GE Medical Systems

Technical Publications

DIRECTION 2383442-100

Revision 1

Infinia™ Conformance Statement for DICOM V3.0

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LIST OF REVISIONS

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0	May. 2003	First Release	All	Rami Barta
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SECTION 1
INTRODUCTION

1.1 OVERVIEW

This DICOM Conformance Statement is divided into Sections and Appendices 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 the DICOM requirements for the implementation of Networking features.

Section 3 - Nuclear Medicine Information Object Implementation, which specifies the GEMS equipment compliance to DICOM requirements for the implementation of a Nuclear Medicine Information Object.

Section 4 - Modality Worklist Information Model, which specifies the information model used for the implementation of the Modality Worklist Information Model.

Section 5 - Infinia Protocol Data Object Implementation, which specifies the GEMS equipment compliance to DICOM requirements for the implementation of a Private Infinia Protocol Data Object.

Appendix A - Infinia Private Data Dictionary

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 1-1.

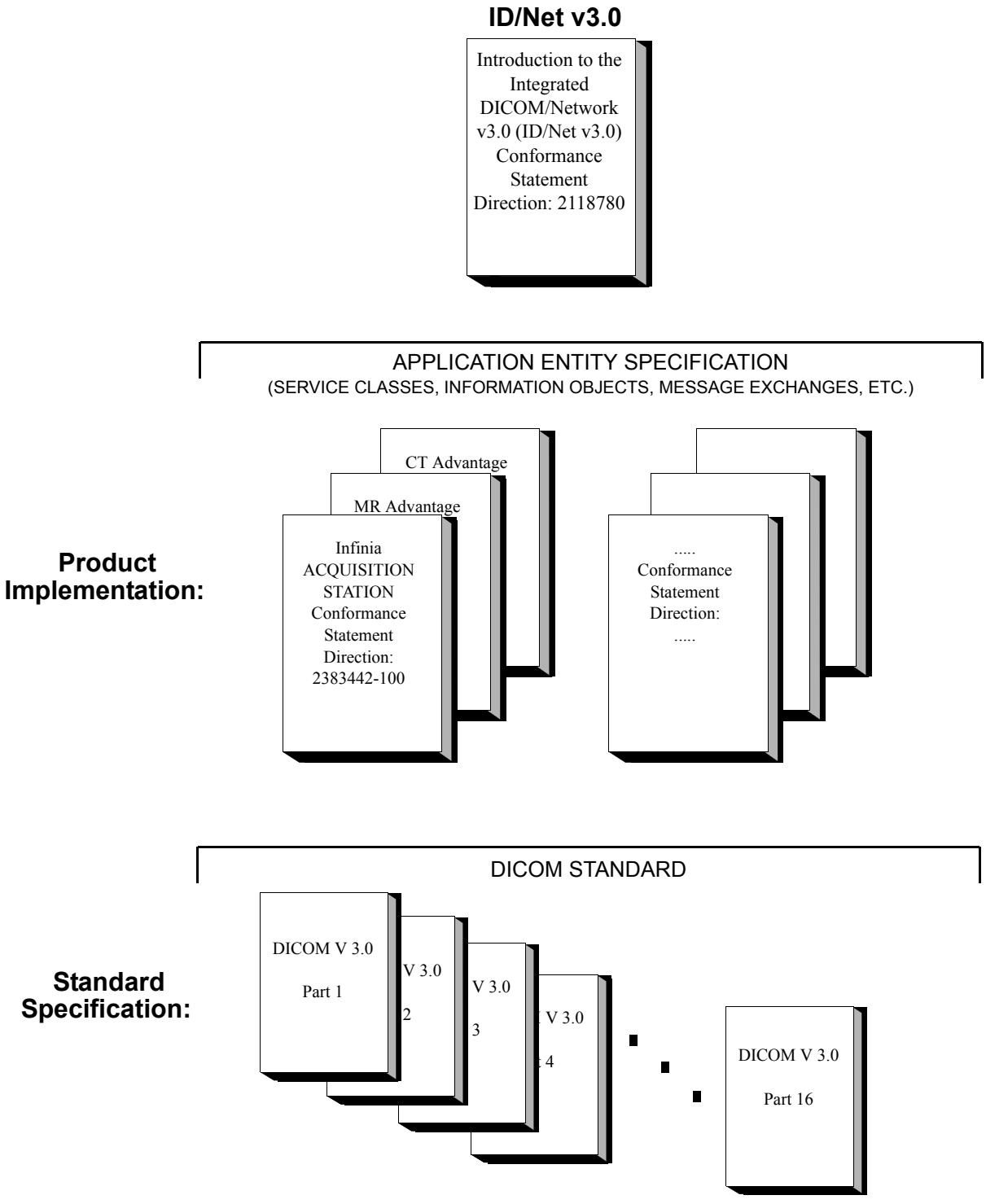

Illustration 1-1. Documentation Structure

This document specifies the DICOM v3.0 implementation.

It 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 via the Internet at <http://medical.nema.org>. Comments to the Standard may be addressed to:

DICOM Secretariat
NEMA
1300 North 17th Street, Suite 1847
Rosslyn, VA 22209
USA
Phone: +1-703-841-3200

1.3 INTENDED AUDIENCE

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM 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 ID/Net DICOM Conformance Statements**. The **user** should ensure that any non–GE provider, which connects with GE devices, also plans for the future

evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.

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

1.6 REFERENCES

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).

1.7 DEFINITIONS

A set of definitions which is applicable to all GEMS Conformance Statements is included in *the Introduction to the IDICOM/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*.

SECTION 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.

Infinia systems provide sophisticated acquisition, image processing and storage functions of nuclear image data acquired through the front end acquisition system. In view of the requirements to conform to a global standard that permits interoperability across equipment produced by different vendors, Infinia system will provide support for DICOM 3.0.

