data did not match SOP Class	(0000,0901) (0000,0902)
	Cxxx	Unable to process	Returned by the DICOM Server if for any other reason, not specified elsewhere in this table, the Find operation failed; error logged.	(0000,0901) (0000,0902)
Cancel	FE00	Matching terminated due to cancel	Returned if the DICOM Server receives a C-CANCEL-FIND-RQ message; error logged.	None
Success	0000	Matching is complete - No final identifier is supplied	Returned when the DICOM Server completes the find operation.	None

Service Status	Status Codes	Further Meaning	Status Code sending explanation	Related Fields Processed if received
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Returned by the DICOM Server for every match found.	Identifier
	FF01	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	Returned by the DICOM Server if one or more Optional Keys were not supported for existence and/or matching.	Identifier

**2.3.2.3.2.3 Presentation Context Acceptance Criterion**

The Presentation Context accepted by the ADVANCE\_DICOM Server has to be one supported by the ADVANCE\_DICOM Server and to which the remote Query SCU has accorded the highest priority.

**2.3.2.3.2.4 Transfer Syntax Selection Policies**

No specific Transfer Syntax selection policy is applied for a given presentation context. The first transfer syntax to be proposed amongst a set of transfer syntax for a given SOP class, by the SCU, will be considered for negotiation by the ADVANCE\_DICOM Server. However, if the ADVANCE\_DICOM Server fails to support this transfer syntax, it shall then negotiate with the next transfer syntax proposed by the remote SCU, for the specific SOP class in question and so on. If the ADVANCE\_DICOM Server does not support any of the transfer syntax proposed by the SCU, the association negotiation shall fail.

**2.3.2.3.3 Real-World Activity: Image Retrieve SCP**

**2.3.2.3.3.1 Associated Real-World Activity**

The ADVANCE\_DICOM Server AE is always listening for associations. No operator action is required to respond to an Image Retrieve request.

The real-world activity associated with the Image Retrieve request is to send all images, curves data corresponding to the C-MOVE request to the specified destination AE through a separate association.

**2.3.2.3.3.2 Accepted Presentation Context Table**

Presentation Context Table - Accepted					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		

Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

Note that this implementation does not support extended negotiation for the C-MOVE Service, including that for relational-retrieve.

**2.3.2.3.3.2.1 SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model - MOVE , Study Root Query/Retrieve Information Model - MOVE SOP Classes**

Following are the status codes the Application may send back to the SCU Equipment after performing the requested **Retrieve** :

Service Status	Status Codes	Further Meaning	Status Code sending explanation	Related Fields Processed if received
Refused	A701	Out of resources - Unable to calculate number of matches	Returned if the DICOM Server can't find requested SOP instance(s); error logged.	(0000,0902)
	A702	Out of resources - Unable to perform sub-operations	Returned if the DICOM Server runs out of resources (e.g. memory); error logged.	(0000,1021) (0000,1022) (0000,1023)
	A801	Move Destination Unknown	Returned if the DICOM Server has no information on destination AE; error logged.	(0000,0902)
Failed	A900	Identifier does not match SOP Class	Returned if the DICOM Server receives other than the Patient Root Query/Retrieve Information Model or Study Root Query/Retrieve Information Model SOP class.	(0000,0901) (0000,0902)
	Cxxx	Unable to process	Returned if the DICOM Server cannot successfully interpret the C-MOVE-RQ message.	(0000,0901) (0000,0902)
Cancel	FE00	Sub-operations terminated due to a Cancel indication	Returned if the DICOM Server receives a C-CANCEL-MOVE-RQ message.	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	B000	Sub-operations Complete - One or more Failures.	Returned upon completion if one or more of the specified images failed to transfer to the destination AE.	(0000,1021) (0000,1022) (0000,1023)
Success	0000	Sub-operations Complete - No	Returned after the transfer of the last image.	(0000,1021)

Service Status	Status Codes	Further Meaning	Status Code sending explanation	Related Fields Processed if received
		Failure.		(0000,1022) (0000,1023)
Pending	FF00	Sub-operations are continuing -	Returned after the transfer of each imageset (series) except for the last.	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

**2.3.2.3.3.3 Presentation Context Acceptance Criterion**

The Presentation Context accepted by the ADVANCE\_DICOM Server has to be one supported by the ADVANCE\_DICOM Server and to which the remote Retrieve SCU has accorded the highest priority.

**2.3.2.3.3.4 Transfer Syntax Selection Policies**

No specific Transfer Syntax selection policy is applied for a given presentation context. The first transfer syntax to be proposed amongst a set of transfer syntax for a given SOP class, by the SCU, will be considered for negotiation by the ADVANCE\_DICOM Server. However, if the ADVANCE\_DICOM Server fails to support this transfer syntax, it shall then negotiate with the next transfer syntax proposed by the remote SCU, for the specific SOP class in question and so on. If the ADVANCE\_DICOM Server does not support any of the transfer syntax proposed by the SCU, the association negotiation shall fail.

**2.3.2.3.4 Real-World Activity: Verify SCP**

**2.3.2.3.4.1 Associated Real-World Activity**

The ADVANCE\_DICOM Server AE is always listening for associations. No operator action is required to respond to a Verification request.

The real-world activity associated with the Verification request is to send a C-ECHO-RSP message with a status of “success” to the requesting AE.

**2.3.2.3.4.2 Accepted Presentation Context Table**

Presentation Context Table - Accepted					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

#### 2.3.2.3.4.2.1 SOP Specific DICOM Conformance Statement for Verification SOP Class

The ADVANCE\_DICOM Server AE provides standard conformance to the DICOM Verification service class.

#### 2.3.2.3.4.3 Presentation Context Acceptance Criterion

The Presentation Context accepted by the ADVANCE\_DICOM Server has to be one supported by the ADVANCE\_DICOM Server and to which the remote Verification SCU has accorded the highest priority.

#### 2.3.2.3.4.4 Transfer Syntax Selection Policies

No specific Transfer Syntax selection policy is applied for a given presentation context. The first transfer syntax to be proposed amongst a set of transfer syntax for a given SOP class, by the SCU, will be considered for negotiation by the ADVANCE\_DICOM Server. However, if the ADVANCE\_DICOM Server fails to support this transfer syntax, it shall then negotiate with the next transfer syntax proposed by the remote SCU, for the specific SOP class in question and so on. If the ADVANCE\_DICOM Server does not support any of the transfer syntax proposed by the SCU, the association negotiation shall fail.

### 2.4 COMMUNICATION PROFILES

#### 2.4.1 Supported Communication Stacks (PS 3.8, PS 3.9)

DICOM Upper Layer (PS 3.8) is supported using TCP/IP.

#### 2.4.2 OSI Stack

OSI stack not supported

#### 2.4.3 TCP/IP Stack

The TCP/IP stack is inherited from a UNIX Operating System.

##### 2.4.3.1 API

Not applicable to this product.

##### 2.4.3.2 Physical Media Support

DICOM is indifferent to the Physical medium over which TCP/IP executes (e.g. Ethernet V2.0, IEEE 802.3, ATM, FDDI)

**Note:** For more information about the Physical Media available on the *Advance*, please refer to the Product Data Sheet.

#### 2.4.4 Point-to-Point Stack

A 50-pin ACR-NEMA connection is not applicable to this product.

### 2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

#### 2.5.1 Standard Extended /Specialized/Private SOPs

#### 2.5.2 Private Transfer Syntaxes

The *Advance* does not implement any private transfer syntaxes.

### 2.6 CONFIGURATION

The *Advance* system is configured by GEMS Field Service Engineers. The DICOM configuration items below are configurable or re-configurable by a Field Service Engineer but are not accessible through the *Advance* user interface.

#### 2.6.1 AE Title/Presentation Address Mapping

The *Advance* allows for the configuration of the mapping of remote AE titles to IP addresses and ports. The IP address of a remote AE may be in a different sub net (using routing). This configuration is performed by GEMS Field Service Engineers.

#### 2.6.2 Configurable Parameters

The following fields are configurable for the ADVANCE\_DICOM Server AE (local):

- Local AE Title (set to hostname of the Advance computer in all capitals (CAPS) )
- Local IP Address
- Local IP Netmask

Note that the port on which the *Advance* receives DICOM incoming TCP/IP connections is **4030**.

The following fields are configurable for every remote DICOM AE:

- Remote AE Title
- Remote IP Address
- Listening TCP/IP Port Number

The following fields are configurable:

- Association Establishment Timer
- Store, Find, Move, Timers
- Inactivity Timers
- Maximum Length PDU



- Number of simultaneous associations

**Note:**

All configurations must be performed by a GE Field Engineer.

**2.7 SUPPORT OF EXTENDED CHARACTER SETS**

No extended character sets are supported.

## 3. PET INFORMATION OBJECT IMPLEMENTATION

### 3.1 INTRODUCTION

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

3.2- PET Image IOD Description

3.3- PET Image IOD Entity-Relationship Model

3.4- PET Image IOD Module Table

3.5- PET Image Information Module Definitions

### 3.2 PET IMAGE IOD IMPLEMENTATION

The *Advance* implementation of DICOM uses the PET image format when creating image objects. In order to preserve full fidelity when transferring data to an *Advance* workstation, some specialized database information is encoded as private DICOM attributes. All of the Standard and private attributes used are defined in the module tables. The *Advance* private data dictionary is included in Section 3.6. Nevertheless, the *Advance* is able to process PET DICOM images without any private data elements.

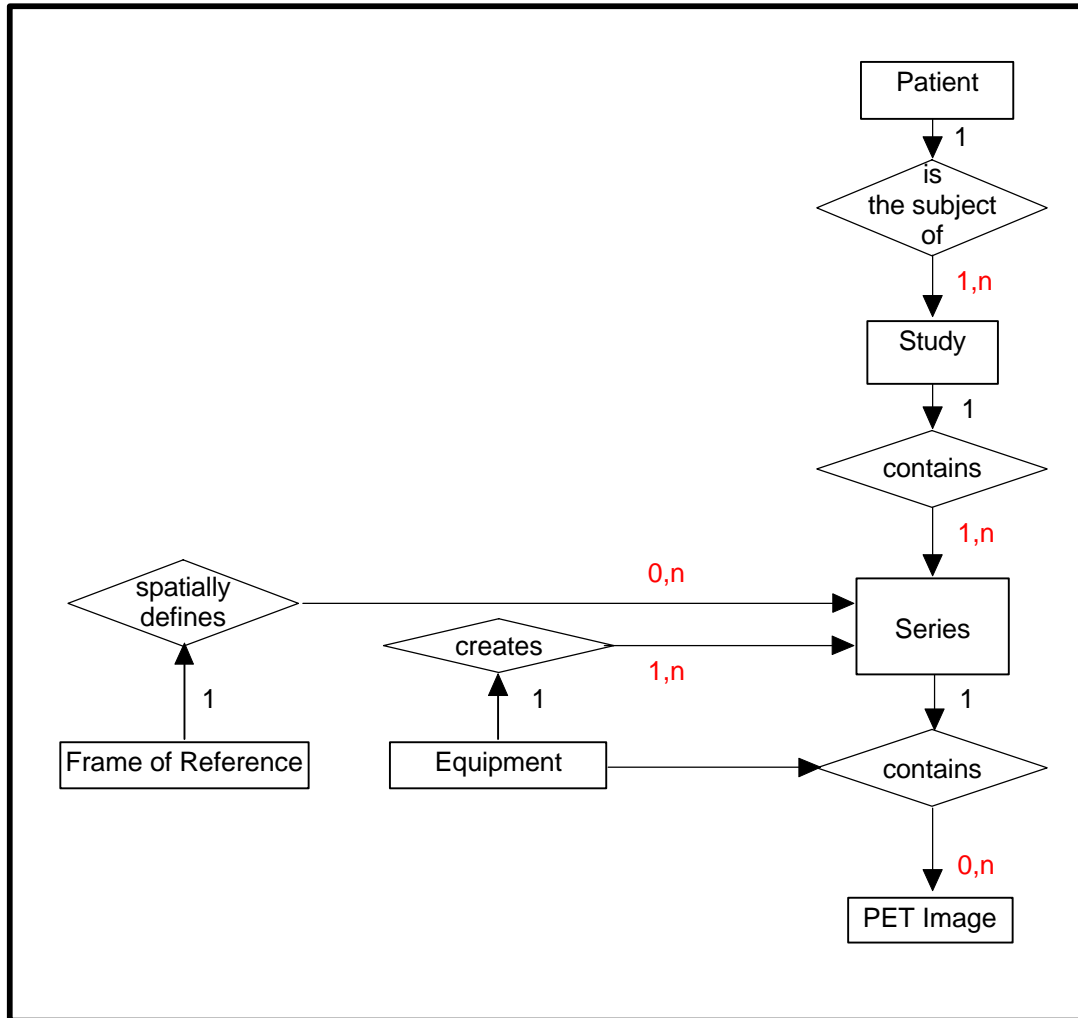
### 3.3 PET IMAGE ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the PET Image interoperability schema is shown in Illustration 3.3-1. 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 Study for each Patient (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 3.3-1  
PET IMAGE ENTITY RELATIONSHIP DIAGRAM



### 3.3.1 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.

#### 3.3.1.1 Patient Entity Description

The Patient Entity defines the characteristics of a patient who is the subject of one or more medical studies which produce medical images.

#### 3.3.1.2 Study Entity Description

The Study Entity defines the characteristics of a medical study performed on a patient. A study is a collection of one or more series of medical images which are logically related for the purpose of diagnosing a patient. Each study is associated with exactly one patient.

### 3.3.1.3 Series Entity Description

The Series Entity defines the attributes which are used to group images into distinct logical sets. Each series is associated with exactly one study.

### 3.3.1.4 Equipment Entity Description

The Equipment Entity describes the particular imaging device which produced the series of images. An imaging device may produce one or more series within a study. The Equipment Entity does not describe the data acquisition or image creation Attributes used to generate images within a series.

### 3.3.1.5 Frame of Reference Entity Description

The Frame of Reference Entity identifies the coordinate system which conveys spatial and/or temporal information of images in a series.

### 3.3.1.6 PET Image Entity Description

The PET Image Entity defines the attributes which describe the pixel data of a PET image. The pixel data is generated as a direct result of patient scanning (an ORIGINAL image) or it is derived from an original image through image processing steps (a DERIVED image). An image is defined by its image plane, pixel data characteristics, gray scale and/or color mapping characteristics and modality specific characteristics (acquisition parameters and image creation information).

## 3.3.2 Advance Mapping of DICOM entities

TABLE 3.3-1  
MAPPING OF DICOM ENTITIES TO ADVANCE ENTITIES

DICOM	Advance Entity
Patient	Patient
Study	Exam
Series	Imageset
Image	Image

## 3.4 PET IMAGE IOD MODULE TABLE

Within an entity of the DICOM v3.0 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 3.4-1 identifies the defined modules within the entities which comprise the DICOM v3.0 PET IOD. Modules are identified by Module Name.

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

**TABLE 3.4-1  
PET IMAGE IOD MODULES**

Entity Name	Module Name	Reference
Patient	Patient	3.5.1.1
	GE Advance Patient	3.5.1.2
Study	General Study	3.5.2.1
	Patient Study	3.5.2.2
	GE Advance Exam	3.5.2.3
Series	General Series	3.5.3.1
	PET Series	3.5.3.2
	PET Isotope	3.5.3.3
	PET Multi-gated Acquisition	3.5.3.4
	NM/PET Patient Orientation	3.5.3.5
	GE Advance Imageset	3.5.3.6
	GE Advance Scan	3.5.3.7
	Frame of Reference	Frame of Reference
Equipment	General Equipment	3.5.5.1
Image	General Image	3.5.6.1
	Image Plane	3.5.6.2
	Image Pixel	3.5.6.3
	PET Image	3.5.6.4
	Overlay Plane	3.5.6.5
	VOI LUT	3.5.6.6
	GE Advance Image	3.5.6.7
	GE Advance Frame	3.5.6.8
	GE Advance ROI	3.5.6.9
	GE Advance Annotation	3.5.6.10
General Modules	SOP Common	3.5.7.1

### 3.5 PET IMAGE 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 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 all the attributes are taken from respective tables in PET Advance Database. It should be noted that they are the same ones as defined in the DICOM v3.0 Standard Part 3 (Information Object Definitions).

### 3.5.1 Common Patient Entity Modules

#### 3.5.1.1 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 3.5-1  
PATIENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (Advance Patient table unless otherwise specified)	Notes
Patient's Name	(0010,0010)	2	PN (64)	1	patient_name	
Patient ID	(0010,0020)	2	LO (64)	1	patient_identifier	
Patient's Birth Date	(0010,0030)	2	DA (26)	1	birthdate	
Patient's Sex	(0010,0040)	2	CS (16)	1	sex	
Referenced Patient Sequence	(0008,1120)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
>Referenced SOP Instance UID	(0008,1155)	1C	UI	1	Not Used	
Patient's Birth Time	(0010,0032)	3	TM	1	Not Used	
Other Patient IDs	(0010,1000)	3	LO	1-n	Not Used	
Other Patient Names	(0010,1001)	3	PN	1-n	Not Used	
Ethnic Group	(0010,2160)	3	SH	1	Not Used	
Patient Comments	(0010,4000)	3	LT	1	Not Used	

#### 3.5.1.2 GE Advance Patient

Refer to Section 3.6.2 for details.

### 3.5.2 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.

### 3.5.2.1 General Study Module

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

**TABLE 3.5-2  
GENERAL STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Exam table unless otherwise specified)	Notes
Study Instance UID	(0020,000D)	1	UI	1	study_uid	
Study Date	(0008,0020)	2	DA	1	extract date from exam_datetime	
Study Time	(0008,0030)	2	TM	1	extract time exam_datetime	
Referring Physician's Name	(0008,0090)	2	PN	1	ref_physician	
Study ID	(0020,0010)	2	SH	1	study_identifier	
Accession Number	(0008,0050)	2	SH	1	requisition	
Study Description	(0008,1030)	3	LO	1	exam_desc	
Physician(s) of Record	(0008,1048)	3	PN	1-n	Not Used	
Name of Physician(s) Reading Study	(0008,1060)	3	PN	1-n	diagnostician	
Referenced Study Sequence	(0008,1110)	3	SQ	1	Not Used	
> Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
> Referenced SOP Instance UID	(0008,1155)	1C	UI	1	Not Used	

### 3.5.2.2 Patient Study Module

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

**TABLE 3.5-3  
PATIENT STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Exam table unless otherwise specified)	Notes
Admitting Diagnosis Description	(0008,1080)	3	LO	1-n	Not Used	
Patient's Age	(0010,1010)	3	AS	1	truncate years from (Exam.exam_datetime - Patient.patient_birthdate)	
Patient's Size	(0010,1020)	3	DS	1	patient_ht / 100.0 (convert cm to m)	
Patient's Weight	(0010,1030)	3	DS	1	patient_wt	
Occupation	(0010,2180)	3	SH	1	Not Used	
Additional Patient's History	(0010,21B0)	3	LT	1	patient_history	

### 3.5.2.3 GE Advance Exam Module

Refer to Section 3.6.3 for details.