This section details the roles and DICOM Service Classes supported by the Infinia.

The Infinia DICOM implementation allows the user to send Nuclear Medicine image data, acquired through the front-end acquisition system to another DICOM station. For example, the user may wish to send data to another Xeleris/eNTEGRA station. In this situation Infinia is providing the DICOM C-STORE service as a service class user (SCU).

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

2.2 IMPLEMENTATION MODEL

All DICOM functionality on the Infinia product is logically provided by the INFINIA_SCANNER Server AE. The INFINIA_SCANNER Server AE is commanded to perform DICOM services through the use of the Infinia user interface. The INFINIA_SCANNER 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 this device are shown in Illustration 2-1, below.

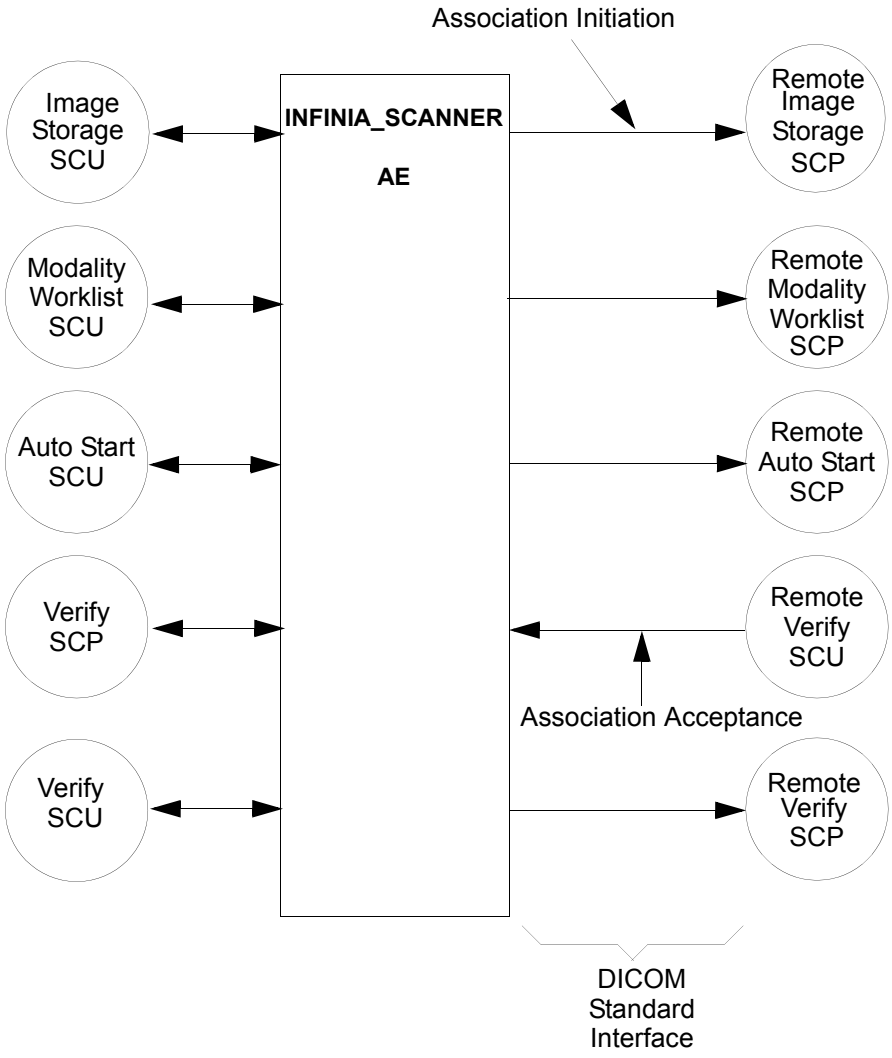

Illustration 2-1. Basic and Specific Application Models

2.2.2 Functional Definitions of Application Entities

The Infinia INFINIA_SCANNER Server Application Entity (AE) initiates the following functions:

- *Store*: Initiates a DICOM association in order to send images to a remote AE. If the remote AE accepts a presentation context applicable to the image(s) being sent, the INFINIA_SCANNER Server will send the images 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.
- *Modality Work List (MWL)*: Initiates a DICOM association in order to query the work list from a remote AE. If the remote AE accepts a presentation context applicable to the modality work list request being sent, the INFINIA_SCANNER Server will Receive appropriate MWL responses via the C-FIND service.
- Auto Start: Initiates a DICOM association in order to activate the GEMS Private Auto Start mechanism on a remote AE. If the remote AE accepts a presentation context applicable to the Auto Start request being sent, the INFINIA_SCANNER Server will receive appropriate information via the C-Auto Start service.

The Infinia INFINIA_SCANNER Server AE responds to the following functions:

- *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 DICOM Server 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
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Verification - SOP Class	1.2.840.10008.1.1
Modality Worklist Information Model - Find	1.2.840.10008.5.1.4.31
Private Auto Start SOP Class	1.2.840.113619.4.27

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

2.3.1.1 Association Establishment Policies

2.3.1.1.1 General

The DICOM Application Context Name (ACN), 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 INFINIA_SCANNER Server is:

Maximum Length PDU	4 Kbytes

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

2.3.1.1.2 Number of Associations

The INFINIA_SCANNER Server AE (SCU) will initiate a DICOM association to perform an image store to a remote AE. Multiple Send operations can be performed. There is no restriction on the total number of associations.

The INFINIA_SCANNER Server AE (SCP) can have multiple DICOM associations open simultaneously to service verifications.