### 3.5.3 Common Series Entity Modules

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

#### 3.5.3.1 General Series Module

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

**TABLE 3.5-4  
GENERAL SERIES MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
Modality	(0008,0060)	1	CS	1	Exam.modality	
Series Instance UID	(0020,000E)	1	UI	1	IF (SOP Class UID == "1.2.840.113619.4.30") THEN = Scan.scan_id ELSE = image_set_id	
Series Number	(0020,0011)	2	IS	1	series_number	
Laterality	(0020,0060)	2C	CS	1	Not Used	
Series Date	(0008,0021)	3	DA	1	superceded by PET Series.Series Date (0008,0021)	
Series Time	(0008,0031)	3	TM	1	superceded by PET Series.Series Time (0008,0031)	
Performing Physician's Name	(0008,1050)	3	PN	1-n	Not Used	
Protocol Name	(0018,1030)	3	LO	1	Not Used	
Series Description	(0008,103E)	3	LO	1	IF (SOP Class UID == "1.2.840.113619.4.30") THEN = Scan.scan_description ELSE = is_description	
Operators' Name	(0008,1070)	3	PN	1-n	Exam.operator	
Referenced Study Component Sequence	(0008,1111)	3	SQ	1	Not Used	
> Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
> Referenced SOP Instance	(0008,1155)	1C	UI	1	Not Used	



Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
UID						
Body Part Examined	(0018,0015)	3	CS	1	Not Used	
Patient Position	(0018,5100)	2C	CS	1	Scan.patient_position, Frame.patient_entry	
Smallest Pixel Value in Series	(0028,0108)	3	US/SS	1	Not Used	
Largest Pixel Value in Series	(0028,0109)	3	US/SS	1	Not Used	

## 3.5.3.2 PET Series Module

TABLE 3.5-5

## PET SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
Series Date	(0008,0021)	1	DA	1	extract date from Scan.scan_datetime	
Series Time	(0008,0031)	1	TM	1	extract time from Scan.scan_datetime	
Counts Source	(0054,1002)	1	CS	1	Scan.scan_type	
Units	(0054,1001)	1	CS	1	units	
Series Type	(0054,1000)	1	CS	2	is_contents Scan.scan_mode	
Reprojection Method	(0054,1004)	2C	CS	1	is_contents	
Number of R-R Intervals	(0054,0061)	1C	US	1	IF (Scan.scan_mode == [ gated ] ) THEN Count the unique image.image_bin_time for images with Image.image_set_id = thisSOPInstance.ImageSetID ELSE = NULL	
Number of Time Slots	(0054,0071)	1C	US	1	IF (Scan.scan_mode == [ gated ] ) THEN = 1 ELSE = NULL	
Number of Time Slices	(0054,0101)	1C	US	1	Count the unique image.image_time for images with Image.image_set_id = thisSOPInstance.ImageSetID	
Number of Slices	(0054,0081)	1	US	1	Count the unique image.image_location for images with Image.image_set_id =	

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
					thisSOPInstance.ImageSetID	
Corrected Image	(0028,0051)	2	CS	1-n	many	
Randoms Correction Method	(0054,1100)	3	CS	1	IF (Scan.scan_type = [ emission ] THEN TR 14: emiss_randoms trans_randoms = NULL ELSE TR 14: trans_randoms emiss_randoms = NULL	
Attenuation Correction Method	(0054,1101)	3	LO	1	attenuation atten_coefficient atten_smooth	
Scatter Correction Method	(0054,1105)	3	LO	1	scatter	
Decay Correction	(0054,1102)	1	CS	1	decay	
Reconstruction Diameter	(0018,1100)	3	DS	1	bp_dfov * 10.0 (cm to mm)	
Convolution Kernel	(0018,1210)	3	SH	1-n	many	
Reconstruction Method	(0054,1103)	3	LO	1	recon_method	
Detector Lines of Response Used	(0054,1104)	3	LO	1	axial_angles_used	
Acquisition Start Condition	(0018,0073)	3	CS	1	Scan.start_condition	
Acquisition Start Condition Data	(0018,0074)	3	IS	1	Scan.start_cond_data	
Acquisition Termination Condition	(0018,0071)	3	CS	1	Scan.sel_stop_cond	
Acquisition Termination Condition Data	(0018,0075)	3	IS	1	Scan.sel_stop_cond_data	
Field of View Shape	(0018,1147)	3	CS	1	IF is_type == [ native PET images] THEN = "CYLINDRICAL RING"	
Field of View Dimensions	(0018,1149)	3	IS	1-2	10.0*Scan.scan_fov \ Scan.axial_fov	
Gantry /Detector Tilt	(0018,1120)	3	DS	1	Scan.gantry_tilt_angle	
Gantry/Detector Slew	(0018,1121)	3	DS	1		
Type of Detector Motion	(0054,0202)	3	CS	1	IF is_type == [ native PET images] THEN = "NONE"	
Collimator Type	(0018,1181)	2	CS	1	Scan.collimation	
Collimator/Grid Name		3	SH	1	Not Used	

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
	(0018,1180)					
Axial Acceptance	(0054,1200)	3	DS	1	Scan.axial_acceptance acceptance_flag axial_angle_3d	
Axial Mash	(0054,1201)	3	IS	2	Scan.axial_acceptance acceptance_flag	
Transverse Mash	(0054,1202)	3	IS	1	Scan.theta_compression	
Detector Element Size	(0054,1203)	3	DS	2	Not Used	
Coincidence Window Width	(0054,1210)	3	DS	1	Scan.upper_coinc_limit - Scan.lower_coinc_limit	
Energy Window Range Sequence	(0054,0013)	3	SQ	1		
> Energy Window Lower Limit	(0054,0014)	3	DS	1	Scan.lower_energy_limit	
> Energy Window Upper Limit	(0054,0015)	3	DS	1	Scan.upper_energy_limit	
Secondary Counts Type	(0054,1220)	3	CS	1-n	IF (Scan.delayed_events == [ separate ] ) THEN = "DLYD"	

3.5.3.3 PET Isotope Module

TABLE 3.5-6  
PET ISOTOPE MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Scan table unless otherwise specified)	Notes
Radiopharmaceutical Information Sequence	(0054,0016)	2	SQ	1	Single item sequence	
> Radionuclide Code Sequence	(0054,0300)	2	SQ	1	Single item sequence	
>> Code Value	(0008,0100)	1C	SH	1	99SDM	
>> Coding Scheme Designator	(0008,0102)	1C	SH	1	radionuclide_name	
>> Code Meaning	(0008,0104)	3	LO	1	radionuclide_name	
> Radiopharmaceutical Route	(0018,1070)	3	LO	1	Not Used	
> Administration Route Code Sequence	(0054,0302)	3	SQ	1	Not Used	
>> Code Value	(0008,0100)	1C	SH	1	Not Used	
>> Coding Scheme Designator	(0008,0102)	1C	SH	1	Not Used	
>> Code Meaning	(0008,0104)	3	LO	1	Not Used	
> Radiopharmaceutical Volume	(0018,1071)	3	DS	1	pre_inj_volume	
> Radiopharmaceutical Start Time	(0018,1072)	3	TM	1	admin_datetime	
> Radiopharmaceutical Stop Time	(0018,1073)	3	TM	1	Not Used	
> Radionuclide Total Dose	(0018,1074)	3	DS	1	tracer_activity, post_inj_activity, half_life, meas_datetime, admin_datetime, post_inj_datetime	
> Radionuclide Half Life	(0018,1075)	3	DS	1	half_life	
> Radionuclide Positron Fraction	(0018,1076)	3	DS	1	positron_fraction	
> Radiopharmaceutical Specific Activity	(0018,1077)	3	DS	1	Not Used	
> Radiopharmaceutical	(0018,0031)	3	LO	1	tracer_name	
> Radiopharmaceutical Code Sequence	(0054,0304)	3	SQ	1	Single item sequence	
>> Code Value	(0008,0100)	1C	SH	1	99SDM	
>> Coding Scheme Designator	(0008,0102)	1C	SH	1	tracer_name	
>> Code Meaning	(0008,0104)	3	LO	1	tracer_name	
Intervention Drug Information Sequence	(0018,0026)	3	SQ	1	Not Used	
> Intervention Drug Name	(0018,0034)	3	LO	1	Not Used	

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Scan table unless otherwise specified)	Notes
> Intervention Drug Code Sequence	(0018,0029)	3	SQ	1	Not Used	
>> Code Value	(0008,0100)	1C	SH	1	Not Used	
>> Coding Scheme Designator	(0008,0102)	1C	SH	1	Not Used	
>> Code Meaning	(0008,0104)	3	LO	1	Not Used	
> Intervention Drug Start Time	(0018,0035)	3	TM	1	Not Used	
> Intervention Drug Stop Time	(0018,0027)	3	TM	1	Not Used	
> Intervention Drug Dose	(0018,0028)	3	DS	1	Not Used	

#### 3.5.3.4 PET Multi-gated Acquisition Module

TABLE 3.5-7  
PET ISOTOPE MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Scan table unless otherwise specified)	Notes
Beat Rejection Flag	(0018,1080)	2	CS	1	IF ( trig_rej_method == [ none ] ) THEN = "N" ELSE = "Y"	
Trigger Source or Type	(0018,1061)	3	LO	1	Not Used	
PVC Rejection	(0018,1085)	3	LO	1	trig_rej_method	
Skip Beats	(0018,1086)	3	IS	1	number_for_reject	
Heart Rate	(0018,1088)	3	IS	1	Not Used	
Framing Type	(0018,1064)	3	LO	1	binning_mode	

#### 3.5.3.5 NM/PET Patient Orientation Module

TABLE 3.5-8  
PET ISOTOPE MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	GE Advance Attribute	Notes
Patient Orientation Code Sequence	(0054,0410)	2	SQ	1	Zero length sequence	
> Code Value	(0008,0100)	1C	SH	1		
> Coding Scheme Designator	(0008,0102)	1C	SH	1		

Attribute Name	Tag	Type	VR	VM	GE Advance Attribute	Notes
> Code Meaning	(0008,0104)	3	LO	1		
> Patient Orientation Modifier Code Sequence	(0054,0412)	2C	SQ	1		
>> Code Value	(0008,0100)	1C	SH	1		
>> Coding Scheme Designator	(0008,0102)	1C	SH	1		
>> Code Meaning	(0008,0104)	3	LO	1		
Patient Gantry Relationship Code Sequence	(0054,0414)	2	SQ	1	Zero length sequence	
> Code Value	(0008,0100)	1C	SH	1		
> Coding Scheme Designator	(0008,0102)	1C	SH	1		
> Code Meaning	(0008,0104)	3	LO	1		

### 3.5.3.6 GE Advance ImageSet Module

Refer to Section 3.6.6 for details.

### 3.5.3.7 GE Advance Scan Module

Refer to Section 3.6.4 for details.

## 3.5.4 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.

### 3.5.4.1 Frame Of Reference Module

This section specifies the Attributes necessary to uniquely identify a frame of reference which insures the spatial relationship of Images within a Series. It also allows Images across multiple Series to share the same Frame Of Reference. This Frame Of Reference (or coordinate system) shall be constant for all Images related to a specific Frame Of Reference.

**TABLE 3.5-9  
FRAME OF REFERENCE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	GE Advance Attribute	Notes
Frame of Reference UID	(0020,0052)	1	UI	1	IF (ImageSet.for_identifier != NULL) THEN = ImageSet.for_identifier ELSE = idbMakeId()	
Position Reference Indicator	(0020,1040)	2	LO	1	Scan.landmark_name	

## 3.5.5 Common Equipment Entity Modules

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

### 3.5.5.1 General Equipment Module

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

**TABLE 3.5-10  
GENERAL EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Exam table unless otherwise specified)	Notes
Manufacturer	(0008,0070)	2	LO	1	manufacturer	
Institution Name	(0008,0080)	3	LO	1	hospital_name	
Institution Address	(0008,0081)	3	ST	1	Not Used	
Station Name	(0008,1010)	3	SH	1	Not Used	
Institutional Department Name	(0008,1040)	3	LO	1	Not Used	
Manufacturer's Model Name	(0008,1090)	3	LO	1	scanner_desc	
Device Serial Number	(0018,1000)	3	LO	1		
Software Versions	(0018,1020)	3	LO	1	Image.software_version Curve.software_version Frame.software_version	
Spatial Resolution	(0018,1050)	3	DS	1	Not Used	
Date of Last Calibration	(0018,1200)	3	DA	1-n	Not Used	
Time of Last Calibration	(0018,1201)	3	TM	1-n	Not Used	
Pixel Padding Value	(0028,0120)	3	US or SS	1	Not Used	

### 3.5.6 Common Image Entity Modules

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

3.5.6.1 General Image Module

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

TABLE 3.5-11  
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Image table unless otherwise specified)	Notes
Image Number	(0020,0013)	2	IS	1	IF (is_source = [ pet dicom ] ) THEN = image_number ELSE = slice_number	
Patient Orientation	(0020,0020)	2C	CS	2	Not Used	
Image Date	(0008,0023)	2C	DA	1	extract date from image_datetime	
Image Time	(0008,0033)	2C	TM	1	extract time from image_datetime	
Image Type	(0008,0008)	3	CS	1-n	superceded by PET Image.Image Type (08,08)	
Acquisition Number	(0020,0012)	3	IS	1	Not Used	
Acquisition Date	(0008,0022)	3	DA	1	superceded by PET Image.Acquisition Date (08,22)	
Acquisition Time	(0008,0032)	3	TM	1	superceded by PET Image.Acquisition Time (08,32)	
Referenced Image Sequence	(0008,1140)	3	SQ	1	Not Used	
> Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
> Referenced SOP Instance UID	(0008,1155)	1C	UI	1	Not Used	
Derivation Description	(0008,2111)	3	ST	1	truncate ImageSet.derivation to 1024A	
Source Image Sequence	(0008,2112)	3	SQ	1	Not Used	
> Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
> Referenced SOP Instance UID	(0008,1155)	1C	UI	1	Not Used	
Images in Acquisition	(0020,1002)	3	IS	1	Not Used	
Image Comments	(0020,4000)	3	LT	1	Not Used	
Lossy Image Compression	(0028,2110)	3	CS	1	superceded by PETImage.Lossy Image Compression (28,2110)	



### 3.5.6.2 Image Plane Module

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

TABLE 3.5-12  
IMAGE PLANE MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Image table unless otherwise specified)	Notes
Pixel Spacing	(0028,0030)	1	DS	2	Value 1 = pixel_width Value 2 = pixel_height	
Image Orientation (Patient)	(0020,0037)	1	DS	6	ImageSet.patient_row_cos_l ImageSet.patient_row_cos_p ImageSet.patient_row_cos_s ImageSet.patient_col_cos_l ImageSet.patient_col_cos_p ImageSet.patient_col_cos_s	
Image Position (Patient)	(0020,0032)	1	DS	3	patient_l patient_p patient_s	
Slice Thickness	(0018,0050)	2	DS	1	image_thickness	
Slice Location	(0020,1041)	3	DS	1	image_location	

### 3.5.6.3 Image Pixel Module

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

TABLE 3.5-13  
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Image table unless otherwise specified)	Notes
Samples per Pixel	(0028,0002)	1	US	1	superceded by PET Image.Samples Per Pixel (28,02)	
Photometric Interpretation	(0028,0004)	1	CS	1	superceded by PET Image.Photometric Interpretation (28,04)	
Rows	(0028,0010)	1	US	1	image_array_height	
Columns	(0028,0011)	1	US	1	image_array_width	
Bits Allocated	(0028,0100)	1	US	1	superceded by PET Image.Bits Allocated (28,100)	
Bits Stored	(0028,0101)	1	US	1	superceded by PET Image.Bits Stored (28,101)	
High Bit	(0028,0102)	1	US	1	superceded by PET Image.High Bit (28,102)	

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Image table unless otherwise specified)	Notes
Pixel Representation	(0028,0103)	1	US	1	= 0001H (2's complement)	
Pixel Data	(7FE0,0010)	1	OB/OW	1	pixel_data (send as OW)	
Planar Configuration	(0028,0006)	1C	US	1	Not Used	
Pixel Aspect Ratio	(0028,0034)	1C	IS	2	Not Used	
Smallest Image Pixel Value	(0028,0106)	3	US/SS	1	round (min_pixel_value/scale_factor) to short (send as SS)	
Largest Image Pixel Value	(0028,0107)	3	US/SS	1	round (max_pixel_value/scale_factor) to short (send as SS)	
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	US/US or SS/US	3	Not Used	
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	US/US or SS/US	3	Not Used	
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	US/US or SS/US	3	Not Used	
Red Palette Color Lookup Table Data	(0028,1201)	1C	US or SS	1-n	Not Used	
Green Palette Color Lookup Table Data	(0028,1202)	1C	US or SS	1-n	Not Used	
Blue Palette Color Lookup Table Data	(0028,1203)	1C	US or SS	1-n	Not Used	

### 3.5.6.4 PET Image Module

This section specifies the Attributes that describe the image within a particular PET Series.

**TABLE 3.5-14**  
**PET IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Image table unless otherwise specified)	Notes
Image Type	(0008,0008)	3	CS	1-n	Use ImageSet.is_source	
Samples per Pixel	(0028,0002)	1	US	1	1	
Photometric Interpretation	(0028,0004)	1	CS	1	"MONOCHROME2"	
Bits Allocated	(0028,0100)	1	US	1	image_depth (always 16)	

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Image table unless otherwise specified)	Notes
Bits Stored	(0028,0101)	1	US	1	image_depth (always 16)	
High Bit	(0028,0102)	1	US	1	15	
Rescale Intercept	(0028,1052)	1	DS	1	0	
Rescale Slope	(0028,1053)	1	DS	1	Use scale_factor, ImageSet.units	
Frame Reference Time	(0054,1300)	1	DS	1	IF (frame_ref_time != NULL) THEN = frame_ref_time ELSE = image_time	
Trigger Time	(0018,1060)	1C	DS	1	IF (Scan.scan_mode == [gated]) THEN = image_bin_time ELSE = NULL	
Frame Time	(0018,1063)	1C	DS	1	IF (Scan.scan_mode == [gated]) THEN = image_bin_dur ELSE = NULL	
Low R-R Value	(0018,1081)	1C	IS	1	Scan.lower_reject_limit	
High R-R Value	(0018,1082)	1C	IS	1	Scan.upper_reject_limit	
Lossy Image Compression	(0028,2110)	1C	CS	1	IF ( compression == [ none ] ) THEN = 00H ELSE IF ( compression == [ lossy ] ) THEN = 01H	
Image Index	(0054,1330)	1	US	1	Scan.scan_mode image_location image_time image_bin_time	
Acquisition Date	(0008,0022)	2	DA	1	= extract date from Scan.scan_datetime + Image.image_time	
Acquisition Time	(0008,0032)	2	TM	1	= extract time from Scan.scan_datetime + Image.image_time	
Actual Frame Duration	(0018,1242)	1C	IS	1	image_duration	
Nominal Interval	(0018,1062)	3	IS	1	Not Used	
Intervals Acquired	(0018,1083)	3	IS	1	Scan.triggers_acquired	
Intervals Rejected	(0018,1084)	3	IS	1	Scan.triggers_rejected	
Primary Counts (Prompts) Accumulated	(0054,1310)	3	IS	1	total_prompts	
Secondary Counts Accumulated	(0054,1311)	3	IS	1-n	Value 1 = total_delays	
Slice Sensitivity Factor	(0054,1320)	3	DS	1	IF ( coefficient != NULL) THEN = coefficient ELSE = 1.0	
Decay Factor	(0054,1321)	1C	DS	1	decay_factor	

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Image table unless otherwise specified)	Notes
Dose Calibration Factor	(0054,1322)	3	DS	1	= activity_factor * 1.0e+06 (convert MBq/ml to Bq/ml)	
Scatter Fraction Factor	(0054,1323)	3	DS	1	= scatter_subtracted / total_counts	
Dead Time Factor	(0054,1324)	3	DS	1	deadtime_factor	
Referenced Overlay Sequence	(0008,1130)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1	UI	1	Not Used	
>Referenced SOP Instance UID	(0008,1155)	1	UI	1	Not Used	
Referenced Curve Sequence	(0008,1145)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1	UI	1	Not Used	
>Referenced SOP Instance UID	(0008,1155)	1	UI	1	Not Used	
Anatomic Region Sequence	(0008,2218)	3	SQ	1	Not Used	
> Code Value	(0008,0100)	1	SH	1	Not Used	
> Coding Scheme Designator	(0008,0102)	1	SH	1	Not Used	
> Code Meaning	(0008,0104)	3	LO	1	Not Used	
> Anatomic Region Modifier Sequence	(0008,2220)	3	SQ	1	Not Used	
>> Code Value	(0008,0100)	1	SH	1	Not Used	
>> Coding Scheme Designator	(0008,0102)	1	SH	1	Not Used	
>> Code Meaning	(0008,0104)	3	LO	1	Not Used	
Primary Anatomic Structure Sequence	(0008,2228)	3	SQ	1	Not Used	
> Code Value	(0008,0100)	1	SH	1	Not Used	
> Coding Scheme Designator	(0008,0102)	1	SH	1	Not Used	
> Code Meaning	(0008,0104)	3	LO	1	Not Used	
> Primary Anatomic Structure Modifier Sequence	(0008,2230)	3	SQ	1	Not Used	
>> Code Value	(0008,0100)	1	SH	1	Not Used	
>> Coding Scheme Designator	(0008,0102)	1	SH	1	Not Used	
>> Code Meaning	(0008,0104)	3	LO	1	Not Used	

3.5.6.5 Overlay Plane Module

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

TABLE 3.5-15  
OVERLAY PLANE MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (Image table	Notes
----------------	-----	------	----	----	--------------------------------	-------

					unless otherwise specified)	
none						

**3.5.6.6 VOI LUT Module**

This section specifies the Attributes that describe the VOI LUT.

**TABLE 3.5-16  
VOI LUT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (ImageSet table unless otherwise specified)	Notes
VOI Lut Sequence	(0028,3010)	3	SQ	1	Not Used	
> LUT Descriptor	(0028,3002)	1C	US\US or SS\US	3	Not Used	
> LUT Explanation	(0028,3003)	3	LO	1	Not Used	
> LUT Data	(0028,3006)	1C	US or SS	1-n	Not Used	
Window Center	(0028,1050)	3	DS	1-n	window_center	
Window Width	(0028,1051)	1C	DS	1-n	window_width	
Window Center & Width Explanation	(0028,1055)	3	LO	1-n	Not Used	

**3.5.6.7 GE Advance Image**

Refer to Section 3.6.7 for details.

**3.5.6.8 GE Advance Frame**

Refer to Section 3.6.5 for details.

**3.5.6.9 GE Advance ROI**

Refer to Section 3.6.8 for details.

**3.5.6.10 GE Advance Annotation**

Refer to Section 3.6.9 for details.

**3.5.7 General Modules**

The SOP Common Module is mandatory for all DICOM IODs.

3.5.7.1 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 3.5-17  
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Image table unless otherwise specified)	Notes
SOP Class UID	(0008,0016)	1	UI	1		TR <sup>48</sup>
SOP Instance UID	(0008,0018)	1	UI	1		TR <sup>49</sup>
Specific Character Set	(0008,0005)	1C	CS	1	= NULL	
Instance Creation Date	(0008,0012)	3	DA	1	current_date	
Instance Creation Time	(0008,0013)	3	TM	1	current_time	
Instance Creator UID	(0008,0014)	3	UI	1	= 1.2.840.113619.1.64.<dbcode>	

T<sup>48</sup>Translate value as follows:

```

IF (PET Image Transfer) THEN
    SOP Class UID (08,16) = 1.2.840.10008.5.1.4.1.1.128
ELSE IF (Curve Transfer)
    CASE ( Curve.curve_type ) OF :
        [ blood sample ], [ rates ] :
            /* PET Curve */
            SOP Class UID (08,16) = 1.2.840.10008.5.1.4.1.1.129
            break;
        [ profile ], [ histogram ], [ volume activity curve ], [ foreign ] :
        [ area ], [ patlak ], [ tac midframe ], [ tac effective ] :
            /* Standalone Curve */
            SOP Class UID (08,16) = 1.2.840.10008.5.1.4.1.1.9
            break;
ELSE IF (Polar Map Transfer) THEN
    Reject Transfer;
    
```

<sup>49</sup>Translate value as follows:

```

IF (SOP Class UID (08,16) == "1.2.840.10008.5.1.4.1.1.128") THEN /* PET Image */
    SOP Instance UID (08,18) = Image.image_id
ELSE IF (SOP Class UID (08,16) == "1.2.840.10008.5.1.4.1.1.129") THEN /* PET Curve */
    IF (Type of Data (50xx,0020) != "CPM") THEN
        Reject Transfer;
/*Standalone Curve */
ELSE IF (SOP Class UID (08,16) == "1.2.840.10008.5.1.4.1.1.9") THEN
    
```

SOP Instance UID (08,18) = Curve.curve\_id



3.6 PRIVATE DATA DICTIONARY

3.6.1 Private Creator Identification Information

TABLE 3.6-1  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(0009,0010)	1	SH	1	n/a
GE Advance Implementation Version Name Value 1: "GE Advance" Value 2: IDB_SOFTWARE_VERSION	(0009,1001)	3	LO	2	n/a

3.6.2 GE Advance Patient Module

TABLE 3.6-2  
GE ADVANCE PATIENT MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Patient.patient_id	(0009,1002)	3	LO	1	20A
GE Advance Patient.compatible_version	(0009,1003)	3	SH	1	5A
GE Advance Patient.software_version	(0009,1004)	3	SH	1	5A
GE Advance Patient.patient_datetime	(0009,1005)	3	DT	1	D
GE Advance Patient.type	(0009,1006)	3	SL	1	L

3.6.3 GE Advance Exam Module

TABLE 3.6-3  
GE ADVANCE EXAM MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Exam.exam_id	(0009,1007)	3	UI	1	64A
GE Advance Exam.compatible_version	(0009,1008)	3	SH	1	5A
GE Advance Exam.software_version	(0009,1009)	3	SH	1	5A

3.6.4 GE Advance Scan Module

TABLE 3.6-4  
GE ADVANCE SCAN MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Scan.scan_id	(0009,100A)	3	UI	1	64A
GE Advance Scan.compatible_version	(0009,100B)	3	SH	1	5A
GE Advance Scan.software_version	(0009,100C)	3	SH	1	5A
GE Advance Scan.scan_datetime	(0009,100D)	3	DT	1	D
GE Advance Scan.scan_ready	(0009,100E)	3	DT	1	D

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Scan.scan_description	(0009,100F)	3	UI	1	64A
GE Advance Scan.hospital_name	(0009,1010)	3	LO	1	32A
GE Advance Scan.scanner_desc	(0009,1011)	3	LO	1	32A
GE Advance Scan.manufacturer	(0009,1012)	3	LO	1	64A
GE Advance Scan.for_identifier	(0009,1013)	3	UI	1	64A
GE Advance Scan.landmark_name	(0009,1014)	3	LO	1	64A
GE Advance Scan.landmark_abbrev	(0009,1015)	3	SH	1	2A
GE Advance Scan.patient_position	(0009,1016)	3	SL	1	L
GE Advance Scan.scan_perspective	(0009,1017)	3	SL	1	L
GE Advance Scan.scan_type	(0009,1018)	3	SL	1	L
GE Advance Scan.scan_mode	(0009,1019)	3	SL	1	L
GE Advance Scan.start_condition	(0009,101A)	3	SL	1	L
GE Advance Scan.start_cond_data	(0009,101B)	3	SL	1	L
GE Advance Scan.sel_stop_cond	(0009,101C)	3	SL	1	L
GE Advance Scan.sel_stop_cond_data	(0009,101D)	3	SL	1	L
GE Advance Scan.collect_deadtime	(0009,101E)	3	SL	1	L
GE Advance Scan.collect_singles	(0009,101F)	3	SL	1	L
GE Advance Scan.collect_countrate	(0009,1020)	3	SL	1	L
GE Advance Scan.countrate_period	(0009,1021)	3	SL	1	L
GE Advance Scan.delayed_events	(0009,1022)	3	SL	1	L
GE Advance Scan.delayed_bias	(0009,1023)	3	SL	1	L
GE Advance Scan.word_size	(0009,1024)	3	SL	1	L
GE Advance Scan.axial_acceptance	(0009,1025)	3	SL	1	L
GE Advance Scan.axial_angle_3d	(0009,1026)	3	SL	1	L
GE Advance Scan.theta_compression	(0009,1027)	3	SL	1	L
GE Advance Scan.axial_compression	(0009,1028)	3	SL	1	L
GE Advance Scan.gantry_tilt_angle	(0009,1029)	3	FL	1	F
GE Advance Scan.collimation	(0009,102A)	3	SL	1	L
GE Advance Scan.scan_fov	(0009,102B)	3	SL	1	L
GE Advance Scan.axial_fov	(0009,102C)	3	SL	1	L
GE Advance Scan.event_separation	(0009,102D)	3	SL	1	L
GE Advance Scan.mask_width	(0009,102E)	3	SL	1	L
GE Advance Scan.binning_mode	(0009,102F)	3	SL	1	L
GE Advance Scan.trig_rej_method	(0009,1030)	3	SL	1	L
GE Advance Scan.number_for_reject	(0009,1031)	3	SL	1	L
GE Advance Scan.lower_reject_limit	(0009,1032)	3	SL	1	L
GE Advance Scan.upper_reject_limit	(0009,1033)	3	SL	1	L
GE Advance Scan.triggers_acquired	(0009,1034)	3	SL	1	L
GE Advance Scan.triggers_rejected	(0009,1035)	3	SL	1	L
GE Advance Scan.tracer_name	(0009,1036)	3	LO	1	40A
GE Advance Scan.batch_description	(0009,1037)	3	LO	1	40A
GE Advance Scan.tracer_activity	(0009,1038)	3	FL	1	F

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Scan.meas_datetime	(0009,1039)	3	DT	1	D
GE Advance Scan.pre_inj_volume	(0009,103A)	3	FL	1	F
GE Advance Scan.admin_datetime	(0009,103B)	3	DT	1	D
GE Advance Scan.post_inj_activity	(0009,103C)	3	FL	1	F
GE Advance Scan.post_inj_datetime	(0009,103D)	3	DT	1	D
GE Advance Scan.radionuclide_name	(0009,103E)	3	SH	1	6A
GE Advance Scan.half_life	(0009,103F)	3	FL	1	F
GE Advance Scan.positron_fraction	(0009,1040)	3	FL	1	F
GE Advance Scan.source1_holder	(0009,1041)	3	SL	1	L
GE Advance Scan.source1_activity	(0009,1042)	3	FL	1	F
GE Advance Scan.source1_meas_dt	(0009,1043)	3	DT	1	D
GE Advance Scan.source1_radnuclide	(0009,1044)	3	SH	1	6A
GE Advance Scan.source1_half_life	(0009,1045)	3	FL	1	F
GE Advance Scan.source2_holder	(0009,1046)	3	SL	1	L
GE Advance Scan.source2_activity	(0009,1047)	3	FL	1	F
GE Advance Scan.source2_meas_dt	(0009,1048)	3	DT	1	D
GE Advance Scan.source2_radnuclide	(0009,1049)	3	SH	1	6A
GE Advance Scan.source2_half_life	(0009,104A)	3	FL	1	F
GE Advance Scan.source_speed	(0009,104B)	3	SL	1	L
GE Advance Scan.source_location	(0009,104C)	3	FL	1	F
GE Advance Scan.emission_present	(0009,104D)	3	SL	1	L
GE Advance Scan.lower_axial_acc	(0009,104E)	3	SL	1	L
GE Advance Scan.upper_axial_acc	(0009,104F)	3	SL	1	L
GE Advance Scan.lower_coinc_limit	(0009,1050)	3	SL	1	L
GE Advance Scan.upper_coinc_limit	(0009,1051)	3	SL	1	L
GE Advance Scan.coinc_delay_offset	(0009,1052)	3	SL	1	L
GE Advance Scan.coinc_output_mode	(0009,1053)	3	SL	1	L
GE Advance Scan.upper_energy_limit	(0009,1054)	3	SL	1	L
GE Advance Scan.lower_energy_limit	(0009,1055)	3	SL	1	L
GE Advance Scan.normal_cal_id	(0009,1056)	3	UI	1	64A
GE Advance Scan.normal_2d_cal_id	(0009,1057)	3	UI	1	64A
GE Advance Scan.blank_cal_id	(0009,1058)	3	UI	1	64A
GE Advance Scan.wc_cal_id	(0009,1059)	3	UI	1	64A
GE Advance Scan.derived	(0009,105A)	3	SL	1	L
GE Advance Scan.contrast_agent	(0009,105B)	3	LO	1	64A

3.6.5 GE Advance Frame Module

TABLE 3.6-5  
GE ADVANCE FRAME MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Frame.frame_id	(0009,105C)	3	UI	1	64A
GE Advance Frame.scan_id	(0009,105D)	3	UI	1	64A
GE Advance Frame.exam_id	(0009,105E)	3	UI	1	64A
GE Advance Frame.patient_id	(0009,105F)	3	LO	1	20A
GE Advance Frame.compatible_version	(0009,1060)	3	SH	1	5A
GE Advance Frame.software_version	(0009,1061)	3	SH	1	5A
GE Advance Frame.where_is_frame	(0009,1062)	3	ST	1	256A
GE Advance Frame.frame_size	(0009,1063)	3	SL	1	L
GE Advance Frame.file_exists	(0009,1064)	3	SL	1	L
GE Advance Frame.patient_entry	(0009,1065)	3	SL	1	L
GE Advance Frame.table_height	(0009,1066)	3	FL	1	F
GE Advance Frame.table_z_position	(0009,1067)	3	FL	1	F
GE Advance Frame.landmark_datetime	(0009,1068)	3	DT	1	D
GE Advance Frame.slice_count	(0009,1069)	3	SL	1	L
GE Advance Frame.start_location	(0009,106A)	3	FL	1	F
GE Advance Frame.acq_delay	(0009,106B)	3	SL	1	L
GE Advance Frame.acq_start	(0009,106C)	3	DT	1	D
GE Advance Frame.acq_duration	(0009,106D)	3	SL	1	L
GE Advance Frame.acq_bin_dur	(0009,106E)	3	SL	1	L
GE Advance Frame.acq_bin_start	(0009,106F)	3	SL	1	L
GE Advance Frame.actual_stop_cond	(0009,1070)	3	SL	1	L
GE Advance Frame.total_prompts	(0009,1071)	3	FD	1	Db1
GE Advance Frame.total_delays	(0009,1072)	3	FD	1	Db1
GE Advance Frame.frame_valid	(0009,1073)	3	SL	1	L
GE Advance Frame.validity_info	(0009,1074)	3	SL	1	L
GE Advance Frame.archived	(0009,1075)	3	SL	1	L
GE Advance Frame.compression	(0009,1076)	3	SL	1	L
GE Advance Frame.uncompressed_size	(0009,1077)	3	SL	1	L
GE Advance Frame.accum_bin_dur	(0009,1078)	3	SL	1	L

3.6.6 GE Advance ImageSet Module

TABLE 3.6-6  
GE ADVANCE IMAGESET MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance ImageSet.compatible_version	(0009,1079)	3	SH	1	5A
GE Advance ImageSet.software_version	(0009,107A)	3	SH	1	5A
GE Advance ImageSet.is_datetime	(0009,107B)	3	DT	1	D
GE Advance ImageSet.is_source	(0009,107C)	3	SL	1	L
GE Advance ImageSet.is_contents	(0009,107D)	3	SL	1	L
GE Advance ImageSet.is_type	(0009,107E)	3	SL	1	L
GE Advance ImageSet.is_reference	(0009,107F)	3	FL	3	F
GE Advance ImageSet.multi_patient	(0009,1080)	3	SL	1	L
GE Advance ImageSet.number_of_normals	(0009,1081)	3	SL	1	L
GE Advance ImageSet.color_map_id	(0009,1082)	3	UI	1	64A
GE Advance ImageSet.window_level_type	(0009,1083)	3	SL	1	L
GE Advance ImageSet.rotate	(0009,1084)	3	FL	1	F
GE Advance ImageSet.flip	(0009,1085)	3	SL	1	L
GE Advance ImageSet.zoom	(0009,1086)	3	FL	1	F
GE Advance ImageSet.pan_x	(0009,1087)	3	SL	1	L
GE Advance ImageSet.pan_y	(0009,1088)	3	SL	1	L
GE Advance ImageSet.window_level_min	(0009,1089)	3	FL	1	F
GE Advance ImageSet.window_level_max	(0009,108A)	3	FL	1	F
GE Advance ImageSet.recon_method	(0009,108B)	3	SL	1	L
GE Advance ImageSet.attenuation	(0009,108C)	3	SL	1	L
GE Advance ImageSet atten_coefficient	(0009,108D)	3	FL	1	F
GE Advance ImageSet.bp_filter	(0009,108E)	3	SL	1	L
GE Advance ImageSet.bp_filter_cutoff	(0009,108F)	3	FL	1	F
GE Advance ImageSet.bp_filter_order	(0009,1090)	3	SL	1	L
GE Advance ImageSet.bp_center_l	(0009,1091)	3	FL	1	F
GE Advance ImageSet.bp_center_p	(0009,1092)	3	FL	1	F
GE Advance ImageSet.atten_smooth	(0009,1093)	3	SL	1	L
GE Advance ImageSet.atten_smooth_param	(0009,1094)	3	SL	1	L
GE Advance ImageSet.angle_smooth_param	(0009,1095)	3	SL	1	L
GE Advance ImageSet.wellcountercal_id	(0009,1096)	3	UI	1	64A
GE Advance ImageSet.trans_scan_id	(0009,1097)	3	UI	1	64A
GE Advance ImageSet.norm_cal_id	(0009,1098)	3	UI	1	64A
GE Advance ImageSet.blnc_cal_id	(0009,1099)	3	UI	1	64A
GE Advance ImageSet.cac_edge_threshold	(0009,109A)	3	FL	1	F
GE Advance ImageSet.cac_skull_offset	(0009,109B)	3	FL	1	F
GE Advance ImageSet.emiss_sub_id	(0009,109C)	3	UI	1	64A
GE Advance ImageSet.radial_filter_3d	(0009,109D)	3	SL	1	L

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance ImageSet.radial_cutoff_3d	(0009,109E)	3	FL	1	F
GE Advance ImageSet.axial_filter_3d	(0009,109F)	3	SL	1	L
GE Advance ImageSet.axial_cutoff_3d	(0009,10A0)	3	FL	1	F
GE Advance ImageSet.axial_start	(0009,10A1)	3	FL	1	F
GE Advance ImageSet.axial_spacing	(0009,10A2)	3	FL	1	F
GE Advance ImageSet.axial_angles_used	(0009,10A3)	3	SL	1	L
GE Advance ImageSet.ir_num_iterations	(0009,10B2)	3	SL	1	F
GE Advance ImageSet.ir_num_subsets	(0009,10B3)	3	SL	1	L
GE Advance ImageSet.ir_recon_fov	(0009,10B4)	3	FL	1	F
GE Advance ImageSet.ir_corr_model	(0009,10B5)	3	SL	1	L
GE Advance ImageSet.ir_loop_filter	(0009,10B6)	3	SL	1	L
GE Advance ImageSet.ir_pre_filt_parm	(0009,10B7)	3	FL	1	F
GE Advance ImageSet.ir_loop_filt_parm	(0009,10B8)	3	SL	1	L
GE Advance ImageSet.response_filt_parm	(0009,10B9)	3	FL	1	F
GE Advance ImageSet.post_filter	(0009,10BA)	3	SL	1	L
GE Advance ImageSet.post_filt_parm	(0009,10BB)	3	FL	1	F
GE Advance ImageSet.ir_regularize	(0009,10BC)	3	SL	1	L
GE Advance ImageSet.regularize_parm	(0009,10BD)	3	FL	1	F
GE Advance ImageSet.ac_bp_filter	(0009,10BE)	3	SL	1	L
GE Advance ImageSet.ac_bp_filt_cut_off	(0009,10BF)	3	FL	1	F
GE Advance ImageSet.ac_bp_filt_order	(0009,10C0)	3	SL	1	L
GE Advance ImageSet.ac_img_smooth	(0009,10C1)	3	SL	1	L
GE Advance ImageSet.ac_img_smooth_parm	(0009,10C2)	3	FL	1	F
GE Advance ImageSet.scatter_method	(0009,10C3)	3	SL	1	L
GE Advance ImageSet.scatter_num_iter	(0009,10C4)	3	SL	1	L
GE Advance ImageSet.scatter_parm	(0009,10C5)	3	FL	1	F

### 3.6.7 GE Advance Image Module

TABLE 3.6-7

GE ADVANCE IMAGE MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Image.compatible_version	(0009,10A4)	3	SH	1	5A
GE Advance Image.software_version	(0009,10A5)	3	SH	1	5A
GE Advance Image.slice_number	(0009,10A6)	3	SL	1	L
GE Advance Image.total_counts	(0009,10A7)	3	FL	1	F
GE Advance Image.other_atts	(0009,10A8)	3	OB	1	Bt
GE Advance Image.other_atts_size	(0009,10A9)	3	SL	1	L
GE Advance Image.archived	(0009,10AA)	3	SL	1	L
GE Advance Image.bp_center_x	(0009,10AB)	3	FL	1	F
GE Advance Image.bp_center_y	(0009,10AC)	3	FL	1	F
GE Advance Image.trans_frame_id	(0009,10AD)	3	UI	1	64A

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Image.tpluse_frame_id	(0009,10AE)	3	UI	1	64A
GE Advance Image.seg_qc_parm	(0009,10C6)	3	FL	1	F
GE Advance Image.overlap	(0009,10C7)	3	SL	1	L
GE Advance Image.ovlp_frm_id	(0009,10C8)	3	UI	1	64A
GE Advance Image.ovlp_trans_frm_id	(0009,10C9)	3	UI	1	64A
GE Advance Image.ovlp_tpulse_frm_id	(0009,10CA)	3	UI	1	64A

### 3.6.8 GE Advance ROI Module

**TABLE 3.6-8**  
**GE ADVANCE ROI MODULE PRIVATE ELEMENTS**  
**PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)**

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(0011,0010)	1	SH	1	n/a
GE Advance ROI Sequence	(0011,1001)	3	SQ	1	n/a
> GE Advance ROI.roi_id	(0011,1002)	3	UI	1	<b>64A</b>
> GE Advance ROI.image_id	(0011,1003)	3	UI	1	<b>64A</b>
> GE Advance ROI.compatible_version	(0011,1004)	3	SH	1	<b>5A</b>
> GE Advance ROI.software_version	(0011,1005)	3	SH	1	<b>5A</b>
> GE Advance ROI.roi_name	(0011,1006)	3	LO	1	<b>32A</b>
> GE Advance ROI.roi_datetime	(0011,1007)	3	DT	1	<b>D</b>
> GE Advance ROI.roi_type	(0011,1008)	3	SL	1	<b>L</b>
> GE Advance ROI.center_x	(0011,1009)	3	FL	1	<b>F</b>
> GE Advance ROI.center_y	(0011,100A)	3	FL	1	<b>F</b>
> GE Advance ROI.width	(0011,100B)	3	FL	1	<b>F</b>
> GE Advance ROI.height	(0011,100C)	3	FL	1	<b>F</b>
> GE Advance ROI.angle	(0011,100D)	3	FL	1	<b>F</b>
> GE Advance ROI.number_of_points	(0011,100E)	3	SL	1	<b>L</b>
> GE Advance ROI.roi_data	(0011,100F)	3	OB	1	<b>Bt</b>
> GE Advance ROI.roi_size	(0011,1010)	3	SL	1	<b>L</b>
> GE Advance ROI.color	(0011,1011)	3	LO	1	<b>20A</b>
> GE Advance ROI.line_type	(0011,1012)	3	SL	1	<b>L</b>
> GE Advance ROI.line_width	(0011,1013)	3	SL	1	<b>L</b>
> GE Advance ROI.roi_number	(0011,1014)	3	SL	1	<b>L</b>
> GE Advance ROI.convex	(0011,1015)	3	SL	1	<b>L</b>
> GE Advance ROI.atten_corr_flag	(0011,1016)	3	SL	1	<b>L</b>

3.6.9 GE Advance Annotation Module

TABLE 3.6-9  
GE ADVANCE ANNOTATION MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(0013,0010)	1	SH	1	n/a
GE Advance Annotation Sequence	(0013,1001)	3	SQ	1	n/a
> GE Advance Annotation.annotation_id	(0013,1002)	3	UI	1	64A
> GE Advance Annotation.image_id	(0013,1003)	3	UI	1	64A
> GE Advance Annotation.compatible_version	(0013,1004)	3	SH	1	5A
> GE Advance Annotation.software_version	(0013,1005)	3	SH	1	5A
> GE Advance Annotation.type	(0013,1006)	3	SL	1	L
> GE Advance Annotation.font_name	(0013,1007)	3	LO	1	32A
> GE Advance Annotation.font_size	(0013,1008)	3	SH	1	2A
> GE Advance Annotation.foreground_color	(0013,1009)	3	LO	1	20A
> GE Advance Annotation.background_color	(0013,100A)	3	LO	1	20A
> GE Advance Annotation.coordinate_system	(0013,100B)	3	SL	1	L
> GE Advance Annotation.start_x	(0013,100C)	3	FL	1	F
> GE Advance Annotation.start_y	(0013,100D)	3	FL	1	F
> GE Advance Annotation.end_x	(0013,100E)	3	FL	1	F
> GE Advance Annotation.end_y	(0013,100F)	3	FL	1	F
> GE Advance Annotation.start_symbol	(0013,1010)	3	SL	1	L
> GE Advance Annotation.end_symbol	(0013,1011)	3	SL	1	L
> GE Advance Annotation.annotation_data	(0013,1012)	3	OB	1	Bt
> GE Advance Annotation.annotation_size	(0013,1013)	3	SL	1	L
> GE Advance Annotation.label_id	(0013,1014)	3	LO	1	64A



## 4. STANDALONE PET CURVE INFORMATION OBJECT IMPLEMENTATION

### 4.1 INTRODUCTION

This section specifies the use of the DICOM Standalone PET Curve IOD (referred to as the PET Curve IOD in other parts of this section) to represent the information included in PET curves produced by this implementation. Corresponding attributes are conveyed using the module construct. The contents of this section are:

4.2- IOD Description

4.3- IOD Entity-Relationship Model

4.4- IOD Module Table

4.5- IOD Module Definition

### 4.2 PET CURVE IOD IMPLEMENTATION

The *Advance* implementation of DICOM uses the PET Curve format when creating curve objects. In order to preserve full fidelity when transferring data to an *Advance* workstation, some specialized database information is encoded as private DICOM attributes. All of the Standard and private attributes used are defined in the module tables. The *Advance* private data dictionary is included in Section 4.6. Nevertheless, the *Advance* is able to process PET DICOM curves without any private data elements.