2.3.1.1.3 Asynchronous Nature

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

2.3.1.1.4 Implementation Identifying Information

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

Infinia Acquisition Station Implementation UID	1.2.840.113619.6.125

2.3.1.2 Association Initiation Policy

The INFINIA_SCANNER Server AE initiates a new association

- Due to an image send operation being initiated from the Infinia user interface, or by auto archive option.
- Due to a Verify operation initiated to determine whether the remote DICOM station is operational.
- Due to modality worklist request being initiated from the Infinia user interface
- Due to Auto Start request being initiated, if the option is enabled, after a study was transferred successfully to the remote AE.

2.3.1.2.1 Real-World Activity: Image Send

2.3.1.2.1.1 Associated Real-World Activity

The operator must both select image(s) to be transferred from the Patient Selector and select a destination by pressing the destination button. Once these selections have been made, the operator pushes the “Send” button to initiate an image send operation. The INFINIA_SCANNER Server will then initiate an association with the remote AE in order to send the selected image(s) and will accept and interparty responses received from the remote AE.

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

The UI will indicate the status of the dataset being transferred. The status can be one of PENDING, SUCCESS, or FAILURE. The associated error messages due to a failed status can be found in system log.

2.3.1.2.1.2 Proposed Presentation Context Table

The following table shows the proposed presentation contexts for the INFINIA_SCANNER Server AE after real-world activity “Image Send” has been initiated:

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Secondary Image Capture Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

2.3.1.2.1.2.1 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 Warning, 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.

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

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Refused	A700	Out of resources.	The message “DICOM Protocol Error” posted on the Log
	A710	Out of resources.	The message “Remote Database could not write dataset” posted to the Log.
	A720	Out of resources.	The message “Internal Error on the Remote Station” posted to the Log.
	A730	Out of resources.	The message “Error! Translation Failed. Cannot send Dataset” posted to the Log.
	A740	Out of resources.	The message “Error! Remote Station could not find Pixel Data” posted to the Log.
Error	C000	Cannot Understand	The message “Unknown Error returned from Remote Station” posted to the Log.
	A900	Data Set does not match SOP Class	The message “Warning!! Dataset does not match SOP Class or Coercion of data elements” posted to the Log. The report about store failure is also posted to the Log
Warning	B000	Coercion of Data Elements	The message “Warning!! Dataset does not match SOP Class or Coercion of data elements” posted to the Log.
	B007	Data Set does not match SOP Class	The message “Warning!! Dataset does not match SOP Class or Coercion of data elements” posted to the Log.
	B006	Elements Discarded	The message “Warning!! Dataset does not match SOP Class or Coercion of data elements” posted to the Log.
Success	0000		The message “Dataset Transfer Completed” posted to the Log.

Note

The error codes A700-A740 are Infinia Private Status Codes. Infinia 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. Infinia uses them to provide more information to the Infinia user in case of an Image Send failure.

If Non-Infinia stations SCP return the same status code, Infinia SCU will interpret them as per the table above. The non-Infinia station’s interpretation of the status code will not be considered.

2.3.1.2.2 Real-World Activity: Verify

2.3.1.2.2.1 Associated real-World Activity

Service personnel invoke the Dicom Station Configuration Utility from the Infinia user interface. The AE Title of the remote is supplied on the command line along with the IP address and the port number of the remote DICOM station.The INFINIA_SCANNER 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.

2.3.1.2.2.2 Proposed Presentation Context Table

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

2.3.1.2.2.2.1 SOP Specific DICOM Conformance Statement for Verification SOP Class

The INFINIA_SCANNER Server AE provides standard conformance to the DICOM Verification Service Class.

2.3.1.2.3 Real-World Activity: Modality Worklist

2.3.1.2.3.1 Associated Real-World Activity

The user requests Infinia to query the remote AE for a worklist.

2.3.1.2.3.2 Proposed Presentation Context Table

The following table shows the proposed presentation contexts for the INFINIA_SCANNER Server AE after real-world activity “Modality Work List” has been initiated:

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Modality Worklist C - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

2.3.1.2.3.2.1 SOP Specific DICOM Conformance Statement for all Query SOP Classes

Infinia provides standard conformance to the DICOM V3.0 Modality Worklist Service Class as an SCU for the following SOP Classes:

- Modality Worklist C-FIND, UID = 1.2.840.10008.5.1.4.31

2.3.1.2.4 Real-World Activity: Auto Start

2.3.1.2.4.1 Associated Real-World Activity

Before initiating an Auto-Start Application request, the Infinia acquisition station will send all the required data to Remote AE (e.g. Xeleris workstation). After the data is being successfully transferred, a new Dicom message that contains the task information will be sent to remote AE using a C-STORE command.

2.3.1.2.4.2 Proposed Presentation contexts

The following table shows the proposed presentation contexts for the INFINIA_SCANNER Server AE after real-world activity “Auto Start” has been initiated

Presentation Context Table - Accepted					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Auto Start	1.2.840.113619.4.27	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

2.3.1.2.4.3 SOP Specific Conformance statement for C-Auto Start SOP Class

Infinia provides private conformance to the DICOM V3.0 Auto Start Service Class as an SCU for the following SOP Classes:

- Auto Start, UID = 1.2.840.113619.4.27

2.3.1.3 Association Acceptance Policy

The INFINIA_SCANNER Server AE places no limitation on whom may connect to it.

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

2.3.1.3.1 Real-World Activity: Verify SCP

2.3.1.3.1.1 Associated Real-World Activity

The INFINIA_SCANNER 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.

2.3.1.3.1.2 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 Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

2.3.1.3.1.2.1 SOP Specific DICOM Conformance Statement for Verification SOP Class

The INFINIA_SCANNER Server AE provides standard conformance to the DICOM verification service class.