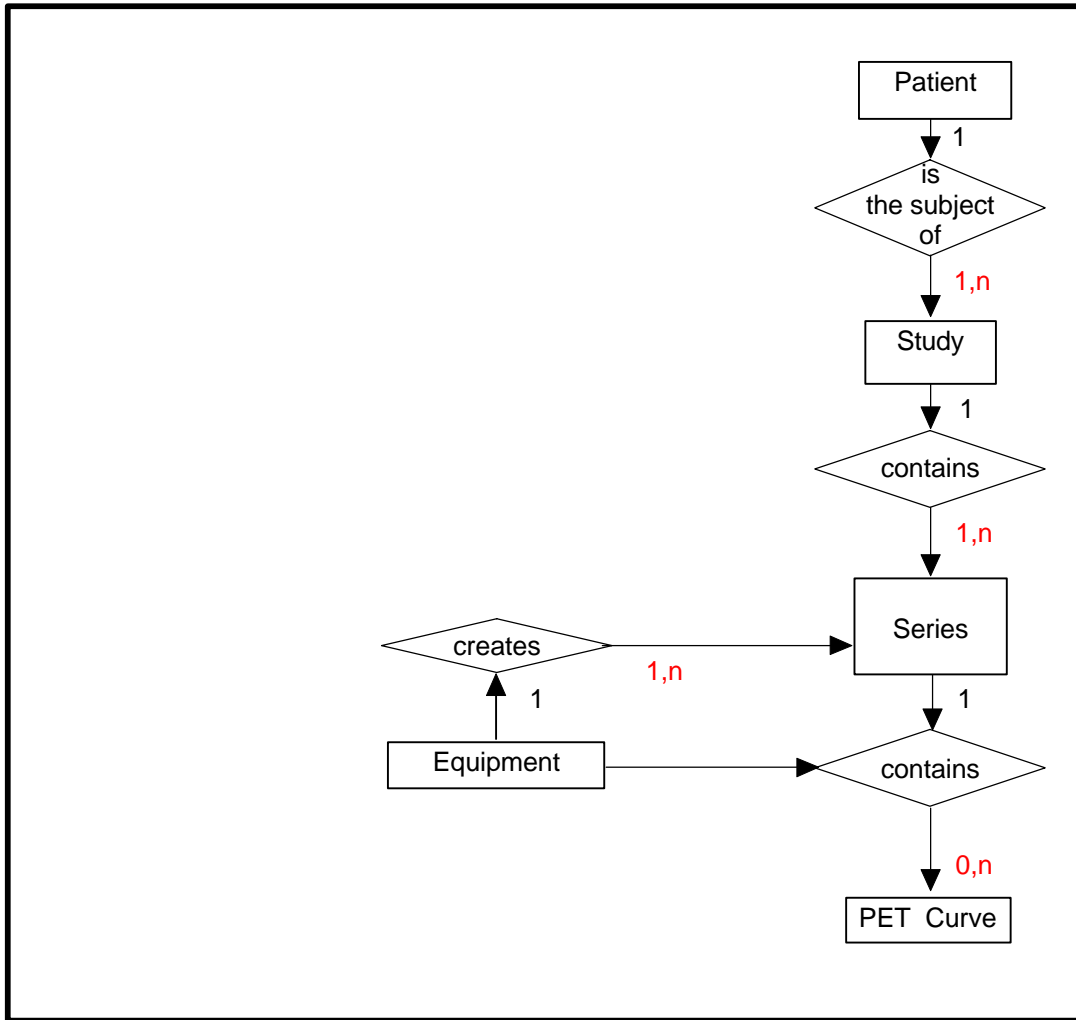
### 4.3 PET CURVE ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the PET Curve interoperability schema is shown in **Illustration 7-1**. 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 Curve can have up to n Curves per Series, but the Patient to Study relationship has 1 Study for each Patient (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 7-1  
PET CURVE ENTITY RELATIONSHIP DIAGRAM



### 4.3.1 ENTITY DESCRIPTIONS

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

#### 4.3.1.1 Patient Entity Description

The Patient Entity defines the characteristics of a patient who is the subject of one or more medical studies which produce medical images.

#### 4.3.1.2 Study Entity Description

The Study Entity defines the characteristics of a medical study performed on a patient. A study is a collection of one or more series of medical images which are logically related for the purpose of diagnosing a patient. Each study is associated with exactly one patient.

#### 4.3.1.3 Series Entity Description

The Series Entity defines the attributes which are used to group images into distinct logical sets. Each series is associated with exactly one study.

#### 4.3.1.4 Equipment Entity Description

The Equipment Entity describes the particular imaging device which produced the series of images. An imaging device may produce one or more series within a study. The Equipment Entity does not describe the data acquisition or image creation Attributes used to generate images within a series.

#### 4.3.1.5 PET Curve Entity Description

The PET Curve Entity defines the attributes which describe the curve data of a PET curve.

#### 4.3.2 Advance Mapping of DICOM entities

TABLE 4.3-1  
MAPPING OF DICOM ENTITIES TO ADVANCE ENTITIES

DICOM	Advance Entity
Patient	Patient
Study	Exam
Series	Imageset
Curve	Curve, Graph, Curve Presentation

#### 4.4 PET CURVE IOD MODULE TABLE

Within an entity of the DICOM v3.0 PET IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

**Table 4.4-1** identifies the defined modules within the entities which comprise the DICOM v3.0 PET IOD. Modules are identified by Module Name.

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

**TABLE 4.4-1  
PET CURVE IOD MODULES**

Entity Name	Module Name	Reference
Patient	Patient	4.5.1.1
	GE Advance Patient	4.5.1.2
Study	General Study	4.5.2.1
	Patient Study	4.5.2.2
	GE Advance Exam	4.5.2.3
Series	General Series	4.5.3.1
	PET Series	4.5.3.2
	PET Isotope	4.5.3.3
	PET Multi-gated Acquisition	4.5.3.4
	GE Advance Imageset	4.5.3.5
	GE Advance Scan	4.5.3.6
Equipment	General Equipment	4.5.4.1
Curve	Curve Identification	4.5.5.1
	Curve	4.5.5.2
	PET Curve	4.5.5.3
	GE Advance Curve	4.5.5.4
	GE Advance Graph	4.5.5.5
	GE Advance Curve Presentation	4.5.5.6
General Modules	SOP Common	4.5.6.1

#### 4.5 PET CURVE 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 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 from. It should be noted that they are the same ones as defined in the DICOM v3.0 Standard Part 3 (Information Object Definitions).

### 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	VR	VM	Advance Attribute (Advance Patient table unless otherwise specified)	Notes
Patient's Name	(0010,0010)	2	PN (64)	1	patient_name	
Patient ID	(0010,0020)	2	LO (64)	1	patient_identifier	
Patient's Birth Date	(0010,0030)	2	DA (26)	1	birthdate	
Patient's Sex	(0010,0040)	2	CS (16)	1	sex	
Referenced Patient Sequence	(0008,1120)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
>Referenced SOP Instance UID	(0008,1155)	1C	UI	1	Not Used	
Patient's Birth Time	(0010,0032)	3	TM	1	Not Used	
Other Patient IDs	(0010,1000)	3	LO	1-n	Not Used	
Other Patient Names	(0010,1001)	3	PN	1-n	Not Used	
Ethnic Group	(0010,2160)	3	SH	1	Not Used	
Patient Comments	(0010,4000)	3	LT	1	Not Used	

#### 4.5.1.2 GE Advance Patient

Refer to Section 4.6.2 for details.

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

**4.5.2.1 General Study Module**

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

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

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Exam table unless otherwise specified)	Notes
Study Instance UID	(0020,000D)	1	UI	1	study_uid	
Study Date	(0008,0020)	2	DA	1	extract date from exam_datetime	
Study Time	(0008,0030)	2	TM	1	extract time exam_datetime	
Referring Physician's Name	(0008,0090)	2	PN	1	ref_physician	
Study ID	(0020,0010)	2	SH	1	study_identifier	
Accession Number	(0008,0050)	2	SH	1	requisition	
Study Description	(0008,1030)	3	LO	1	exam_desc	
Physician(s) of Record	(0008,1048)	3	PN	1-n	Not Used	
Name of Physician(s) Reading Study	(0008,1060)	3	PN	1-n	diagnostician	
Referenced Study Sequence	(0008,1110)	3	SQ	1	Not Used	
> Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
> Referenced SOP Instance UID	(0008,1155)	1C	UI	1	Not Used	

**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	VR	VM	Advance Attribute (GE Advance Exam table unless otherwise specified)	Notes
Admitting Diagnosis Description	(0008,1080)	3	LO	1-n	Not Used	
Patient's Age	(0010,1010)	3	AS	1	truncate years from (Exam.exam_datetime - Patient.patient_birthdate)	
Patient's Size	(0010,1020)	3	DS	1	patient_ht / 100.0 (convert cm to m)	
Patient's Weight	(0010,1030)	3	DS	1	patient_wt	
Occupation	(0010,2180)	3	SH	1	Not Used	
Additional Patient's History	(0010,21B0)	3	LT	1	patient_history	

**4.5.2.3 GE Advance Exam Module**

Refer to Section 4.6.3 for details.

**4.5.3 Common Series Entity Modules**

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

**4.5.3.1 General Series Module**

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

**TABLE 4.5-4  
GENERAL SERIES MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
Modality	(0008,0060)	1	CS	1	Exam.modality	
Series Instance UID	(0020,000E)	1	UI	1	IF (SOP Class UID == "1.2.840.113619.4.30") THEN = Scan.scan_id ELSE = image_set_id	
Series Number	(0020,0011)	2	IS	1	series_number	
Laterality	(0020,0060)	2C	CS	1	Not Used	
Series Date	(0008,0021)	3	DA	1	superceded by PET Series.Series Date (0008,0021)	
Series Time	(0008,0031)	3	TM	1	superceded by PET Series.Series Time (0008,0031)	
Performing Physician's Name	(0008,1050)	3	PN	1-n	Not Used	
Protocol Name	(0018,1030)	3	LO	1	Not Used	
Series Description	(0008,103E)	3	LO	1	IF (SOP Class UID == "1.2.840.113619.4.30") THEN = Scan.scan_description ELSE = is_description	
Operators' Name	(0008,1070)	3	PN	1-n	Exam.operator	
Referenced Study Component Sequence	(0008,1111)	3	SQ	1	Not Used	
> Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
> Referenced SOP Instance	(0008,1155)	1C	UI	1	Not Used	

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
UID						
Body Part Examined	(0018,0015)	3	CS	1	Not Used	
Patient Position	(0018,5100)	2C	CS	1	Scan.patient_position, Frame.patient_entry	
Smallest Pixel Value in Series	(0028,0108)	3	US/SS	1	Not Used	
Largest Pixel Value in Series	(0028,0109)	3	US/SS	1	Not Used	

4.5.3.2 PET Series Module

TABLE 4.5-5

PET SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
Series Date	(0008,0021)	1	DA	1	extract date from Scan.scan_datetime	
Series Time	(0008,0031)	1	TM	1	extract time from Scan.scan_datetime	
Counts Source	(0054,1002)	1	CS	1	Scan.scan_type	
Units	(0054,1001)	1	CS	1	units	
Series Type	(0054,1000)	1	CS	2	is_contents Scan.scan_mode	
Reprojection Method	(0054,1004)	2C	CS	1	is_contents	
Number of R-R Intervals	(0054,0061)	1C	US	1	IF (Scan.scan_mode == [ gated ] ) THEN Count the unique image.image_bin_time for images with Image.image_set_id = thisSOPInstance.ImageSetID ELSE = NULL	
Number of Time Slots	(0054,0071)	1C	US	1	IF (Scan.scan_mode == [ gated ] ) THEN = 1 ELSE = NULL	
Number of Time Slices	(0054,0101)	1C	US	1	Count the unique image.image_time for images with Image.image_set_id = thisSOPInstance.ImageSetID	
Number of Slices	(0054,0081)	1	US	1	Count the unique image.image_location for images with Image.image_set_id =	



Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
					thisSOPInstance.ImageSetID	
Corrected Image	(0028,0051)	2	CS	1-n	many	
Randoms Correction Method	(0054,1100)	3	CS	1	IF (Scan.scan_type = [ emission ] THEN TR 14: emiss_randoms trans_randoms = NULL ELSE TR 14: trans_randoms emiss_randoms = NULL	
Attenuation Correction Method	(0054,1101)	3	LO	1	attenuation atten_coefficient atten_smooth	
Scatter Correction Method	(0054,1105)	3	LO	1	scatter	
Decay Correction	(0054,1102)	1	CS	1	decay	
Reconstruction Diameter	(0018,1100)	3	DS	1	bp_dfov * 10.0 (cm to mm)	
Convolution Kernel	(0018,1210)	3	SH	1-n	many	
Reconstruction Method	(0054,1103)	3	LO	1	recon_method	
Detector Lines of Response Used	(0054,1104)	3	LO	1	axial_angles_used	
Acquisition Start Condition	(0018,0073)	3	CS	1	Scan.start_condition	
Acquisition Start Condition Data	(0018,0074)	3	IS	1	Scan.start_cond_data	
Acquisition Termination Condition	(0018,0071)	3	CS	1	Scan.sel_stop_cond	
Acquisition Termination Condition Data	(0018,0075)	3	IS	1	Scan.sel_stop_cond_data	
Field of View Shape	(0018,1147)	3	CS	1	IF is_type == [ native PET images] THEN = "CYLINDRICAL RING"	
Field of View Dimensions	(0018,1149)	3	IS	1-2	10.0*Scan.scan_fov \ Scan.axial_fov	
Gantry /Detector Tilt	(0018,1120)	3	DS	1	Scan.gantry_tilt_angle	
Gantry/Detector Slew	(0018,1121)	3	DS	1		
Type of Detector Motion	(0054,0202)	3	CS	1	IF is_type == [ native PET images] THEN = "NONE"	
Collimator Type	(0018,1181)	2	CS	1	Scan.collimation	
Collimator/Grid Name		3	SH	1	Not Used	

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
	(0018,1180)					
Axial Acceptance	(0054,1200)	3	DS	1	Scan.axial_acceptance acceptance_flag axial_angle_3d	
Axial Mash	(0054,1201)	3	IS	2	Scan.axial_acceptance acceptance_flag	
Transverse Mash	(0054,1202)	3	IS	1	Scan.theta_compression	
Detector Element Size	(0054,1203)	3	DS	2	Not Used	
Coincidence Window Width	(0054,1210)	3	DS	1	Scan.upper_coinc_limit - Scan.lower_coinc_limit	
Energy Window Range Sequence	(0054,0013)	3	SQ	1		
> Energy Window Lower Limit	(0054,0014)	3	DS	1	Scan.lower_energy_limit	
> Energy Window Upper Limit	(0054,0015)	3	DS	1	Scan.upper_energy_limit	
Secondary Counts Type	(0054,1220)	3	CS	1-n	IF (Scan.delayed_events == [ separate ] ) THEN = "DLYD"	

## 4.5.3.3 PET Isotope Module

TABLE 4.5-6  
PET ISOTOPE MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Scan table unless otherwise specified)	Notes
Radiopharmaceutical Information Sequence	(0054,0016)	2	SQ	1	Single item sequence	
> Radionuclide Code Sequence	(0054,0300)	2	SQ	1	Single item sequence	
>> Code Value	(0008,0100)	1C	SH	1	99SDM	
>> Coding Scheme Designator	(0008,0102)	1C	SH	1	radionuclide_name	
>> Code Meaning	(0008,0104)	3	LO	1	radionuclide_name	
> Radiopharmaceutical Route	(0018,1070)	3	LO	1	Not Used	
> Administration Route Code Sequence	(0054,0302)	3	SQ	1	Not Used	
>> Code Value	(0008,0100)	1C	SH	1	Not Used	
>> Coding Scheme Designator	(0008,0102)	1C	SH	1	Not Used	
>> Code Meaning	(0008,0104)	3	LO	1	Not Used	
> Radiopharmaceutical	(0018,1071)	3	DS	1	pre_inj_volume	

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Scan table unless otherwise specified)	Notes
Volume						
> Radiopharmaceutical Start Time	(0018,1072)	3	TM	1	admin_datetime	
> Radiopharmaceutical Stop Time	(0018,1073)	3	TM	1	Not Used	
> Radionuclide Total Dose	(0018,1074)	3	DS	1	tracer_activity, post_inj_activity, half_life, meas_datetime, admin_datetime, post_inj_datetime	
> Radionuclide Half Life	(0018,1075)	3	DS	1	half_life	
> Radionuclide Positron Fraction	(0018,1076)	3	DS	1	positron_fraction	
> Radiopharmaceutical Specific Activity	(0018,1077)	3	DS	1	Not Used	
> Radiopharmaceutical	(0018,0031)	3	LO	1	tracer_name	
> Radiopharmaceutical Code Sequence	(0054,0304)	3	SQ	1	Single item sequence	
>> Code Value	(0008,0100)	1C	SH	1	99SDM	
>> Coding Scheme Designator	(0008,0102)	1C	SH	1	tracer_name	
>> Code Meaning	(0008,0104)	3	LO	1	tracer_name	
Intervention Drug Information Sequence	(0018,0026)	3	SQ	1	Not Used	
> Intervention Drug Name	(0018,0034)	3	LO	1	Not Used	
> Intervention Drug Code Sequence	(0018,0029)	3	SQ	1	Not Used	
>> Code Value	(0008,0100)	1C	SH	1	Not Used	
>> Coding Scheme Designator	(0008,0102)	1C	SH	1	Not Used	
>> Code Meaning	(0008,0104)	3	LO	1	Not Used	
> Intervention Drug Start Time	(0018,0035)	3	TM	1	Not Used	
> Intervention Drug Stop Time	(0018,0027)	3	TM	1	Not Used	
> Intervention Drug Dose	(0018,0028)	3	DS	1	Not Used	

## 4.5.3.4 PET Multi-gated Acquisition Module

TABLE 4.5-7

## PET ISOTOPE MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Scan table unless otherwise specified)	Notes
----------------	-----	------	----	----	--	-------

Beat Rejection Flag	(0018,1080)	2	CS	1	IF ( trig_rej_method == [ none ] ) THEN = "N" ELSE = "Y"	
Trigger Source or Type	(0018,1061)	3	LO	1	Not Used	
PVC Rejection	(0018,1085)	3	LO	1	trig_rej_method	
Skip Beats	(0018,1086)	3	IS	1	number_for_reject	
Heart Rate	(0018,1088)	3	IS	1	Not Used	
Framing Type	(0018,1064)	3	LO	1	binning_mode	

**4.5.3.5 GE Advance ImageSet Module**

Refer to Section 4.6.6 for details.

**4.5.3.6 GE Advance Scan Module**

Refer to Section 4.6.4 for details.

**4.5.4 Common Equipment Entity Modules**

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

**4.5.4.1 General Equipment Module**

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

**TABLE 4.5-8  
GENERAL EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Exam table unless otherwise specified)	Notes
Manufacturer	(0008,0070)	2	LO	1	manufacturer	
Institution Name	(0008,0080)	3	LO	1	hospital_name	
Institution Address	(0008,0081)	3	ST	1	Not Used	
Station Name	(0008,1010)	3	SH	1	Not Used	
Institutional Department Name	(0008,1040)	3	LO	1	Not Used	
Manufacturer's Model Name	(0008,1090)	3	LO	1	scanner_desc	
Device Serial Number	(0018,1000)	3	LO	1	Not Used	
Software Versions	(0018,1020)	3	LO	1	Image.software_version Curve.software_version Frame.software_version	

Spatial Resolution	(0018,1050)	3	DS	1	Not Used	
Date of Last Calibration	(0018,1200)	3	DA	1-n	Not Used	
Time of Last Calibration	(0018,1201)	3	TM	1-n	Not Used	
Pixel Padding Value	(0028,0120)	3	US or SS	1	Not Used	

#### 4.5.5 Common Curve Entity Modules

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

##### 4.5.5.1 Curve Identification Module

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

**TABLE 4.5-9**  
**CURVE IDENTIFICATION MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Curve table unless otherwise specified)	Notes
Curve Number	(0020,0024)	2	IS	1	1	
Curve Date	(0008,0025)	3	DA	1	extract date from curve_datetime	
Curve Time	(0008,0035)	3	TM	1	extract time from curve_datetime	
Referenced Image Sequence	(0008,1140)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1	UI	1		
>Referenced SOP Instance UID	(0008,1155)	1	UI	1		
Referenced Overlay Sequence	(0008,1130)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1	UI	1		
>Referenced SOP Instance UID	(0008,1155)	1	UI	1		
Referenced Curve Sequence	(0008,1145)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1	UI	1		
>Referenced SOP Instance UID	(0008,1155)	1	UI	1		

4.5.5.2 Curve Module

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

TABLE 4.5-10  
CURVE MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Curve table unless otherwise specified)	Notes
Curve Dimensions	(50xx,0005)	1	US	1	use curve_type	
Number of Points	(50xx,0010)	1	US	1	curve_size / sizeof (curvePoint) /* struct curvePoint in idbBlobStructs.h */	
Type of Data	(50xx,0020)	1	CS	1	curve_type SYSRATE = system count rate SLICERATE = slice count rate BLDSMPL = blood samples	Refer Note Below
Data Value Representation	(50xx,0103)	1	US	1	0002H	
Curve Data	(50xx,3000)	1	OW/OB	1	curve_data	
Curve Description	(50xx,0022)	3	LO	1	curve_name	
Axis Units	(50xx,0030)	3	SH	1-n	Graph.x_axis_units \ Graph.y_axis_units	Refer Note below
Axis Labels	(50xx,0040)	3	SH	1-n	Graph.x_axis_label \ Graph.y_axis_label (truncate from 32A to 16A)	
Minimum Coordinate Value	(50xx,0104)	3	US	1-n	Not Used	
Maximum Coordinate Value	(50xx,0105)	3	US	1-n	Not Used	
Curve Range	(50xx,0106)	3	SH	1-n	Graph.x_axis_min \ Graph.x_axis_max \ Graph.y_axis_min \ Graph.y_axis_max	
Curve Data Descriptor	(50xx,0110)	1C	US	1-n	Not Used	
Coordinate Start Value	(50xx,0112)	1C	US	1	Not Used	
Coordinate Step Value	(50xx,0114)	1C	US	1	Not Used	
Curve Label	(50xx,2500)	3	LO	1	CurvePresentation.curve_label	
Referenced Overlay Sequence	(50xx,2600)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1	UI	1	Not Used	
>Referenced SOP Instance UID	(0008,1155)	1	UI	1	Not Used	
>Referenced Overlay Group	(50xx,2610)	1	US	1	Not Used	

Note:

IF ( curve\_type == [ blood sample ] ) THEN  
CASE x\_axis\_units OF :  
[ msec ], [ sec ] : break;/\* MILS and SEC ok \*/

[ min ]: Axis Units (50xx,0030) Value 1 = SEC  
DEFAULT: Reject send

CASE y\_axis\_units OF :  
[ counts/sec ] : break; /\* BQML and CPS ok \*/  
DEFAULT: Reject send

IF ( curve\_type == [ rate ] ) THEN  
CASE x\_axis\_units OF :  
[ msec ], [ sec ] : break; /\* MLS, SEC ok \*/  
[ min ]: Axis Units (50xx,0030) Value 1 = SEC  
DEFAULT: Reject send

CASE y\_axis\_units OF :  
[ counts/sec ] : break; /\* CPS ok \*/  
DEFAULT: Reject send

**Note:** *Cardiac Polar Maps are not supported as part of the PET Curve IOD.*

**4.5.5.3 PET Curve Module**

This section specifies the Attributes that describe the PET Curve Module.

**TABLE 4.5-11  
PET CURVE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Curve table unless otherwise specified)	Notes
Curve Dimensions	(50xx,0005)	1	US	1	2	
Type of Data	(50xx,0020)	1	CS	1	curve_type	
Curve Data	(50xx,3000)	1	OW/OB	1	curve_data	
Axis Units	(50xx,0030)	3	SH	1-n	Graph.x_axis_units \ Graph.y_axis_units	
Dead Time Correction Flag	(0054,1401 )	1C	CS	1	IF (curve_type == [ blood sample ] THEN = deadtime	
Counts Included	(0054,1400 )	2C	CS	1-n	IF (Axis Units (50xx,0030) contains CPS or CNTS) THEN ImageSet.scatter or ImageSet.emiss_randoms	
Processing Function	(0018,5020 )	3	LO	1	Not Used	

**Note:** *Cardiac Polar Maps are not supported as part of the PET Curve IOD.*

**4.5.5.4 GE Advance Curve**

Refer to Section 4.6.7 for details.

**4.5.5.5 GE Advance Graph**

Refer to Section 4.6.8 for details.

**4.5.5.6 GE Advance Curve Presentation**

Refer to Section 4.6.9 for details.

**4.5.6 General Modules**

The SOP Common Module is mandatory for all DICOM IODs.



4.5.6.1 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 4.5-12  
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Image table unless otherwise specified)	Notes
SOP Class UID	(0008,0016)	1	UI	1		TR <sup>48</sup>
SOP Instance UID	(0008,0018)	1	UI	1		TR <sup>49</sup>
Specific Character Set	(0008,0005)	1C	CS	1	= NULL	
Instance Creation Date	(0008,0012)	3	DA	1	current_date	
Instance Creation Time	(0008,0013)	3	TM	1	current_time	
Instance Creator UID	(0008,0014)	3	UI	1	= 1.2.840.113619.1.64.<dbcode>	

T<sup>48</sup>Translate value as follows:

```

IF (PET Image Transfer) THEN
    SOP Class UID (08,16) = 1.2.840.10008.5.1.4.1.1.128
ELSE IF (Curve Transfer)
    CASE ( Curve.curve_type ) OF :
        [ blood sample ], [ rates ] :
            /* PET Curve */
            SOP Class UID (08,16) = 1.2.840.10008.5.1.4.1.1.129
            break;
        [ profile ], [ histogram ], [ volume activity curve ], [ foreign ] :
        [ area ], [ patlak ], [ tac midframe ], [ tac effective ] :
            /* Standalone Curve */
            SOP Class UID (08,16) = 1.2.840.10008.5.1.4.1.1.9
            break;
ELSE IF (Polar Map Transfer) THEN
    Reject Transfer;

```

<sup>49</sup>Translate value as follows:

```

IF (SOP Class UID (08,16) == "1.2.840.10008.5.1.4.1.1.128") THEN /* PET Image */
    SOP Instance UID (08,18) = Image.image_id
ELSE IF (SOP Class UID (08,16) == "1.2.840.10008.5.1.4.1.1.129") THEN /* PET Curve */
    IF (Type of Data (50xx,0020) != "CPM") THEN
        /* Polar map */
        Reject Transfer

```

REV 0.3

/\*Standalone Curve \*/

ELSE IF (SOP Class UID (08,16) == "1.2.840.10008.5.1.4.1.1.9") THEN

SOP Instance UID (08,18) = Curve.curve\_id

#### 4.6 PRIVATE DATA DICTIONARY

##### 4.6.1 Private Creator Identification Information

TABLE 4.6-1  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(0009,0010)	1	SH	1	n/a
GE Advance Implementation Version Name Value 1: "GE Advance" Value 2: IDB_SOFTWARE_VERSION	(0009,1001)	3	LO	2	n/a

##### 4.6.2 GE Advance Patient Module

TABLE 4.6-2  
GE ADVANCE PATIENT MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Patient.patient_id	(0009,1002)	3	LO	1	20A
GE Advance Patient.compatible_version	(0009,1003)	3	SH	1	5A
GE Advance Patient.software_version	(0009,1004)	3	SH	1	5A
GE Advance Patient.patient_datetime	(0009,1005)	3	DT	1	D
GE Advance Patient.type	(0009,1006)	3	SL	1	L

##### 4.6.3 GE Advance Exam Module

TABLE 4.6-3  
GE ADVANCE EXAM MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Exam.exam_id	(0009,1007)	3	UI	1	64A
GE Advance Exam.compatible_version	(0009,1008)	3	SH	1	5A
GE Advance Exam.software_version	(0009,1009)	3	SH	1	5A

##### 4.6.4 GE Advance Scan Module

TABLE 4.6-4  
GE ADVANCE SCAN MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Scan.scan_id	(0009,100A)	3	UI	1	64A
GE Advance Scan.compatible_version	(0009,100B)	3	SH	1	5A
GE Advance Scan.software_version	(0009,100C)	3	SH	1	5A
GE Advance Scan.scan_datetime	(0009,100D)	3	DT	1	D
GE Advance Scan.scan_ready	(0009,100E)	3	DT	1	D

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Scan.scan_description	(0009,100F)	3	UI	1	64A
GE Advance Scan.hospital_name	(0009,1010)	3	LO	1	32A
GE Advance Scan.scanner_desc	(0009,1011)	3	LO	1	32A
GE Advance Scan.manufacturer	(0009,1012)	3	LO	1	64A
GE Advance Scan.for_identifier	(0009,1013)	3	UI	1	64A
GE Advance Scan.landmark_name	(0009,1014)	3	LO	1	64A
GE Advance Scan.landmark_abbrev	(0009,1015)	3	SH	1	2A
GE Advance Scan.patient_position	(0009,1016)	3	SL	1	L
GE Advance Scan.scan_perspective	(0009,1017)	3	SL	1	L
GE Advance Scan.scan_type	(0009,1018)	3	SL	1	L
GE Advance Scan.scan_mode	(0009,1019)	3	SL	1	L
GE Advance Scan.start_condition	(0009,101A)	3	SL	1	L
GE Advance Scan.start_cond_data	(0009,101B)	3	SL	1	L
GE Advance Scan.sel_stop_cond	(0009,101C)	3	SL	1	L
GE Advance Scan.sel_stop_cond_data	(0009,101D)	3	SL	1	L
GE Advance Scan.collect_deadtime	(0009,101E)	3	SL	1	L
GE Advance Scan.collect_singles	(0009,101F)	3	SL	1	L
GE Advance Scan.collect_countrate	(0009,1020)	3	SL	1	L
GE Advance Scan.countrate_period	(0009,1021)	3	SL	1	L
GE Advance Scan.delayed_events	(0009,1022)	3	SL	1	L
GE Advance Scan.delayed_bias	(0009,1023)	3	SL	1	L
GE Advance Scan.word_size	(0009,1024)	3	SL	1	L
GE Advance Scan.axial_acceptance	(0009,1025)	3	SL	1	L
GE Advance Scan.axial_angle_3d	(0009,1026)	3	SL	1	L
GE Advance Scan.theta_compression	(0009,1027)	3	SL	1	L
GE Advance Scan.axial_compression	(0009,1028)	3	SL	1	L
GE Advance Scan.gantry_tilt_angle	(0009,1029)	3	FL	1	F
GE Advance Scan.collimation	(0009,102A)	3	SL	1	L
GE Advance Scan.scan_fov	(0009,102B)	3	SL	1	L
GE Advance Scan.axial_fov	(0009,102C)	3	SL	1	L
GE Advance Scan.event_separation	(0009,102D)	3	SL	1	L
GE Advance Scan.mask_width	(0009,102E)	3	SL	1	L
GE Advance Scan.binning_mode	(0009,102F)	3	SL	1	L
GE Advance Scan.trig_rej_method	(0009,1030)	3	SL	1	L
GE Advance Scan.number_for_reject	(0009,1031)	3	SL	1	L
GE Advance Scan.lower_reject_limit	(0009,1032)	3	SL	1	L
GE Advance Scan.upper_reject_limit	(0009,1033)	3	SL	1	L
GE Advance Scan.triggers_acquired	(0009,1034)	3	SL	1	L
GE Advance Scan.triggers_rejected	(0009,1035)	3	SL	1	L
GE Advance Scan.tracer_name	(0009,1036)	3	LO	1	40A
GE Advance Scan.batch_description	(0009,1037)	3	LO	1	40A
GE Advance Scan.tracer_activity	(0009,1038)	3	FL	1	F

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Scan.meas_datetime	(0009,1039)	3	DT	1	D
GE Advance Scan.pre_inj_volume	(0009,103A)	3	FL	1	F
GE Advance Scan.admin_datetime	(0009,103B)	3	DT	1	D
GE Advance Scan.post_inj_activity	(0009,103C)	3	FL	1	F
GE Advance Scan.post_inj_datetime	(0009,103D)	3	DT	1	D
GE Advance Scan.radionuclide_name	(0009,103E)	3	SH	1	6A
GE Advance Scan.half_life	(0009,103F)	3	FL	1	F
GE Advance Scan.positron_fraction	(0009,1040)	3	FL	1	F
GE Advance Scan.source1_holder	(0009,1041)	3	SL	1	L
GE Advance Scan.source1_activity	(0009,1042)	3	FL	1	F
GE Advance Scan.source1_meas_dt	(0009,1043)	3	DT	1	D
GE Advance Scan.source1_radnuclide	(0009,1044)	3	SH	1	6A
GE Advance Scan.source1_half_life	(0009,1045)	3	FL	1	F
GE Advance Scan.source2_holder	(0009,1046)	3	SL	1	L
GE Advance Scan.source2_activity	(0009,1047)	3	FL	1	F
GE Advance Scan.source2_meas_dt	(0009,1048)	3	DT	1	D
GE Advance Scan.source2_radnuclide	(0009,1049)	3	SH	1	6A
GE Advance Scan.source2_half_life	(0009,104A)	3	FL	1	F
GE Advance Scan.source_speed	(0009,104B)	3	SL	1	L
GE Advance Scan.source_location	(0009,104C)	3	FL	1	F
GE Advance Scan.emission_present	(0009,104D)	3	SL	1	L
GE Advance Scan.lower_axial_acc	(0009,104E)	3	SL	1	L
GE Advance Scan.upper_axial_acc	(0009,104F)	3	SL	1	L
GE Advance Scan.lower_coinc_limit	(0009,1050)	3	SL	1	L
GE Advance Scan.upper_coinc_limit	(0009,1051)	3	SL	1	L
GE Advance Scan.coinc_delay_offset	(0009,1052)	3	SL	1	L
GE Advance Scan.coinc_output_mode	(0009,1053)	3	SL	1	L
GE Advance Scan.upper_energy_limit	(0009,1054)	3	SL	1	L
GE Advance Scan.lower_energy_limit	(0009,1055)	3	SL	1	L
GE Advance Scan.normal_cal_id	(0009,1056)	3	UI	1	64A
GE Advance Scan.normal_2d_cal_id	(0009,1057)	3	UI	1	64A
GE Advance Scan.blank_cal_id	(0009,1058)	3	UI	1	64A
GE Advance Scan.wc_cal_id	(0009,1059)	3	UI	1	64A
GE Advance Scan.derived	(0009,105A)	3	SL	1	L
GE Advance Scan.contrast_agent	(0009,105B)	3	LO	1	64A

4.6.5 GE Advance Frame Module

TABLE 4.6-5  
GE ADVANCE FRAME MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Frame.frame_id	(0009,105C)	3	UI	1	64A
GE Advance Frame.scan_id	(0009,105D)	3	UI	1	64A
GE Advance Frame.exam_id	(0009,105E)	3	UI	1	64A
GE Advance Frame.patient_id	(0009,105F)	3	LO	1	20A
GE Advance Frame.compatible_version	(0009,1060)	3	SH	1	5A
GE Advance Frame.software_version	(0009,1061)	3	SH	1	5A
GE Advance Frame.where_is_frame	(0009,1062)	3	ST	1	256A
GE Advance Frame.frame_size	(0009,1063)	3	SL	1	L
GE Advance Frame.file_exists	(0009,1064)	3	SL	1	L
GE Advance Frame.patient_entry	(0009,1065)	3	SL	1	L
GE Advance Frame.table_height	(0009,1066)	3	FL	1	F
GE Advance Frame.table_z_position	(0009,1067)	3	FL	1	F
GE Advance Frame.landmark_datetime	(0009,1068)	3	DT	1	D
GE Advance Frame.slice_count	(0009,1069)	3	SL	1	L
GE Advance Frame.start_location	(0009,106A)	3	FL	1	F
GE Advance Frame.acq_delay	(0009,106B)	3	SL	1	L
GE Advance Frame.acq_start	(0009,106C)	3	DT	1	D
GE Advance Frame.acq_duration	(0009,106D)	3	SL	1	L
GE Advance Frame.acq_bin_dur	(0009,106E)	3	SL	1	L
GE Advance Frame.acq_bin_start	(0009,106F)	3	SL	1	L
GE Advance Frame.actual_stop_cond	(0009,1070)	3	SL	1	L
GE Advance Frame.total_prompts	(0009,1071)	3	FD	1	Db1
GE Advance Frame.total_delays	(0009,1072)	3	FD	1	Db1
GE Advance Frame.frame_valid	(0009,1073)	3	SL	1	L
GE Advance Frame.validity_info	(0009,1074)	3	SL	1	L
GE Advance Frame.archived	(0009,1075)	3	SL	1	L
GE Advance Frame.compression	(0009,1076)	3	SL	1	L
GE Advance Frame.uncompressed_size	(0009,1077)	3	SL	1	L
GE Advance Frame.accum_bin_dur	(0009,1078)	3	SL	1	L

4.6.6 GE Advance ImageSet Module

TABLE 4.6-6  
GE ADVANCE IMAGESET MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance ImageSet.compatible_version	(0009,1079)	3	SH	1	5A
GE Advance ImageSet.software_version	(0009,107A)	3	SH	1	5A
GE Advance ImageSet.is_datetime	(0009,107B)	3	DT	1	D
GE Advance ImageSet.is_source	(0009,107C)	3	SL	1	L
GE Advance ImageSet.is_contents	(0009,107D)	3	SL	1	L
GE Advance ImageSet.is_type	(0009,107E)	3	SL	1	L
GE Advance ImageSet.is_reference	(0009,107F)	3	FL	3	F
GE Advance ImageSet.multi_patient	(0009,1080)	3	SL	1	L
GE Advance ImageSet.number_of_normals	(0009,1081)	3	SL	1	L
GE Advance ImageSet.color_map_id	(0009,1082)	3	UI	1	64A
GE Advance ImageSet.window_level_type	(0009,1083)	3	SL	1	L
GE Advance ImageSet.rotate	(0009,1084)	3	FL	1	F
GE Advance ImageSet.flip	(0009,1085)	3	SL	1	L
GE Advance ImageSet.zoom	(0009,1086)	3	FL	1	F
GE Advance ImageSet.pan_x	(0009,1087)	3	SL	1	L
GE Advance ImageSet.pan_y	(0009,1088)	3	SL	1	L
GE Advance ImageSet.window_level_min	(0009,1089)	3	FL	1	F
GE Advance ImageSet.window_level_max	(0009,108A)	3	FL	1	F
GE Advance ImageSet.recon_method	(0009,108B)	3	SL	1	L
GE Advance ImageSet.attenuation	(0009,108C)	3	SL	1	L
GE Advance ImageSet atten_coefficient	(0009,108D)	3	FL	1	F
GE Advance ImageSet.bp_filter	(0009,108E)	3	SL	1	L
GE Advance ImageSet.bp_filter_cutoff	(0009,108F)	3	FL	1	F
GE Advance ImageSet.bp_filter_order	(0009,1090)	3	SL	1	L
GE Advance ImageSet.bp_center_l	(0009,1091)	3	FL	1	F
GE Advance ImageSet.bp_center_p	(0009,1092)	3	FL	1	F
GE Advance ImageSet.atten_smooth	(0009,1093)	3	SL	1	L
GE Advance ImageSet.atten_smooth_param	(0009,1094)	3	SL	1	L
GE Advance ImageSet.angle_smooth_param	(0009,1095)	3	SL	1	L
GE Advance ImageSet.wellcountercal_id	(0009,1096)	3	UI	1	64A
GE Advance ImageSet.trans_scan_id	(0009,1097)	3	UI	1	64A
GE Advance ImageSet.norm_cal_id	(0009,1098)	3	UI	1	64A
GE Advance ImageSet.blnc_cal_id	(0009,1099)	3	UI	1	64A
GE Advance ImageSet.cac_edge_threshold	(0009,109A)	3	FL	1	F
GE Advance ImageSet.cac_skull_offset	(0009,109B)	3	FL	1	F
GE Advance ImageSet.emiss_sub_id	(0009,109C)	3	UI	1	64A
GE Advance ImageSet.radial_filter_3d	(0009,109D)	3	SL	1	L

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance ImageSet.radial_cutoff_3d	(0009,109E)	3	FL	1	F
GE Advance ImageSet.axial_filter_3d	(0009,109F)	3	SL	1	L
GE Advance ImageSet.axial_cutoff_3d	(0009,10A0)	3	FL	1	F
GE Advance ImageSet.axial_start	(0009,10A1)	3	FL	1	F
GE Advance ImageSet.axial_spacing	(0009,10A2)	3	FL	1	F
GE Advance ImageSet.axial_angles_used	(0009,10A3)	3	SL	1	L
GE Advance ImageSet.ir_num_iterations	(0009,10B2)	3	SL	1	F
GE Advance ImageSet.ir_num_subsets	(0009,10B3)	3	SL	1	L
GE Advance ImageSet.ir_recon_fov	(0009,10B4)	3	FL	1	F
GE Advance ImageSet.ir_corr_model	(0009,10B5)	3	SL	1	L
GE Advance ImageSet.ir_loop_filter	(0009,10B6)	3	SL	1	L
GE Advance ImageSet.ir_pre_filt_parm	(0009,10B7)	3	FL	1	F
GE Advance ImageSet.ir_loop_filt_parm	(0009,10B8)	3	SL	1	L
GE Advance ImageSet.response_filt_parm	(0009,10B9)	3	FL	1	F
GE Advance ImageSet.post_filter	(0009,10BA)	3	SL	1	L
GE Advance ImageSet.post_filt_parm	(0009,10BB)	3	FL	1	F
GE Advance ImageSet.ir_regularize	(0009,10BC)	3	SL	1	L
GE Advance ImageSet.regularize_parm	(0009,10BD)	3	FL	1	F
GE Advance ImageSet.ac_bp_filter	(0009,10BE)	3	SL	1	L
GE Advance ImageSet.ac_bp_filt_cut_off	(0009,10BF)	3	FL	1	F
GE Advance ImageSet.ac_bp_filt_order	(0009,10C0)	3	SL	1	L
GE Advance ImageSet.ac_img_smooth	(0009,10C1)	3	SL	1	L
GE Advance ImageSet.ac_img_smooth_parm	(0009,10C2)	3	FL	1	F
GE Advance ImageSet.scatter_method	(0009,10C3)	3	SL	1	L
GE Advance ImageSet.scatter_num_iter	(0009,10C4)	3	SL	1	L
GE Advance ImageSet.scatter_parm	(0009,10C5)	3	FL	1	F