2.3.1.3.1.3 Presentation Context Acceptance Criterion

The Presentation Context that will be accepted by the INFINIA_SCANNER Server will be the one to which the remote Storage SCP has accorded the highest priority and that is supported by the INFINIA_SCANNER Server.

2.3.1.3.1.4 Transfer Syntax Selection Policies

A Transfer Syntax that will be selected will be the one to which the remote Storage SCU has accorded the highest priority and that is supported by the DICOM Server.

2.4 COMMUNICATION PROFILES

2.4.1 Support Communication Stacks (PS 3.8, PS 3.9)

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

2.4.2 OSI Stack

The OSI Communication Stack is not supported by this implementation.

2.4.3 TCP/IP Stack

The TCP/IP Communication Stack is inherited from the Windows operating system.

2.4.3.1 API

Not applicable to this product.

2.4.3.2 Physical Media Support

Ethernet 802.3 provides the physical network layer for this product.

2.4.4 Point-to-Point Stack

The Point-to-Point Communication Stack is not supported by this implementation.

2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

2.5.1 Standard Extended/Specialized/Private SOPs

Infinia NM Images are Standard Extended NM Image Storage SOP Class (see Section 3.6 for a complete description).

Infinia implements a transfer SOP class for full fidelity transfer of protocol data to Xeleris/eNTEGRA systems. The protocol data object conveys information about image processing steps, results data, and display formatting. Protocol data objects are not visible on the Infinia patient selector, but are generally sent automatically with image data if the entire series is selected for transfer. For details of the Infinia Private Protocol Data Object refer to Section 5.

2.5.2 Private Transfer Syntaxes

Infinia does not implement any private transfer syntaxes.

2.6 CONFIGURATION

The Infinia 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 Infinia user interface.

2.6.1 AE Title/Presentation Address Mapping

Infinia 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 subnet (using routing). A router is configurable to ensure communication from one sub-net to another. This configuration is performed by GEMS Field Service Engineers.

2.6.2 Configuration Parameters

The following parameters are configurable for the DICOM Server AE:

- Local AE Title (set to hostname of Infinia computer)
- Local IP address
- Local DICOM Port Number - to change the port number set the environment variable DCM_PORT
  If the variable is not defined, the default port number is used

Note that the default port on which Infinia receives DICOM incoming TCP/IP connections is **104.** The configuration of IP routers and subnet mask is available on a OS level.

2.7 SUPPORT OF EXTENDED CHARACTER SETS

Infinia will support only the ISO_IR 100 (ISO 8859-1:1987 Latin alphabet N 1. supplementary set) as extended character sets.

SECTION 3
NUCLEAR MEDICINE (NM) INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

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

3.2 NM IOD IMPLEMENTATION

The Infinia implementation of DICOM uses the Nuclear Medicine multi-frame image format when creating image objects. In order to preserve full fidelity when transferring data to a Xeleris/eNTEGRA station, 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 Infinia private data dictionary is included in Section Section 3.6.

3.3 NM ENTITY-RELATIONSHIP MODE

The Entity-Relationship diagram for the NM Image interoperability schema is shown in Illustration 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. For example, the relationship between Series and Image can have up to n NM Images per Series, but the NM Image can only belong to 1 Series.

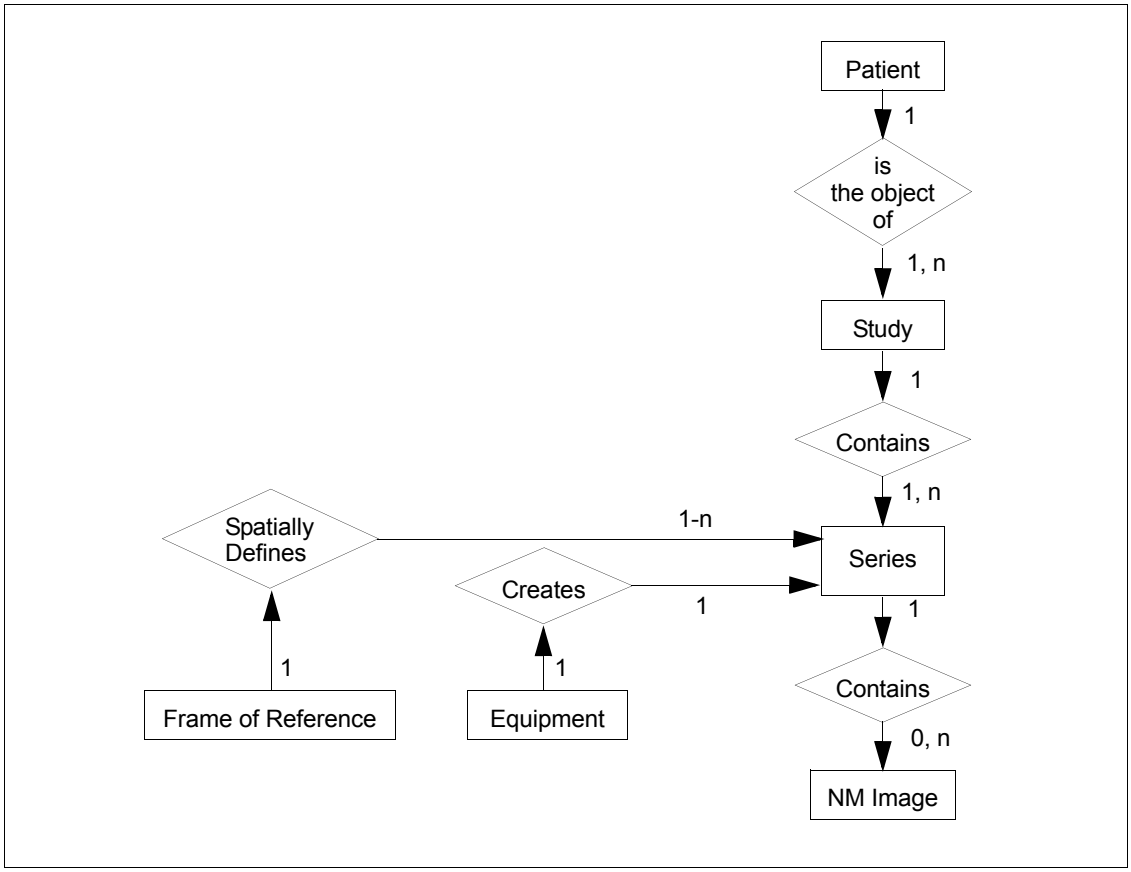

Illustration 3-1. NM Image Entity Relationship Diagram

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 NM 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 NM Image Entity Description