#### 4.6.7 GE Advance Curve Module

**TABLE 4.6-7**  
**GE ADVANCE CURVE MODULE PRIVATE ELEMENTS**  
**PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)**

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(5001,0010)	1	SH	1	n/a
GE Advance Curve.curve_id	(5001,1001)	3	UI	1	64A
GE Advance Curve.compatible_version	(5001,1002)	3	SH	1	5A
GE Advance Curve.software_version	(5001,1003)	3	SH	1	5A
GE Advance Curve.statistics_type	(5001,1004)	3	SL	1	L
GE Advance Curve.how_derived	(5001,1005)	3	LT	1	Bt
GE Advance Curve.how_derived_size	(5001,1006)	3	SL	1	L
GE Advance Curve.multi_patient	(5001,1007)	3	SL	1	L
GE Advance Curve.deadtime	(5001,1008)	3	SL	1	L



4.6.8 GE Advance Graph Module

TABLE 4.6-8  
GE ADVANCE GRAPH MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(5003,0010)	1	SH	1	n/a
GE Advance Graph Sequence	(5003,1001)	3	SQ	1	n/a
> GE Advance Graph.graph_id	(5003,1002)	3	UI	1	64A
> GE Advance Graph.compatible_version	(5003,1003)	3	SH	1	5A
> GE Advance Graph.software_version	(5003,1004)	3	SH	1	5A
> GE Advance Graph.title	(5003,1005)	3	LO	1	32A
> GE Advance Graph.graph_datetime	(5003,1006)	3	DT	1	D
> GE Advance Graph.graph_description	(5003,1007)	3	ST	1	128A
> GE Advance Graph.title_font_name	(5003,1008)	3	LO	1	32A
> GE Advance Graph.title_font_size	(5003,1009)	3	SH	1	2A
> GE Advance Graph.footer	(5003,100A)	3	LO	1	64A
> GE Advance Graph.footer_font_size	(5003,100B)	3	SH	1	2A
> GE Advance Graph.foreground_color	(5003,100C)	3	LO	1	20A
> GE Advance Graph.background_color	(5003,100D)	3	LO	1	20A
> GE Advance Graph.graph_border	(5003,100E)	3	SL	1	L
> GE Advance Graph.graph_width	(5003,100F)	3	SL	1	L
> GE Advance Graph.graph_height	(5003,1010)	3	SL	1	L
> GE Advance Graph.grid	(5003,1011)	3	SL	1	L
> GE Advance Graph.label_font_name	(5003,1012)	3	LO	1	32A
> GE Advance Graph.label_font_size	(5003,1013)	3	SH	1	2A
> GE Advance Graph.axes_color	(5003,1014)	3	LO	1	20A
> GE Advance Graph.x_axis_label	(5003,1015)	3	LO	1	32A
> GE Advance Graph.x_axis_units	(5003,1016)	3	SL	1	L
> GE Advance Graph.x_major_tics	(5003,1017)	3	FL	1	F
> GE Advance Graph.x_axis_min	(5003,1018)	3	FL	1	F
> GE Advance Graph.x_axis_max	(5003,1019)	3	FL	1	F
> GE Advance Graph.y_axis_label	(5003,101A)	3	LO	1	32A
> GE Advance Graph.y_axis_units	(5003,101B)	3	SL	1	L
> GE Advance Graph.y_major_tics	(5003,101C)	3	FL	1	F
> GE Advance Graph.y_axis_min	(5003,101D)	3	FL	1	F
> GE Advance Graph.y_axis_max	(5003,101E)	3	FL	1	F
> GE Advance Graph.legend_font_name	(5003,101F)	3	LO	1	32A
> GE Advance Graph.legend_font_size	(5003,1020)	3	SH	1	2A
> GE Advance Graph.legend_location_x	(5003,1021)	3	SL	1	L
> GE Advance Graph.legend_location_y	(5003,1022)	3	SL	1	L
> GE Advance Graph.legend_width	(5003,1023)	3	SL	1	L

> GE Advance Graph.legend_height	(5003,1024)	3	SL	1	L
> GE Advance Graph.legend_border	(5003,1025)	3	SL	1	L
> GE Advance Graph.multi_patient	(5003,1026)	3	SL	1	L

#### 4.6.9 GE Advance Curve Presentation Module

TABLE 4.6-9

##### GE ADVANCE CURVE PRESENTATION MODULE PRIVATE ELEMENTS PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(5005,0010)	1	SH	1	n/a
GE Advance CurvePresentation Sequence	(5005,1001)	3	SQ	1	n/a
> GE Advance CurvePresentation.curvepresent_id	(5005,1002)	3	UI	1	64A
> GE Advance CurvePresentation.graph_id	(5005,1003)	3	UI	1	64A
> GE Advance CurvePresentation.curve_id	(5005,1004)	3	UI	1	64A
> GE Advance CurvePresentation.compatible_version	(5005,1005)	3	SH	1	5A
> GE Advance CurvePresentation.software_version	(5005,1006)	3	SH	1	5A
> GE Advance CurvePresentation.curve_label	(5005,1007)	3	LO	1	60A
> GE Advance CurvePresentation.color	(5005,1008)	3	LO	1	20A
> GE Advance CurvePresentation.line_type	(5005,1009)	3	SL	1	L
> GE Advance CurvePresentation.line_width	(5005,100A)	3	SL	1	L
> GE Advance CurvePresentation.point_symbol	(5005,100B)	3	SL	1	L
> GE Advance CurvePresentation.point_symbol_dim	(5005,100C)	3	SL	1	L
> GE Advance CurvePresentation.point_color	(5005,100D)	3	LO	1	20A

## 5. PATIENT ROOT QUERY/RETRIEVE INFORMATION MODEL DEFINITION

### 5.1 INTRODUCTION

This section specifies the use of the DICOM Patient Root Query/Retrieve Model used to organize data and against which a Query/Retrieve will be performed. The contents of this section are:

5.2 - Patient Root Information Model Description

5.3 - Patient Root Information Model Entity-Relationship Model

5.4 - Patient Root Information Model Keys

### 5.2 PATIENT ROOT INFORMATION MODEL DESCRIPTION

The Patient Root Query/Retrieve Information Model is based upon a four level hierarchy:

- 1 Patient
- 2 Study
- 3 Series
- 4 Image

The patient level is the top level and contains Attributes associated with the Patient Information Entity (IE) of Image IODs. Patient IEs are modality independent.

The study level is below the patient level and contains Attributes associated with the Study IE of Image IODs. A study belongs to a single patient. A single patient may have multiple studies. Study IEs are modality independent.

The series level is below the study level and contains Attributes associated with the Series, Frame of Reference and Equipment IEs of Image IODs. A series belongs to a single study. A single study may have multiple series. Series IEs are modality dependent

The lowest level is the image level and contains Attributes associated with the Image IE of Image IODs. An image belongs to a single series. A single series may contain multiple images. Image IEs are modality dependent

**Note:** The *Advance* supports the Patient Root Model as the DICOM Query SCP only.

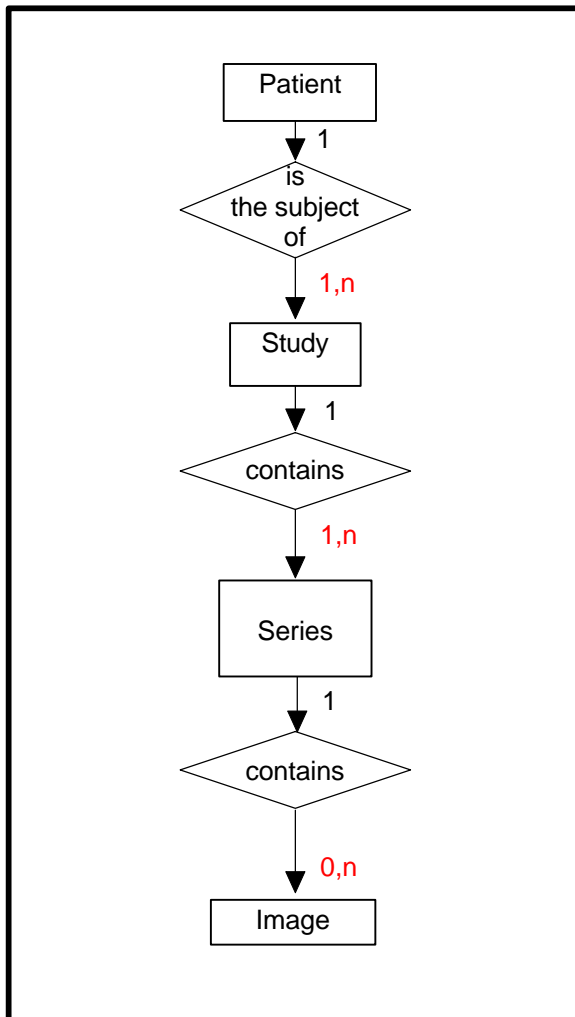
### 5.3 PATIENT ROOT INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Patient Root Information Model schema is shown in Illustration 5.3-1. 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 Study for each Patient (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 5.3-1  
PATIENT ROOT QUERY/RETRIEVE INFORMATION MODEL E/R DIAGRAM



### 5.3.1 ENTITY DESCRIPTIONS

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Patient Root Query/Retrieve Information Model.

#### 5.3.1.1 Patient Entity Description

The Patient Entity defines the characteristics of a patient who is the subject of one or more medical studies which produce medical images.

#### 5.3.1.2 Study Entity Description

The Study Entity defines the characteristics of a medical study performed on a patient. A study is a collection of one or more series of medical images which are logically related for the purpose of

diagnosing a patient. Each study is associated with exactly one patient.

**5.3.1.3 Series Entity Description**

The Series Entity defines the attributes which are used to group images into distinct logical sets. Each series is associated with exactly one study.

**5.3.1.4 Image Entity Description**

The Image Entity defines the attributes which describe the pixel data of an image. The pixel data is generated as a direct result of patient scanning (an Original image). An image is defined by its image plane, pixel data characteristics gray scale and/or color mapping characteristics and modality specific characteristics (acquisition parameters and image creation information).

**5.3.2 Advance Mapping of DICOM entities**

**TABLE 5.3-1  
MAPPING OF DICOM ENTITIES TO ADVANCE ENTITIES**

DICOM	Advance Entity
Patient	Patient
Study	Exam
Series	ImageSet, Scan
Image	Image, Frame

**5.4 INFORMATION MODEL KEYS**

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Patient Root Query/Retrieve Information Model.

The following Level descriptions are included to specify what data elements are supported and what type of matching can be applied. It should be noted that they are the same ones as defined in the DICOM v3.0 Standard PS 3.4 (Service Class Specifications).

**5.4.1 Supported Matching**

The *Advance* Query SCP supports the following types of matching:

- Single Value matching
- List of UID matching
- Universal Matching
- Wild Card Matching

– Range of date, Range of Time

### 5.4.2 Patient Level

This section defines the keys at the Patient Level of the Patient Root Query/Retrieve Information Model that are supported by this implementation.

**TABLE 5.4-1**  
**PATIENT LEVEL ATTRIBUTES FOR THE PATIENT ROOT**  
**QUERY/RETRIEVE INFORMATION MODEL**

Attribute Name	Tag	Type	Note
Patient's Name	(0010,0010)	R	Matched. Matching performed without regard to the PN VR individual component values.
Patient ID	(0010,0020)	U	Matched.
Patient's Sex	(0010,0040)	O	Returned

**TABLE 5.4-2**  
**Q/R PATIENT LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES**

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = PATIENT
Retrieve AE Title	(0008,0054)	-	Returned with AE title obtained during association negotiation.

### 5.4.3 Study Level

This section defines the keys at the Study Level of the Patient Root Query/Retrieve Information Model that are supported by this implementation.

**TABLE 5.4-3**  
**STUDY LEVEL ATTRIBUTES FOR THE PATIENT ROOT**  
**QUERY/RETRIEVE INFORMATION MODEL**

Attribute Name	Tag	Type	Attribute Description
Study Date	(0008,0020)	R	Matched
Study Time	(0008,0030)	R	Matched
Accession Number	(0008,0050)	R	Matched as zero length required key.
Modalities in Study	(0008,0061)	O	Matched
Study ID	(0020,0010)	R	Matched
Study Instance UID	(0020,000D)	U	Matched
Referring Physician's Name	(0008,0090)	O	Returned
Study Description	(0008,1030)	O	Returned
Name of Physician(s) Reading Study	(0008,1060)	O	Returned

Attribute Name	Tag	Type	Attribute Description
Patient's Size	(0010,1020)	O	Returned
Patient's Weight	(0010,1030)	O	Returned
Number of Study Related Series	(0020,1206)	O	Returned

**TABLE 5.4-4**  
**Q/R STUDY LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES**

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = STUDY
Retrieve AE Title	(0008,0054)	-	Returned with AE title obtained during association negotiation.

**5.4.4 Series Level**

This section defines the keys at the Series Level of the Patient Root Query/Retrieve Information Model that are supported by this implementation.

**TABLE 5.4-5**  
**SERIES LEVEL ATTRIBUTES FOR THE PATIENT ROOT**  
**QUERY/RETRIEVE INFORMATION MODEL**

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	R	Matched
Series Number	(0020,0011)	R	Matched
Series Instance UID	(0020,000E)	U	Matched
Series Date	(0008,0021)	O	Returned
Series Time	(0008,0031)	O	Returned
Series Description	(0008,103E)	O	Returned
Operator's Name	(0008,1070)	O	Returned
Radio Pharmaceutical	(0008,1070)	O	Returned
Series Number of Images	(0020,1209)	O	Returned
Series Type	(0054,1000)	O	Returned
Counts Source	(0054,1002)	O	Returned
Imageset Source	(0009,107C)	O	Returned
Imageset Contents	(0009,107D)	O	Returned

**TABLE 5.4-6**  
**Q/R SERIES LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES**

Attribute Name	Tag	Type	Note
----------------	-----	------	------



Query Retrieve Level	(0008,0052)	-	Value = SERIES
Retrieve AE Title	(0008,0054)	-	Returned with AE title obtained during association negotiation.

**5.4.5 Image Level**

This section defines the keys at the Image Level of the Patient Root Query/Retrieve Information Model that are supported by this implementation.

**TABLE 5.4-7  
IMAGE LEVEL ATTRIBUTES FOR THE PATIENT ROOT  
QUERY/RETRIEVE INFORMATION MODEL**

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	R	Matched
SOP Instance UID	(0008,0018)	U	Matched
Rows	(0028,0010)	O	Returned
Columns	(0028,0011)	O	Returned

**TABLE 5.4-8  
Q/R IMAGE LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES**

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = IMAGE
Retrieve AE Title	(0008,0054)	-	Returned with AE title obtained during association negotiation.

### 5.5 PRIVATE DATA DICTIONARY

The Type of a Private Attribute is determined by the level of the Information Model in which it is used, and hence is not listed in this dictionary.

**TABLE 5.5-1**  
**PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)**  
**SERIES LEVEL PRIVATE ATTRIBUTES FOR THE PATIENT ROOT MODEL**

Attribute Name	Tag	VR	VM
Imageset Source	(0009,107C)	SL	1
Imageset Contents	(0009,107D)	SL	1

## 6. STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL DEFINITION

### 6.1 INTRODUCTION

This section specifies the use of the DICOM Study Root Query/Retrieve Model used to organize data and against which a Query/Retrieve will be performed. The contents of this section are:

6.2 - Study Root Information Model Description

6.3 - Study Root Information Model Entity-Relationship Model

6.4 - Study Root Information Model Keys

### 6.2 STUDY ROOT INFORMATION MODEL DESCRIPTION

The Study Root Query/Retrieve Information Model is based upon a three level hierarchy:

- Study
- Series
- Image

The study level is the top level and contains Attributes associated with the Study IE of Image IODs. Attributes of patients are considered to be attributes of studies. Study IEs are modality independent.

The series level is below the study level and contains Attributes associated with the Series, Frame of Reference and Equipment IEs of Image IODs. A series belongs to a single study. A single study may have multiple series. Series IEs are modality dependent

The lowest level is the image level and contains Attributes associated with the Image IE of Image IODs. An image belongs to a single series. A single series may contain multiple images. Image IEs are modality dependent

### 6.3 STUDY ROOT INFORMATION MODEL ENTITY- RELATIONSHIP MODEL

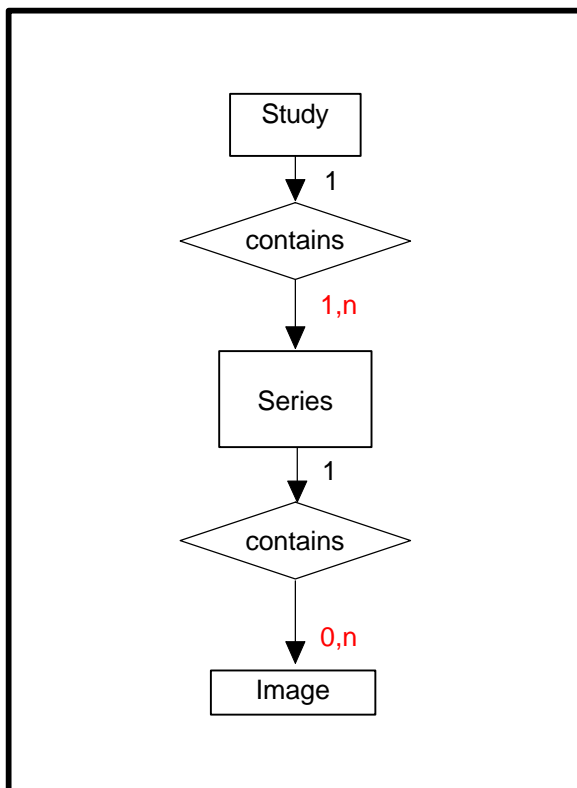
The Entity-Relationship diagram for the Study Root Information Model schema is shown in Illustration 6.3-1. In this figure, the following diagrammatic convention is established to represent the information organization :

- 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.

**ILLUSTRATION 6.3-1**  
**STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL E/R DIAGRAM**



### 6.3.1 Entity Descriptions

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Study Root Query/Retrieve Information Model.

#### 6.3.1.1 Study Entity Description

The Study Entity defines the characteristics of a medical study performed on a patient. A study is a collection of one or more series of medical images which are logically related for the purpose of diagnosing a patient.

### 6.3.1.2 Series Entity Description

The Series Entity defines the attributes which are used to group images into distinct logical sets. Each series is associated with exactly one study.

### 6.3.1.3 Image Entity Description

The Image Entity defines the attributes which describe the pixel data of an image. The pixel data is generated as a direct result of patient scanning (an Original image). An image is defined by its image plane, pixel data characteristics gray scale and/or color mapping characteristics and modality specific characteristics (acquisition parameters and image creation information).

## 6.3.2 Advance Mapping of DICOM entities

**TABLE 6.3-1**  
**MAPPING OF DICOM ENTITIES TO ADVANCE ENTITIES**

DICOM	Advance Entity
Study	Exam
Series	Imageset, Scan
Image	Image, Frame

## 6.4 INFORMATION MODEL KEYS

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Study Root Query/Retrieve Information Model.

The following Level descriptions are included to specify what data elements are supported and what type of matching can be applied. It should be noted that they are the same ones as defined in the DICOM v3.0 Standard PS 3.4 (Service Class Specifications).

### 6.4.1 Supported Matching

The *Advance* Query SCU request the following type(s) of matching:

- Wild Card Matching

The *Advance* Query SCP supports the following types of matching:

- Single Value matching
- List of UID matching
- Universal Matching
- Wild Card Matching
- Range of date, Range of Time

– Sequence Matching

**6.4.2 Study Level**

This section defines the keys at the Study Level of the Study Root Query/Retrieve Information Model that are supported by this implementation.

**TABLE 6.4-2  
STUDY LEVEL ATTRIBUTES FOR THE STUDY ROOT  
QUERY/RETRIEVE INFORMATION MODEL**

Attribute Name	Tag	Type	Note
Patient's Name	(0010,0010)	R	Matched. Matching performed without regard to the PN VR individual component values.
Patient ID	(0010,0020)	R	Matched.
Study Date	(0008,0020)	R	Matched
Study Time	(0008,0030)	R	Matched
Accession Number	(0008,0050)	R	Matched as zero length required key.
Modalities in Study	(0008,0061)	O	Matched
Study ID	(0020,0010)	R	Matched
Study Instance UID	(0020,000D)	U	Matched
Referring Physician's Name	(0008,0090)	O	Returned
Study Description	(0008,1030)	O	Returned
Name of Physician(s) Reading Study	(0008,1060)	O	Returned
Patient's Size	(0010,1020)	O	Returned
Patient's Weight	(0010,1030)	O	Returned
Patient's Sex	(0010,0040)	O	Returned
Number of Study Related Series	(0020,1206)	O	Returned

**TABLE 6.4-3  
Q/R STUDY LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES**

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = STUDY
Retrieve AE Title	(0008,0054)	-	Returned with AE title obtained during association negotiation.

**6.4.3 Series Level**

This section defines the keys at the Series Level of the Study Root Query/Retrieve Information Model that are supported by this implementation.