The NM Image Entity defines the attributes which describe the pixel data of a NM 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 Infinia Mapping of DICOM Entities

Table 3-1. Mapping of DICOM Entities to Infinia Entities

DICOM	Infinia Entity
Patient	Patient
Study	Study
Series	Series
Image	Imageset
Frame	Not Applicable

3.4 IOD MODULE TABLE

Within an entity of the DICOM v3.0 NM IOD, attributes are grouped into related sets 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 to each other. A module grouping does not infer any encoding of information into datasets.

Table 3-2 identifies the defined modules within the entities which comprise the DICOM v3.0 NM IOD. Modules are identified by Module Name.

Please refer to the DICOM v3.0 Standard Part 3 for a complete definition of the entities, modules, and attributes..

Table 3-2. NM Image IOD Modules

Entity Name	Module Name	Reference
Patient	Patient	Section 3.5.1.1
Study	General Study	Section 3.5.2.1
	Patient Study	Section 3.5.2.2
Series	General Series	Section 3.5.3.1
NM/PET Patient orientation	NM/PET Patient orientation	Section 3.5.3.2
Frame of Reference	Frame of Reference	Section 3.5.4.1
Equipment	General Equipment	Section 3.5.5.1
Image	General Image	Section 3.5.6.1
	Infinia Image	Section 3.5.6.2
	Image Pixel	Section 3.5.6.3
	NM Image Pixel	Section 3.5.8.1
	Multi-frame	Section 3.5.6.4
	NM Multi-frame	Section 3.5.8.2
	NM Image	Section 3.5.8.3
	NM Isotope	Section 3.5.8.4
	NM Detector	Section 3.5.8.5
	NM TOMO Acquisition	Section 3.5.8.6
	NM Multi-gated	Section 3.5.8.7

Table 3-2. NM Image IOD Modules (Continued)

	NM Phase	Section 3.5.8.8
	NM Reconstruction	Section 3.5.8.9
	Infinia Private SPECT Reconstruction	Section 3.5.8.10
	SOP Common	Section 3.5.7.1

3.5 INFORMATION MODULE DEFINITIONS

Please refer to the DICOM v3.0 Standard Part 3 (Information Object Definitions) for a description of each of the Standard entities and modules contained within the NM 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 as those defined in the DICOM v3.0 Standard Part 3 (Information Object Definitions).

Infinia Private attributes are defined in private modules, each of which follow the related Standard module. Private data element tags are assigned following the rules given in Part 5 of the DICOM v3.0 Standard, and are identified using the (gggg,xxnn) format, where xx represents a reserved block of element numbers within the group gggg.

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. The fields in the Patient Module which can be copied from user input or the worklist will be updated to reflect the possible sources.

Table 3-3. Patient Module Attributes

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Patient Name
Patient ID	(0010,0020)	2	Patient ID
Patient's Birth Date	(0010,0030)	2	Patient Date Of Birth
Patient's Sex	(0010,0040)	2	Patient Sex
Referenced Patient Sequence	(0008,1120)	3	Not used.
>Referenced SOP Class UID	(0008,1150)	1C	Not used.
>Referenced SOP Instance UID	(0008,1155)	1C	Not used.
Patient's Birth Time	(0010,0032)	3	Not used.
Other Patient IDs	(0010,1000)	3	Other Patient IDs
Other Patient Names	(0010,1001)	3	Other Patient Names
Ethnic Group	(0010,2160)	3	Ethnic Group
Patient Comments	(0010,4000)	3	Patient Comments field.

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

3.5.2.1 General Study Modules

This section specifies the Attributes which describe and identify the study performed upon the patient.

Table 3-4. General Study Module Attributes

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Copied from the work list if the study source was actually copied from a worklist query result.
Study Date	(0008,0020)	2	Creation date of study entity.
Study Time	(0008,0030)	2	Creation time of study entity.
Referring Physician's Name	(0008,0090)	2	Referring Physician field.
Study ID	(0020,0010)	2	Study Name (Processing Tag field).
Accession Number	(0008,0050)	2	Accession Number
Study Description	(0008,1030)	3	Study Description (comments)
Physician(s) of Record	(0008,1048)	3	Not used.
Name of Physician(s) Reading Study	(0008,1060)	3	Name of Physician(s) Reading Study
Referenced Study Sequence	(0008,1110)	3	Copied from the work list if the study source was actually copied from a worklist query result.
>Referenced SOP Class UID	(0008,1150)	1C	Not used.
>Referenced SOP Instance UID	(0008,1155)	1C	Not used.

3.5.2.2 Patient Study Modules

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

Table 3-5. Patient Study Module Attributes

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Not used.
Patient's Age	(0010,1010)	3	Patient Age field.
Patient's Size	(0010,1020)	3	Patient Height field.
Patient's Weight	(0010,1030)	3	Patient Weight field.
Occupation	(0010,2180)	3	Patient Occupation field.
Additional Patient’s History	(0010,21B0)	3	Other Patient History field.