**TABLE 6.4-4  
SERIES LEVEL ATTRIBUTES FOR THE STUDY ROOT  
QUERY/RETRIEVE INFORMATION MODEL**

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	R	Matched
Series Number	(0020,0011)	R	Matched
Series Instance UID	(0020,000E)	U	Matched
Series Date	(0008,0021)	O	Returned
Series Time	(0008,0031)	O	Returned
Series Description	(0008,103E)	O	Returned
Operator's Name	(0008,1070)	O	Returned
Radio Pharmaceutical	(0008,1070)	O	Returned
Series Number of Images	(0020,1209)	O	Returned
Series Type	(0054,1000)	O	Returned
Counts Source	(0054,1002)	O	Returned
Imageset Source	(0009,107C)	O	Returned
Imageset Contents	(0009,107D)	O	Returned

**TABLE 6.4-5**  
**Q/R SERIES LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES**

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = SERIES
Retrieve AE Title	(0008,0054)	-	Returned with AE title obtained during association negotiation.

**6.4.4 Image Level**

This section defines the keys at the Image Level of the Study Root Query/Retrieve Information Model that are supported by this implementation.

**TABLE 6.4-6**  
**IMAGE LEVEL ATTRIBUTES FOR THE STUDY ROOT**  
**QUERY/RETRIEVE INFORMATION MODEL**

**TABLE 6.4-7**

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	R	Matched
SOP Instance UID	(0008,0018)	U	Matched
Rows	(0028,0010)	O	Returned
Columns	(0028,0011)	O	Returned

**Q/R IMAGE LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES**

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = IMAGE

Retrieve AE Title	(0008,0054)	-	Returned with AE title obtained during association negotiation.
-------------------	-------------	---	---



### 6.5 PRIVATE DATA DICTIONARY

The Type of a Private Attribute is determined by the level of the Information Model in which it is used, and hence is not listed in this dictionary.

**TABLE 6.5-1**  
**PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)**  
**SERIES LEVEL PRIVATE ATTRIBUTES FOR THE STUDY ROOT MODEL**

<b>Attribute Name</b>	<b>Tag</b>	<b>VR</b>	<b>VM</b>
Imageset Source	(0009,107C)	SL	1
Imageset Contents	(0009,107D)	SL	1

## 7. STANDALONE CURVE INFORMATION OBJECT IMPLEMENTATION

### 7.1 INTRODUCTION

This section specifies the use of the DICOM Standalone Curve IOD (referred to as the Curve IOD in other parts of this section) to represent the information included in curves produced by this implementation. Corresponding attributes are conveyed using the module construct. The contents of this section are:

7.2- Standalone Curve IOD Description

7.3- Standalone Curve IOD Entity-Relationship Model

7.4- Standalone Curve IOD Module Table

7.5- IOD Module Definition

### 7.2 STANDALONE CURVE IOD IMPLEMENTATION

The *Advance* implementation of DICOM uses the Standalone Curve format when creating curve objects. The *Advance* Curve object includes time activity curves, volume activity curves, image profile histograms, energy spectrum histograms and area curves. In order to preserve full fidelity when transferring data to an *Advance* workstation, some specialized database information is encoded as private DICOM attributes. All of the Standard and private attributes used are defined in the module tables. The *Advance* private data dictionary is included in Section 7.6. Nevertheless, the *Advance* is able to process DICOM curves without any private data elements.

### 7.3 STANDALONE CURVE ENTITY-RELATIONSHIP MODEL

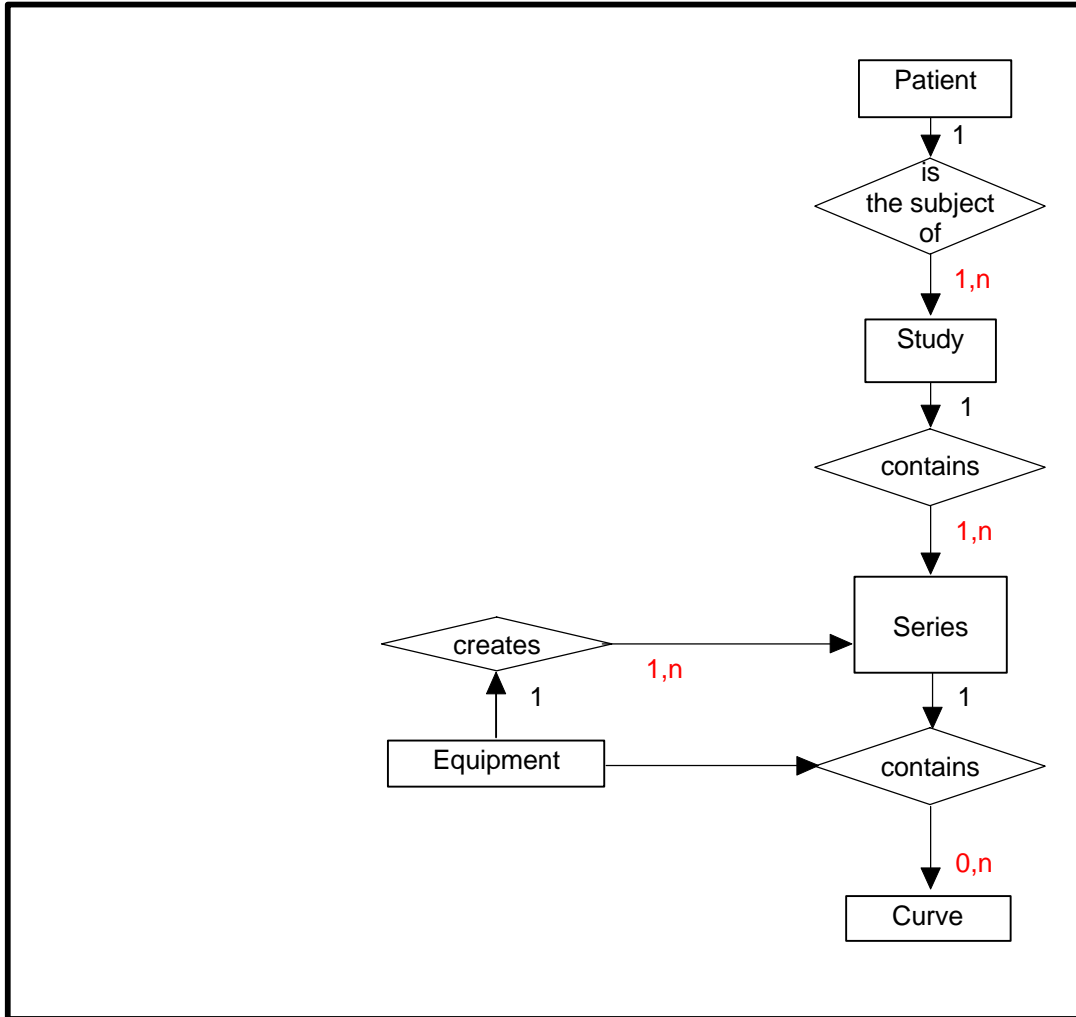
The Entity-Relationship diagram for the Curve interoperability schema is shown in **Illustration 10-1** . In this figure, the following diagrammatic convention is established to represent the information organization :

- 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 Curve can have up to n Curves per Series, but the Patient to Study relationship has 1 Study for each Patient (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 10-1  
CURVE 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 Information Object.

#### 7.3.1.1 Patient Entity Description

The Patient Entity defines the characteristics of a patient who is the subject of one or more medical studies which produce medical images.

### 7.3.1.2 Study Entity Description

The Study Entity defines the characteristics of a medical study performed on a patient. A study is a collection of one or more series of medical images which are logically related for the purpose of diagnosing a patient. Each study is associated with exactly one patient.

### 7.3.1.3 Series Entity Description

The Series Entity defines the attributes which are used to group images into distinct logical sets. Each series is associated with exactly one study.

### 7.3.1.4 Equipment Entity Description

The Equipment Entity describes the particular imaging device which produced the series of images. An imaging device may produce one or more series within a study. The Equipment Entity does not describe the data acquisition or image creation Attributes used to generate images within a series.

### 7.3.1.5 Curve Entity Description

The Curve Entity defines the attributes which describe the curve data of a curve.

## 7.3.2 Advance Mapping of DICOM entities

TABLE 7.3-1  
MAPPING OF DICOM ENTITIES TO ADVANCE ENTITIES

DICOM	Advance Entity
Patient	Patient
Study	Exam
Series	Imageset
Curve	Curve, Graph, Curve Presentation

## 7.4 STANDALONE CURVE IOD MODULE TABLE

Within an entity of the DICOM v3.0 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 which comprise the DICOM v3.0 Standalone Curve IOD. Modules are identified by Module Name.

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

**TABLE 7.4-1  
CURVE IOD MODULES**

Entity Name	Module Name	Reference
Patient	Patient	7.5.1.1
	GE Advance Patient	7.5.1.2
Study	General Study	7.5.2.1
	Patient Study	7.5.2.2
	GE Advance Exam	7.5.2.3
Series	General Series	7.5.3.1
	GE Advance Imageset	7.5.3.2
	GE Advance Scan	7.5.3.3
Equipment	General Equipment	7.5.4.1
Curve	Curve Identification	7.5.5.1
	Curve	7.5.5.2
	GE Advance Curve	7.5.5.3
	GE Advance Graph	7.5.5.4
	GE Advance Curve Presentation	7.5.5.5
General Modules	SOP Common	7.5.6.1

**7.5 STANDALONE CURVE 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 Standalone Curve 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).

### 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 Image and are common for all studies performed on the patient.

**TABLE 7.5-1  
PATIENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (Advance Patient table unless otherwise specified)	Notes
Patient's Name	(0010,0010)	2	PN (64)	1	patient_name	
Patient ID	(0010,0020)	2	LO (64)	1	patient_identifier	
Patient's Birth Date	(0010,0030)	2	DA (26)	1	birthdate	
Patient's Sex	(0010,0040)	2	CS (16)	1	sex	
Referenced Patient Sequence	(0008,1120)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
>Referenced SOP Instance UID	(0008,1155)	1C	UI	1	Not Used	
Patient's Birth Time	(0010,0032)	3	TM	1	Not Used	
Other Patient IDs	(0010,1000)	3	LO	1-n	Not Used	
Other Patient Names	(0010,1001)	3	PN	1-n	Not Used	
Ethnic Group	(0010,2160)	3	SH	1	Not Used	
Patient Comments	(0010,4000)	3	LT	1	Not Used	

#### 7.5.1.2 GE Advance Patient

Refer to Section 7.6.2 for details.

### 7.5.2 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.

**7.5.2.1 General Study Module**

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

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

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Exam table unless otherwise specified)	Notes
Study Instance UID	(0020,000D)	1	UI	1	study_uid	
Study Date	(0008,0020)	2	DA	1	extract date from exam_datetime	
Study Time	(0008,0030)	2	TM	1	extract time exam_datetime	
Referring Physician's Name	(0008,0090)	2	PN	1	ref_physician	
Study ID	(0020,0010)	2	SH	1	study_identifier	
Accession Number	(0008,0050)	2	SH	1	requisition	
Study Description	(0008,1030)	3	LO	1	exam_desc	
Physician(s) of Record	(0008,1048)	3	PN	1-n	Not Used	
Name of Physician(s) Reading Study	(0008,1060)	3	PN	1-n	diagnostician	
Referenced Study Sequence	(0008,1110)	3	SQ	1	Not Used	
> Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
> Referenced SOP Instance UID	(0008,1155)	1C	UI	1	Not Used	

**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	VM	Advance Attribute (GE Advance Exam table unless otherwise specified)	Notes
Admitting Diagnosis Description	(0008,1080)	3	LO	1-n	Not Used	
Patient's Age	(0010,1010)	3	AS	1	truncate years from (Exam.exam_datetime - Patient.patient_birthdate)	
Patient's Size	(0010,1020)	3	DS	1	patient_ht / 100.0 (convert cm to m)	
Patient's Weight	(0010,1030)	3	DS	1	patient_wt	

Occupation	(0010,2180)	3	SH	1	Not Used	
Additional Patient's History	(0010,21B0)	3	LT	1	patient_history	

**7.5.2.3 GE Advance Exam Module**

Refer to Section 7.6.3 for details.

**7.5.3 Common Series Entity Modules**

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

**7.5.3.1 General Series Module**

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

**TABLE 7.5-4  
GENERAL SERIES MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance ImageSet table unless otherwise specified)	Notes
Modality	(0008,0060)	1	CS	1	Exam.modality	
Series Instance UID	(0020,000E)	1	UI	1	IF (SOP Class UID == "1.2.840.113619.4.30") THEN = Scan.scan_id ELSE = image_set_id	
Series Number	(0020,0011)	2	IS	1	series_number	
Laterality	(0020,0060)	2C	CS	1	Not Used	
Series Date	(0008,0021)	3	DA	1	extract date from imageset.datetime	
Series Time	(0008,0031)	3	TM	1	extract time from imageset.datetime	
Performing Physician's Name	(0008,1050)	3	PN	1-n	Not Used	
Protocol Name	(0018,1030)	3	LO	1	Not Used	
Series Description	(0008,103E)	3	LO	1	IF (SOP Class UID == "1.2.840.113619.4.30") THEN = Scan.scan_description ELSE	



					= is_description	
Operators' Name	(0008,1070)	3	PN	1-n	Exam.operator	
Referenced Study Component Sequence	(0008,1111)	3	SQ	1	Not Used	
> Referenced SOP Class UID	(0008,1150)	1C	UI	1	Not Used	
> Referenced SOP Instance UID	(0008,1155)	1C	UI	1	Not Used	
Body Part Examined	(0018,0015)	3	CS	1	Not Used	
Patient Position	(0018,5100)	2C	CS	1	Scan.patient_position, Frame.patient_entry	
Smallest Pixel Value in Series	(0028,0108)	3	US/SS	1	Not Used	
Largest Pixel Value in Series	(0028,0109)	3	US/SS	1	Not Used	

**7.5.3.2 GE Advance ImageSet Module**

Refer to Section 7.6.5 for details.

**7.5.3.3 GE Advance Scan Module**

Refer to Section 7.6.4 for details.

**7.5.4 Common Equipment Entity Modules**

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

**7.5.4.1 General Equipment Module**

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

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

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Exam table unless otherwise specified)	Notes
Manufacturer	(0008,0070)	2	LO	1	manufacturer	
Institution Name	(0008,0080)	3	LO	1	hospital_name	
Institution Address	(0008,0081)	3	ST	1	Not Used	
Station Name	(0008,1010)	3	SH	1	Not Used	
Institutional Department Name	(0008,1040)	3	LO	1	Not Used	
Manufacturer's Model Name	(0008,1090)	3	LO	1	scanner_desc	

Device Serial Number	(0018,1000)	3	LO	1	Not Used	
Software Versions	(0018,1020)	3	LO	1	Image.software_version Curve.software_version Frame.software_version	
Spatial Resolution	(0018,1050)	3	DS	1	Not Used	
Date of Last Calibration	(0018,1200)	3	DA	1-n	Not Used	
Time of Last Calibration	(0018,1201)	3	TM	1-n	Not Used	
Pixel Padding Value	(0028,0120)	3	US or SS	1	Not Used	

**7.5.5 Common Curve Entity Modules**

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

**7.5.5.1 Curve Identification Module**

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

**TABLE 7.5-6  
CURVE IDENTIFICATION MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Curve table unless otherwise specified)	Notes
Curve Number	(0020,0024)	2	IS	1	1	
Curve Date	(0008,0025)	3	DA	1	extract date from curve_datetime	
Curve Time	(0008,0035)	3	TM	1	extract time from curve_datetime	
Referenced Image Sequence	(0008,1140)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1	UI	1		
>Referenced SOP Instance UID	(0008,1155)	1	UI	1		
Referenced Overlay Sequence	(0008,1130)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1	UI	1		
>Referenced SOP Instance UID	(0008,1155)	1	UI	1		
Referenced Curve Sequence	(0008,1145)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1	UI	1		
>Referenced SOP Instance UID	(0008,1155)	1	UI	1		

### 7.5.5.2 Curve Module

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

**TABLE 7.5-7  
CURVE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Curve table unless otherwise specified)	Notes
Curve Dimensions	(50xx,0005)	1	US	1	use curve_type	
Number of Points	(50xx,0010)	1	US	1	curve_size / sizeof (curvePoint) /* struct curvePoint in idbBlobStructs.h */	
Type of Data	(50xx,0020)	1	CS	1	curve_type SYSRATE = system count rate SLICERATE = slice count rate BLDSMPL = blood samples	Refer Note Below
Data Value Representation	(50xx,0103)	1	US	1	0002H	
Curve Data	(50xx,3000)	1	OW/OB	1	curve_data	
Curve Description	(50xx,0022)	3	LO	1	curve_name	
Axis Units	(50xx,0030)	3	SH	1-n	Graph.x_axis_units \ Graph.y_axis_units	Refer Note below
Axis Labels	(50xx,0040)	3	SH	1-n	Graph.x_axis_label \ Graph.y_axis_label (truncate from 32A to 16A)	
Minimum Coordinate Value	(50xx,0104)	3	US	1-n	Not Used	
Maximum Coordinate Value	(50xx,0105)	3	US	1-n	Not Used	
Curve Range	(50xx,0106)	3	SH	1-n	Graph.x_axis_min \ Graph.x_axis_max \ Graph.y_axis_min \ Graph.y_axis_max	
Curve Data Descriptor	(50xx,0110)	1C	US	1-n	Not Used	
Coordinate Start Value	(50xx,0112)	1C	US	1	Not Used	
Coordinate Step Value	(50xx,0114)	1C	US	1	Not Used	
Curve Label	(50xx,2500)	3	LO	1	CurvePresentation.curve_label	
Referenced Overlay Sequence	(50xx,2600)	3	SQ	1	Not Used	
>Referenced SOP Class UID	(0008,1150)	1	UI	1	Not Used	
>Referenced SOP Instance UID	(0008,1155)	1	UI	1	Not Used	
>Referenced Overlay Group	(50xx,2610)	1	US	1	Not Used	

**Note:**

```

IF ( curve_type == [ blood sample ] ) THEN
  CASE x_axis_units OF :
    [ msec ], [ sec ] : break; /* MILS and SEC ok
*/
    [ min ]: Axis Units (50xx,0030) Value 1 = SEC
    DEFAULT: Reject send

  CASE y_axis_units OF :
    [ counts/sec] :break; /* BQML and CPS ok */
    DEFAULT:Reject send

IF ( curve_type == [ rate ] ) THEN
  CASE x_axis_units OF :
    [ msec ], [ sec ] : break; /* MLS, SEC ok */
    [ min ]: Axis Units (50xx,0030) Value 1 = SEC
    DEFAULT: Reject send

  CASE y_axis_units OF :
    [ counts/sec] : break; /* CPS ok */
    DEFAULT: Reject send

```

**7.5.5.3 GE Advance Curve**

Refer to Section 7.6.6 for details.

**7.5.5.4 GE Advance Graph**

Refer to Section 7.6.7 for details.

**7.5.5.5 GE Advance Curve Presentation**

Refer to Section 7.6.8 for details.

**7.5.6 General Modules**

The SOP Common Module is mandatory for all DICOM IODs.