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 Modules

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

Table 3-6. General Series Module Attributes

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Internally set to “NM” for data created on this system.
Series Instance UID	(0020,000E)	1	Internally generated.
Series Number	(0020,0011)	2	Internally generated.
Laterality	(0020,0060)	2C	Body Part Laterality, if present.
Series Date	(0008,0021)	3	Date of Series Creation or acquisition completion.
Series Time	(0008,0031)	3	Time of Series Creation or acquisition completion.
Performing Physicians’ Name	(0008,1050	3	Not used.
Protocol Name	(0018,1030)	3	Protocol Name
Series Description	(0008,103E)	3	Series ID
Operators' Name	(0008,1070)	3	Operator’s Name
Referenced Study Component Sequence	(0008,1111)	3	Not used.
>Referenced SOP Class UID	(0008,1150)	1C	Not used.
>Referenced SOP Instance UID	(0008,1155)	1C	Not used.
Body Part Examined	(0018,0015)	3	Body Part field.

Table 3-6. General Series Module Attributes (Continued)

Patient Position	(0018,5100)	2C	Patient Position The Defined Terms are: HFP = Head First-Prone HFS = Head First-Supine HFDR = Head First-Decubitus Right HFDL = Head First-Decubitus Left FFDR = Feet First-Decubitus Right FFDL = Feet First-Decubitus Left FFP = Feet First-Prone FFS = Feet First-Supine
Smallest Pixel Value in Series	(0028,0108)	3	Min Pixel field
Largest Pixel Value in Series	(0028,0109)	3	Max Pixel field

3.5.3.2 NM/PET Patient Orientation Module

This section specifies the Attributes which identify and describe NM/PET Patient Orientation of the Series within a Study.

Table 3-7. NM/PET Patient Orientation Module Attributes

Attribute Name	Tag	Type	Attribute Description
Patient Orientation Code Sequence	(0054,0410)	2	Sequence that describes the orientation of the patient with respect to gravity, and it independent of the position in the gantry. Only a single Item shall be permitted in this sequence.
>Code Value	(0008,0100)	1C	“context ID is 19”
>Coding Scheme Designator	(0008,0102)	1C	Enumerated Value of “99SDM”
>Code Meaning	(0008,0104)	3	
> Patient Orientation Modifier Code Sequence	(0054,0412)	2C	Patient Orientation Modifier. Required if needed to fully specify the orientation of the patient with respect to gravity. Is used to modify or enhance the orientation specified by Patient Orientation Code Sequence (0054,0410). Only a single Item shall be permitted in this sequence.
>>Code Value	(0008,0100)	1C	Baseline Context ID is 20.
>>Coding Scheme Designator	(0008,0102)	1C	Enumerated Value of “99SDM”
>>Code Meaning	(0008,0104)	3	
Patient Gantry Relationship Code Sequence	(0054,0414)	2	Sequence which describes the orientation of the patient with respect to the gantry.
>>Code Value	(0008,0100)	1C	Baseline Context ID is 21.
>>Coding Scheme Designator	(0008,0102)	1C	Enumerated Value of “99SDM”
>>Code Meaning	(0008,0104)	3	

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 Modules

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.

Infinia systems group spatially and/or temporally related Images in the same Series. Acquisition data created on other systems may be missing frame of reference information, and for these cases the attribute contains a null value.

Table 3-8. Frame of Reference Module Attributes

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	Frame of Reference UID, if available.
Position Reference Indicator	(0020,1040)	2	Position Reference Indicator, if available.

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. For Series created on the Infinia system, the values are generally copied from the original data.

Table 3-9. General Equipment Module Attributes

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Manufacturer
Institution Name	(0008,0080)	3	Institution Name
Institution Address	(0008,0081)	3	Not used.
Station Name	(0008,1010)	3	Station Name
Institutional Department Name	(0008,1040)	3	Not used.
Manufacturer's Model Name	(0008,1090)	3	Manufacturer's Model Name
Device Serial Number	(0018,1000)	3	Device Serial Number
Software Versions	(0018,1020)	3	Software Versions
Spatial Resolution	(0018,1050)	3	Not used.
Date of Last Calibration	(0018,1200)	3	Not used.
Time of Last Calibration	(0018,1201)	3	Not used.
Pixel Padding Value	(0028,0120)	3	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 3-10. General Image Module Attributes

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	2	Dataset Image Number
Patient Orientation	(0020,0020)	2C	Not required for NM.
Content Date	(0008,0023)	2C	Image Date
Content Time	(0008,0033)	2C	Image Time
Image Type	(0008,0008)	3	See NM Image module.
Acquisition Number	(0020,0012)	3	Not used.
Acquisition Date	(0008,0022)	3	Dataset Start Date
Acquisition Time	(0008,0032)	3	Dataset Start Time
Referenced Image Sequence	(0008,1140)	3	Not used.
>Referenced SOP Class UID	(0008,1150)	1C	Not used.
>Referenced SOP Instance UID	(0008,1155)	1C	Not used.
Derivation Description	(0008,2111)	3	Not used.
Source Image Sequence	(0008,2112)	3	Not used.
>Referenced SOP Class UID	(0008,1150)	1C	Not used.
>Referenced SOP Instance UID	(0008,1155)	1C	Not used.
Images in Acquisition	(0020,1002)	3	Not used.
Image Comments	(0020,4000)	3	Dataset Comments
Lossy Image Compression	(0028,2110)	3	Not used.

3.5.6.2 Infinia Private Image Module

This section specifies the Attributes which identify and describe an image within a particular series. This Module contains *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Module. The private attributes are required for full fidelity transfer between Xeleris/eNTEGRA systems.