**7.5.6.1 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 7.5-8  
SOP COMMON MODULE ATTRIBUTES**

Attribute Name	Tag	Type	VR	VM	Advance Attribute (GE Advance Image table unless otherwise specified)	Notes
SOP Class UID	(0008,0016)	1	UI	1		TR <sup>48</sup>
SOP Instance UID	(0008,0018)	1	UI	1		TR <sup>49</sup>
Specific Character Set	(0008,0005)	1C	CS	1	= NULL	
Instance Creation Date	(0008,0012)	3	DA	1	current_date	
Instance Creation Time	(0008,0013)	3	TM	1	current_time	
Instance Creator UID	(0008,0014)	3	UI	1	= 1.2.840.113619.1.64.<dbcode>	

T<sup>48</sup>Translate value as follows:

```

IF (PET Image Transfer) THEN
    SOP Class UID (08,16) = 1.2.840.10008.5.1.4.1.1.128
ELSE IF (Curve Transfer)
    CASE ( Curve.curve_type ) OF :
        [ blood sample ], [ rates ] :
            /* PET Curve */
            SOP Class UID (08,16) = 1.2.840.10008.5.1.4.1.1.129
            break;
        [ profile ], [ histogram ], [ volume activity curve ], [ foreign ] :
        [ area ], [ patlak ], [ tac midframe ], [ tac effective ] :
            /* Standalone Curve */
            SOP Class UID (08,16) = 1.2.840.10008.5.1.4.1.1.9
            break;
ELSE IF (Polar Map Transfer) THEN
    Reject Transfer;
    
```

<sup>49</sup>Translate value as follows:

```

IF (SOP Class UID (08,16) == "1.2.840.10008.5.1.4.1.1.128") THEN /* PET Image */
    
```

REV 0.3

```
SOP Instance UID (08,18) = Image.image_id
ELSE IF (SOP Class UID (08,16) == "1.2.840.10008.5.1.4.1.1.129") THEN /* PET Curve
*/
    IF (Type of Data (50xx,0020) != "CPM") THEN
        /* Polar map */
        Reject Transfer
/*Standalone Curve */
ELSE IF (SOP Class UID (08,16) == "1.2.840.10008.5.1.4.1.1.9") THEN
    SOP Instance UID (08,18) = Curve.curve_id
```

7.6 PRIVATE DATA DICTIONARY

7.6.1 Private Creator Identification Information

TABLE 7.6-1  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(0009,0010)	1	SH	1	n/a
GE Advance Implementation Version Name Value 1: "GE Advance" Value 2: IDB_SOFTWARE_VERSION	(0009,1001)	3	LO	2	n/a

7.6.2 GE Advance Patient Module

TABLE 7.6-2  
GE ADVANCE PATIENT MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Patient.patient_id	(0009,1002)	3	LO	1	20A
GE Advance Patient.compatible_version	(0009,1003)	3	SH	1	5A
GE Advance Patient.software_version	(0009,1004)	3	SH	1	5A
GE Advance Patient.patient_datetime	(0009,1005)	3	DT	1	D
GE Advance Patient.type	(0009,1006)	3	SL	1	L

7.6.3 GE Advance Exam Module

TABLE 7.6-3  
GE ADVANCE EXAM MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Exam.exam_id	(0009,1007)	3	UI	1	64A
GE Advance Exam.compatible_version	(0009,1008)	3	SH	1	5A
GE Advance Exam.software_version	(0009,1009)	3	SH	1	5A

7.6.4 GE Advance Scan Module

TABLE 7.6-4  
GE ADVANCE SCAN MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Scan.scan_id	(0009,100A)	3	UI	1	64A
GE Advance Scan.compatible_version	(0009,100B)	3	SH	1	5A
GE Advance Scan.software_version	(0009,100C)	3	SH	1	5A

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Scan.scan_datetime	(0009,100D)	3	DT	1	D
GE Advance Scan.scan_ready	(0009,100E)	3	DT	1	D
GE Advance Scan.scan_description	(0009,100F)	3	UI	1	64A
GE Advance Scan.hospital_name	(0009,1010)	3	LO	1	32A
GE Advance Scan.scanner_desc	(0009,1011)	3	LO	1	32A
GE Advance Scan.manufacturer	(0009,1012)	3	LO	1	64A
GE Advance Scan.for_identifier	(0009,1013)	3	UI	1	64A
GE Advance Scan.landmark_name	(0009,1014)	3	LO	1	64A
GE Advance Scan.landmark_abbrev	(0009,1015)	3	SH	1	2A
GE Advance Scan.patient_position	(0009,1016)	3	SL	1	L
GE Advance Scan.scan_perspective	(0009,1017)	3	SL	1	L
GE Advance Scan.scan_type	(0009,1018)	3	SL	1	L
GE Advance Scan.scan_mode	(0009,1019)	3	SL	1	L
GE Advance Scan.start_condition	(0009,101A)	3	SL	1	L
GE Advance Scan.start_cond_data	(0009,101B)	3	SL	1	L
GE Advance Scan.sel_stop_cond	(0009,101C)	3	SL	1	L
GE Advance Scan.sel_stop_cond_data	(0009,101D)	3	SL	1	L
GE Advance Scan.collect_deadtime	(0009,101E)	3	SL	1	L
GE Advance Scan.collect_singles	(0009,101F)	3	SL	1	L
GE Advance Scan.collect_countrate	(0009,1020)	3	SL	1	L
GE Advance Scan.countrate_period	(0009,1021)	3	SL	1	L
GE Advance Scan.delayed_events	(0009,1022)	3	SL	1	L
GE Advance Scan.delayed_bias	(0009,1023)	3	SL	1	L
GE Advance Scan.word_size	(0009,1024)	3	SL	1	L
GE Advance Scan.axial_acceptance	(0009,1025)	3	SL	1	L
GE Advance Scan.axial_angle_3d	(0009,1026)	3	SL	1	L
GE Advance Scan.theta_compression	(0009,1027)	3	SL	1	L
GE Advance Scan.axial_compression	(0009,1028)	3	SL	1	L
GE Advance Scan.gantry_tilt_angle	(0009,1029)	3	FL	1	F
GE Advance Scan.collimation	(0009,102A)	3	SL	1	L
GE Advance Scan.scan_fov	(0009,102B)	3	SL	1	L
GE Advance Scan.axial_fov	(0009,102C)	3	SL	1	L
GE Advance Scan.event_separation	(0009,102D)	3	SL	1	L
GE Advance Scan.mask_width	(0009,102E)	3	SL	1	L
GE Advance Scan.binning_mode	(0009,102F)	3	SL	1	L
GE Advance Scan.trig_rej_method	(0009,1030)	3	SL	1	L
GE Advance Scan.number_for_reject	(0009,1031)	3	SL	1	L
GE Advance Scan.lower_reject_limit	(0009,1032)	3	SL	1	L
GE Advance Scan.upper_reject_limit	(0009,1033)	3	SL	1	L
GE Advance Scan.triggers_acquired	(0009,1034)	3	SL	1	L
GE Advance Scan.triggers_rejected	(0009,1035)	3	SL	1	L



Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Scan.tracer_name	(0009,1036)	3	LO	1	40A
GE Advance Scan.batch_description	(0009,1037)	3	LO	1	40A
GE Advance Scan.tracer_activity	(0009,1038)	3	FL	1	F
GE Advance Scan.meas_datetime	(0009,1039)	3	DT	1	D
GE Advance Scan.pre_inj_volume	(0009,103A)	3	FL	1	F
GE Advance Scan.admin_datetime	(0009,103B)	3	DT	1	D
GE Advance Scan.post_inj_activity	(0009,103C)	3	FL	1	F
GE Advance Scan.post_inj_datetime	(0009,103D)	3	DT	1	D
GE Advance Scan.radionuclide_name	(0009,103E)	3	SH	1	6A
GE Advance Scan.half_life	(0009,103F)	3	FL	1	F
GE Advance Scan.positron_fraction	(0009,1040)	3	FL	1	F
GE Advance Scan.source1_holder	(0009,1041)	3	SL	1	L
GE Advance Scan.source1_activity	(0009,1042)	3	FL	1	F
GE Advance Scan.source1_meas_dt	(0009,1043)	3	DT	1	D
GE Advance Scan.source1_radnuclide	(0009,1044)	3	SH	1	6A
GE Advance Scan.source1_half_life	(0009,1045)	3	FL	1	F
GE Advance Scan.source2_holder	(0009,1046)	3	SL	1	L
GE Advance Scan.source2_activity	(0009,1047)	3	FL	1	F
GE Advance Scan.source2_meas_dt	(0009,1048)	3	DT	1	D
GE Advance Scan.source2_radnuclide	(0009,1049)	3	SH	1	6A
GE Advance Scan.source2_half_life	(0009,104A)	3	FL	1	F
GE Advance Scan.source_speed	(0009,104B)	3	SL	1	L
GE Advance Scan.source_location	(0009,104C)	3	FL	1	F
GE Advance Scan.emission_present	(0009,104D)	3	SL	1	L
GE Advance Scan.lower_axial_acc	(0009,104E)	3	SL	1	L
GE Advance Scan.upper_axial_acc	(0009,104F)	3	SL	1	L
GE Advance Scan.lower_coinc_limit	(0009,1050)	3	SL	1	L
GE Advance Scan.upper_coinc_limit	(0009,1051)	3	SL	1	L
GE Advance Scan.coinc_delay_offset	(0009,1052)	3	SL	1	L
GE Advance Scan.coinc_output_mode	(0009,1053)	3	SL	1	L
GE Advance Scan.upper_energy_limit	(0009,1054)	3	SL	1	L
GE Advance Scan.lower_energy_limit	(0009,1055)	3	SL	1	L
GE Advance Scan.normal_cal_id	(0009,1056)	3	UI	1	64A
GE Advance Scan.normal_2d_cal_id	(0009,1057)	3	UI	1	64A
GE Advance Scan.blank_cal_id	(0009,1058)	3	UI	1	64A
GE Advance Scan.wc_cal_id	(0009,1059)	3	UI	1	64A
GE Advance Scan.derived	(0009,105A)	3	SL	1	L
GE Advance Scan.contrast_agent	(0009,105B)	3	LO	1	64A

## 7.6.5 GE Advance ImageSet Module

TABLE 7.6-5  
 GE ADVANCE IMAGESET MODULE PRIVATE ELEMENTS  
 PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance ImageSet.compatible_version	(0009,1079)	3	SH	1	5A
GE Advance ImageSet.software_version	(0009,107A)	3	SH	1	5A
GE Advance ImageSet.is_datetime	(0009,107B)	3	DT	1	D
GE Advance ImageSet.is_source	(0009,107C)	3	SL	1	L
GE Advance ImageSet.is_contents	(0009,107D)	3	SL	1	L
GE Advance ImageSet.is_type	(0009,107E)	3	SL	1	L
GE Advance ImageSet.is_reference	(0009,107F)	3	FL	3	F
GE Advance ImageSet.multi_patient	(0009,1080)	3	SL	1	L
GE Advance ImageSet.number_of_normals	(0009,1081)	3	SL	1	L
GE Advance ImageSet.color_map_id	(0009,1082)	3	UI	1	64A
GE Advance ImageSet.window_level_type	(0009,1083)	3	SL	1	L
GE Advance ImageSet.rotate	(0009,1084)	3	FL	1	F
GE Advance ImageSet.flip	(0009,1085)	3	SL	1	L
GE Advance ImageSet.zoom	(0009,1086)	3	FL	1	F
GE Advance ImageSet.pan_x	(0009,1087)	3	SL	1	L
GE Advance ImageSet.pan_y	(0009,1088)	3	SL	1	L
GE Advance ImageSet.window_level_min	(0009,1089)	3	FL	1	F
GE Advance ImageSet.window_level_max	(0009,108A)	3	FL	1	F
GE Advance ImageSet.recon_method	(0009,108B)	3	SL	1	L
GE Advance ImageSet.attenuation	(0009,108C)	3	SL	1	L
GE Advance ImageSet atten_coefficient	(0009,108D)	3	FL	1	F
GE Advance ImageSet.bp_filter	(0009,108E)	3	SL	1	L
GE Advance ImageSet.bp_filter_cutoff	(0009,108F)	3	FL	1	F
GE Advance ImageSet.bp_filter_order	(0009,1090)	3	SL	1	L
GE Advance ImageSet.bp_center_l	(0009,1091)	3	FL	1	F
GE Advance ImageSet.bp_center_p	(0009,1092)	3	FL	1	F
GE Advance ImageSet.atten_smooth	(0009,1093)	3	SL	1	L
GE Advance ImageSet.atten_smooth_param	(0009,1094)	3	SL	1	L
GE Advance ImageSet.angle_smooth_param	(0009,1095)	3	SL	1	L
GE Advance ImageSet.wellcountercal_id	(0009,1096)	3	UI	1	64A
GE Advance ImageSet.trans_scan_id	(0009,1097)	3	UI	1	64A
GE Advance ImageSet.norm_cal_id	(0009,1098)	3	UI	1	64A
GE Advance ImageSet.blk_cal_id	(0009,1099)	3	UI	1	64A
GE Advance ImageSet.cac_edge_threshold	(0009,109A)	3	FL	1	F

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance ImageSet.cac_skull_offset	(0009,109B)	3	FL	1	F
GE Advance ImageSet.emiss_sub_id	(0009,109C)	3	UI	1	64A
GE Advance ImageSet.radial_filter_3d	(0009,109D)	3	SL	1	L
GE Advance ImageSet.radial_cutoff_3d	(0009,109E)	3	FL	1	F
GE Advance ImageSet.axial_filter_3d	(0009,109F)	3	SL	1	L
GE Advance ImageSet.axial_cutoff_3d	(0009,10A0)	3	FL	1	F
GE Advance ImageSet.axial_start	(0009,10A1)	3	FL	1	F
GE Advance ImageSet.axial_spacing	(0009,10A2)	3	FL	1	F
GE Advance ImageSet.axial_angles_used	(0009,10A3)	3	SL	1	L
GE Advance ImageSet.ir_num_iterations	(0009,10B2)	3	SL	1	F
GE Advance ImageSet.ir_num_subsets	09,10B4)	3	FL	1	F
GE Advance ImageSet.ir_corr_model	(0009,10B5)	3	SL	1	L
GE Advance ImageSet.ir_loop_filter	(0009,10B6)	3	SL	1	L
GE Advance ImageSet.ir_pre_filt_parm	(0009,10B7)	3	FL	1	F
GE Advance ImageSet.ir_loop_filt_parm	(0009,10B8)	3	SL	1	L
GE Advance ImageSet.response_filt_parm	(0009,10B9)	3	FL	1	F
GE Advance ImageSet.post_filter	(0009,10BA)	3	SL	1	L
GE Advance ImageSet.post_filt_parm	(0009,10BB)	3	FL	1	F
GE Advance ImageSet.ir_regularize	(0009,10BC)	3	SL	1	L
GE Advance ImageSet.regularize_parm	(0009,10BD)	3	FL	1	F
GE Advance ImageSet.ac_bp_filter	(0009,10BE)	3	SL	1	L
GE Advance ImageSet.ac_bp_filt_cut_off	(0009,10BF)	3	FL	1	F
GE Advance ImageSet.ac_bp_filt_order	(0009,10C0)	3	SL	1	L
GE Advance ImageSet.ac_img_smooth	(0009,10C1)	3	SL	1	L
GE Advance ImageSet.ac_img_smooth_parm	(0009,10C2)	3	FL	1	F
GE Advance ImageSet.scatter_method	(0009,10C3)	3	SL	1	L
GE Advance ImageSet.scatter_num_iter	(0009,10C4)	3	SL	1	L
GE Advance ImageSet.scatter_parm	(0009,10C5)	3	FL	1	F

7.6.6 GE Advance Curve Module

TABLE 7.6-6  
 GE ADVANCE CURVE MODULE PRIVATE ELEMENTS  
 PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(5001,0010)	1	SH	1	n/a
GE Advance Curve.curve_id	(5001,1001)	3	UI	1	64A
GE Advance Curve.compatible_version	(5001,1002)	3	SH	1	5A
GE Advance Curve.software_version	(5001,1003)	3	SH	1	5A
GE Advance Curve.statistics_type	(5001,1004)	3	SL	1	L
GE Advance Curve.how_derived	(5001,1005)	3	LT	1	Bt

Attribute Name	Tag	Type	VR	VM	Advance Type
GE Advance Curve.how_derived_size	(5001,1006)	3	SL	1	L
GE Advance Curve.multi_patient	(5001,1007)	3	SL	1	L
GE Advance Curve.deadtime	(5001,1008)	3	SL	1	L

7.6.7 GE Advance Graph Module

TABLE 7.6-7

GE ADVANCE GRAPH MODULE PRIVATE ELEMENTS  
PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(5003,0010)	1	SH	1	n/a
GE Advance Graph Sequence	(5003,1001)	3	SQ	1	n/a
> GE Advance Graph.graph_id	(5003,1002)	3	UI	1	64A
> GE Advance Graph.compatible_version	(5003,1003)	3	SH	1	5A
> GE Advance Graph.software_version	(5003,1004)	3	SH	1	5A
> GE Advance Graph.title	(5003,1005)	3	LO	1	32A
> GE Advance Graph.graph_datetime	(5003,1006)	3	DT	1	D
> GE Advance Graph.graph_description	(5003,1007)	3	ST	1	128A
> GE Advance Graph.title_font_name	(5003,1008)	3	LO	1	32A
> GE Advance Graph.title_font_size	(5003,1009)	3	SH	1	2A
> GE Advance Graph.footer	(5003,100A)	3	LO	1	64A
> GE Advance Graph.footer_font_size	(5003,100B)	3	SH	1	2A
> GE Advance Graph.foreground_color	(5003,100C)	3	LO	1	20A
> GE Advance Graph.background_color	(5003,100D)	3	LO	1	20A
> GE Advance Graph.graph_border	(5003,100E)	3	SL	1	L
> GE Advance Graph.graph_width	(5003,100F)	3	SL	1	L
> GE Advance Graph.graph_height	(5003,1010)	3	SL	1	L
> GE Advance Graph.grid	(5003,1011)	3	SL	1	L
> GE Advance Graph.label_font_name	(5003,1012)	3	LO	1	32A
> GE Advance Graph.label_font_size	(5003,1013)	3	SH	1	2A
> GE Advance Graph.axes_color	(5003,1014)	3	LO	1	20A
> GE Advance Graph.x_axis_label	(5003,1015)	3	LO	1	32A
> GE Advance Graph.x_axis_units	(5003,1016)	3	SL	1	L
> GE Advance Graph.x_major_tics	(5003,1017)	3	FL	1	F
> GE Advance Graph.x_axis_min	(5003,1018)	3	FL	1	F
> GE Advance Graph.x_axis_max	(5003,1019)	3	FL	1	F
> GE Advance Graph.y_axis_label	(5003,101A)	3	LO	1	32A
> GE Advance Graph.y_axis_units	(5003,101B)	3	SL	1	L
> GE Advance Graph.y_major_tics	(5003,101C)	3	FL	1	F
> GE Advance Graph.y_axis_min	(5003,101D)	3	FL	1	F
> GE Advance Graph.y_axis_max	(5003,101E)	3	FL	1	F

Attribute Name	Tag	Type	VR	VM	Advance Type
> GE Advance Graph.legend_font_name	(5003,101F)	3	LO	1	32A
> GE Advance Graph.legend_font_size	(5003,1020)	3	SH	1	2A
> GE Advance Graph.legend_location_x	(5003,1021)	3	SL	1	L
> GE Advance Graph.legend_location_y	(5003,1022)	3	SL	1	L
> GE Advance Graph.legend_width	(5003,1023)	3	SL	1	L
> GE Advance Graph.legend_height	(5003,1024)	3	SL	1	L
> GE Advance Graph.legend_border	(5003,1025)	3	SL	1	L
> GE Advance Graph.multi_patient	(5003,1026)	3	SL	1	L

7.6.8 GE Advance Curve Presentation Module

TABLE 7.6-8  
 GE ADVANCE CURVE PRESENTATION MODULE PRIVATE ELEMENTS  
 PRIVATE CREATOR IDENTIFICATION (GEMS\_PETD\_01)

Attribute Name	Tag	Type	VR	VM	Advance Type
Private Creator Data Element	(5005,0010)	1	SH	1	n/a
GE Advance CurvePresentation Sequence	(5005,1001)	3	SQ	1	n/a
> GE Advance CurvePresentation.curvepresent_id	(5005,1002)	3	UI	1	64A
> GE Advance CurvePresentation.graph_id	(5005,1003)	3	UI	1	64A
> GE Advance CurvePresentation.curve_id	(5005,1004)	3	UI	1	64A
> GE Advance CurvePresentation.compatible_version	(5005,1005)	3	SH	1	5A
> GE Advance CurvePresentation.software_version	(5005,1006)	3	SH	1	5A
> GE Advance CurvePresentation.curve_label	(5005,1007)	3	LO	1	60A
> GE Advance CurvePresentation.color	(5005,1008)	3	LO	1	20A
> GE Advance CurvePresentation.line_type	(5005,1009)	3	SL	1	L
> GE Advance CurvePresentation.line_width	(5005,100A)	3	SL	1	L
> GE Advance CurvePresentation.point_symbol	(5005,100B)	3	SL	1	L
> GE Advance CurvePresentation.point_symbol_dim	(5005,100C)	3	SL	1	L
> GE Advance CurvePresentation.point_color	(5005,100D)	3	LO	1	20A

## Appendix A

### SOP Specific Conformance for Image Storage SOP Classes for DICOMRecv AE Server :

<i>Attribute</i>	<i>Tag</i>
SOP class UID	(0008,00016)
SOP Instance UID	(0008,0018)
Study Date	(0008,0020)
Series Date	(0008,0021)
Scan Date	(0008,0022)
Image Date	(0008,0023)
Study Time	(0008,0030)
Series Time	(0008,0031)
Scan Time	(0008,0032)
Image Time	(0008,0033)
Accession Number	(0008,0050)
Modality	(0008,0060)
Manufacturer	(0008,0070)
Institution Name	(0008,0080)
Referring Physician Name	(0008,0090)
Station ID	(0008,1010)
Study Description	(0008,1030)
Series Description	(0008,103E)
Name of Physician Reading Study	(0008,1060)
Operator	(0008,1070)
Manufacture Model Name	(0008,1090)

<i>Attribute</i>	<i>Tag</i>
<b>Patient Name</b>	<b>(0010,0010)</b>
<b>Patient ID</b>	<b>(0010,0020)</b>
<b>Patients Birth Date</b>	<b>(0010,0030)</b>
<b>Patient's Sex</b>	<b>(0010,0040)</b>
<b>Patient's Weight</b>	<b>(0010,1030)</b>
<b>Other Patient History</b>	<b>(0010,21B0)</b>
<b>Contrast Agent</b>	<b>(0018,0010)</b>
<b>Slice Thickness</b>	<b>(00018,0050)</b>
<b>Echo Number</b>	<b>(0018,0086)</b>
<b>Patient Position</b>	<b>(0018,5100)</b>
<b>Study Instance UID</b>	<b>(0020,000D)</b>
<b>Series Instance UID</b>	<b>(0020,000E)</b>
<b>Study Identifier</b>	<b>(0020,0010)</b>
<b>Series Number</b>	<b>(0020,0011)</b>
<b>Image Number</b>	<b>(0020,0013)</b>
<b>Image Position ( Patient)</b>	<b>(0020,0032)</b>
<b>Image Orientation</b>	<b>(0020,0037)</b>
<b>Frame Reference UID</b>	<b>(0020,0052)</b>
<b>Position Reference Indicator</b>	<b>(0020,1040)</b>
<b>Slice Location</b>	<b>(0028,1041)</b>
<b>Rows</b>	<b>(0028,0010)</b>
<b>Columns</b>	<b>(0028,0011)</b>
<b>Pixel_Spacing</b>	<b>(0028,0030)</b>
<b>Image.Bits_Allocated</b>	<b>(0028,0100)</b>
<b>Pixel Padding Value</b>	<b>(0028,0120)</b>

<i>Attribute</i>	<i>Tag</i>
<b>Smallest Image Pixel Value</b>	<b>(0028,0106)</b>
<b>Largest Pixel Value</b>	<b>(0028,0107)</b>
<b>Image.Pixel_Data</b>	<b>(7FE0,0010)</b>
<b>Data Size</b>	<b>(7FE0,0000)</b>