Private Creator Code = "GEMS_GENIE_1"

Table 3-11. Infinia Private Image Module Attributes

Attribute Name	Tag	Type	Attribute Description
Radio Nuclide Name	(0011,xx0D)	3	Name of radionuclide used.
Dataset Name	(0011,xx12)	3	Dataset Name
Dataset Type	(0011,xx13)	3	Defines type of dataset. The Defined Terms are: 0 = static 2 = whole body 8 = dynamic 11 = multi-gated 12 = tomographic planar
Detector Number	(0011,xx15)	3	Detector number image was acquired by.

3.5.6.3 Image Pixel Module

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

Table 3-12. Image Pixel Module Attributes

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	See NM and SC Image Pixel modules.
Photometric Interpretation	(0028,0004)	1	See NM and SC Image Pixel modules.
Rows	(0028,0010)	1	Rows
Columns	(0028,0011)	1	Columns
Bits Allocated	(0028,0100)	1	See NM Image Pixel module.
Bits Stored	(0028,0101)	1	See NM Image Pixel module.
High Bit	(0028,0102))	1	See NM Image Pixel module.
Pixel Representation	(0028,0103)	1	Pixel Representation (see the NM and SC Pixel Modules)
Pixel Data	(7FE0,0010)	1	Pixel Data (see details in the NM and SC Pixel Modules)
Planar Configuration	(0028,0006))	1C	Planar Configuration
Pixel Aspect Ratio	(0028,0034)	1C	Pixel Aspect Ratio
Smallest Image Pixel Value	(0028,0106))	3	Set to minimum pixel value in image.
Largest Image Pixel Value	(0028,0107)	3	Set to maximum pixel value in image.
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Not used.
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Not used.
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Not used.
Red Palette Color Lookup Table Data	(0028,1201))	1C	Not used.
Green Palette Color Lookup Table Data	(0028,1202)	1C	Not used.
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Not used.

3.5.6.4 Multi-Frame Module

This section specifies the Attributes of a Multi-frame pixel data Image.

Table 3-13. Multi-Frame Module Attributes

Attribute Name	Tag	Type	Attribute Description
Number of Frames	(0028,0008)	1	Set to total number of frames in image.
Frame Increment Pointer	(0028,0009)	1	See Section 3.5.8.2.2 for further explanation.

3.5.6.4.1 Multi-Frame Attribute Descriptions

3.5.6.4.1.1 Frame Increment Pointer

See the NM Multi-Frame Module (Section 3.5.8.2.2) for further information.

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 3-17. SOP Common Module Attributes

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Set to “1.2.840.10008.5.1.4.1.1.20”, Nuclear Medicine Image Storage SOP Class UID.
SOP Instance UID	(0008,0018)	1	Internally generated.
Specific Character Set	(0008,0005)	1C	Not used when the default character set (ISO 646) is used. Set to “ISO_IR 100” when extended character sets are used.
Instance Creation Date	(0008,0012)	3	Date of instance creation.
Instance Creation Time	(0008,0013)	3	Time of instance creation.
Instance Creator UID	(0008,0014)	3	Set to the Implementation UID (see Section 2.3.1.1.4)

3.5.8 Nuclear Medicine Modules

This Section describes NM Image Modules. These Modules contain Attributes that are specific to the NM Image IOD.

NM images always use the NM Multi-frame module and the appropriate frame vectors even if there is only one frame in the Image sent. If the user selects an entire Series for one Send operation, individual datasets in the Series will be combined into multi-frame NM Images as appropriate.

If the user selects and sends individual datasets within a Series, then each is sent as a separate DICOM Image. For example, for Multi-gated Tomographic acquisitions, if the dataset for each gate interval is sent individually, then each is encoded into a separate SOP Instance as a separate Multi-gated Tomographic image. It is valid for the receiving AE to recombine the SOP Instances, per the structure of the NM IOD, to form a new SOP Instance.

3.5.8.1 NM Image Pixel Module

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

Table 3-18. NM Image Pixel Module Attributes

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Samples per Pixel (always 1 for NM)
Photometric Interpretation	(0028,0004)	1	Photometric Interpretation (always MONOCHOME2)
Bits Allocated	(0028,0100)	1	Bits Allocated (8 or 16)
Bits Stored	(0028,0101)	1	Bits Stored (same as Bits Allocated)
High Bit	(0028,0102)	1	High Bit.
Pixel Spacing	(0028,0030)	2	Pixel Spacing

3.5.8.2 NM Multi-Frame Module

This section specifies the Attributes of a NM Multi-frame Image. This module is always included in a NM SOP instance, even if there is only one frame in the image.

Table 3-19. NM Multi-Frame Module Attributes

Attribute Name	Tag	Type	Attribute Description
Frame Increment Pointer	(0028,0009)	1	See for specialization by NM image type (see Section 3.5.8.2.2).
Energy Window Vector	(0054,0010)	1C	Defines energy set window to which each frame belongs.
Number of Energy Windows	(0054,0011)	1	Number of energy set windows in SOP Instance.
Detector Vector	(0054,0020)	1C	Defines detector to which each frame belongs.
Number of Detectors	(0054,0021)	1	Number of detectors in SOP Instance.
Phase Vector	(0054,0030)	1C	Defines phase to which each frame belongs.
Number of Phases	(0054,0031)	1C	Number of phases in SOP Instance.
Rotation Vector	(0054,0050)	1C	Defines rotation to which each frame belongs.
Number of Rotations	(0054,0051)	1C	Number of Rotations in SOP Instance.
R-R Interval Vector	(0054,0060)	1C	Defines R-R Interval to which each frame belongs.
Number of R-R Intervals	(0054,0061)	1C	Number of R-R Intervals in SOP Instance.
Time Slot Vector	(0054,0070)	1C	Defines time slot, within cardiac cycle, to which each frame belongs.
Number of Time Slots	(0054,0071)	1C	Number of time slots in SOP Instance.
Slice Vector	(0054,0080)	1C	Defines image slice to which each frame belongs.
Number of Slices	(0054,0081)	1C	Number of images slices in SOP Instance.
Angular View Vector	(0054,0090)	1C	Defines angular view number to which each frame belongs.
Time Slice Vector	(0054,0100)	1C	Defines frame numbers within each phase.

3.5.8.2.1 Infinia Private Multi-Frame Module

This section contains Attributes that describe the Multi-Frame module administered for the acquisition. This Module contains *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Module

Table 3-20. Infinia Private Multi-Frame Module Attributes (QUASAR_INTERNAL_USE)

Attribute Name	Tag	Type	Attribute Description
Rate Vector	0009, xx01	3	rate for each frame
Count Vector	0009, xx02	3	count accumulated for each frame
Time Vector	0009, xx03	3	time for each frame

3.5.8.2.2 NM Multi-Frame Attribute Description

3.5.8.2.2.1 Frame Increment Pointer

The Frame Increment Pointer (0028,0009) defines which frame index vectors are present in the NM Image instance. The Frame Increment Pointer is supported per the DICOM specification for all image types defined in Table 3-20.

Table 3-20. Enumerated Values for Frame Increment Pointer

Image Type (0008,0008), Value 3	Frame Increment Pointer (0028,0009)
STATIC or WHOLE BODY	0054H 0010H \ 0054H 0020H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020)
DYNAMIC	0054H 0010H \ 0054H 0020H \ 0054H 0030H \ 0054H 0100H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020) Phase Vector (0054,0030), Time Slice Vector (0054,0100)
GATED	0054H 0010H \ 0054H 0020H \ 0054H 0060H \ 0054H 0070H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), R-R Interval Vector (0054,0060), Time Slot Vector (0054,0070)
TOMO	0054H 0010H \ 0054H 0020H \ 0054H 0050H \ 0054H 0090H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), Rotation Vector (0054,0050), Angular View Vector (0054,0090)
GATED TOMO	0054H 0010H \ 0054H 0020H \ 0054H 0050H \ 0054H 0060H \ 0054H 0070H \ 0054H 0090H Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), Rotation Vector (0054,0050), R-R Interval Vector (0054,0060), Time Slot Vector (0054,0070), Angular View Vector (0054,0090).
RECON TOMO	0054H 0080H Sequencing is by Slice Vector (0054,0080)

3.5.8.3 NM Image Module

This section contains the Attributes that describe Nuclear Medicine Images.

Table 3-21. NM Image Module Attributes

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	Dataset Type (See Section 3.5.8.3.1.1)
Image ID	(0054,0400)	3	Set to name of imageset.
Lossy Image Compression	(0028,2110)	1C	Compression (Not used).
Counts Accumulated	(0018,0070)	2	Detector Counts (number of counts in imageset)
Acquisition Termination Condition	(0018,0071)	3	Defined Terms used: CNTS = count limit reached DENS = count limit reached within ROI MANU = manual TIME = time limit reached TRIG = number of beats limit reached
Table Height	(0018,1130)	3	Table Height - Height of table at acquisition start.
Table Traverse	(0018,1131)	3	Table longitudinal position at acquisition start.
Actual Frame Duration	(0018,1242)	1C	Duration of each frame in imageset.
Count Rate	(0018,1243)	3	Maximum count rate during image acquisition.
Processing Function	(0018,5020)	3	Not Used
Corrected Image	(0028,0051)	3	Not Used
Whole Body Technique	(0018,1301)	3	Enumerated Values used: 1PS, 2PS, PCN, MSP
Scan Velocity	(0018,1300)	2C	Whole body scan speed
Scan Length	(0018,1302)	2C	Whole body scan length
Referenced Overlay Sequence	(0008,1130)	3	Not used.
>Referenced SOP Class UID	(0008,1150)	1C	Not used.

Table 3-21. NM Image Module Attributes (Continued)

>Referenced SOP Instance UID	(0008,1155)	1C	Not used.
Referenced Curve Sequence	(0008,1145)	3	Not used.
>Referenced SOP Class UID	(0008,1150)	1C	Not used.
>Referenced SOP Instance UID	(0008,1155)	1C	Not used.
Trigger Source or Type	(0018,1061)	3	Defined Terms used: EKG
Anatomic Region Sequence	(0008,2218)	3	Not used.
> Code Value	(0008,0100)	1C	Not used.
> Coding Scheme Designator	(0008,0102)	1C	Not used.
> Code Meaning	(0008,0104)	3	Not used.
> Anatomic Region Modifier Sequence	(0008,2220)	3	Not used.
>> Code Value	(0008,0100)	1C	Not used.
>> Coding Scheme Designator	(0008,0102)	1C	Not used.
>> Code Meaning	(0008,0104)	3	Not used.
Primary Anatomic Structure Sequence	(0008,2228)	3	Not used.
> Code Value	(0008,0100)	1C	Not used.
> Coding Scheme Designator	(0008,0102)	1C	Not used.
> Code Meaning	(0008,0104)	3	Not used.
> Primary Anatomic Structure Modifier Sequence	(0008,2230)	3	Not used.
>> Code Value	(0008,0100)	1C	Not used.
>> Coding Scheme Designator	(0008,0102)	1C	Not used.
>> Code Meaning	(0008,0104)	3	Not used.

3.5.8.3.1 NM Image Module Attribute Description

3.5.8.3.1.1 Image Type

The following Image Type (0008,0008) values are sent:

- Value 1 shall have one of the following Enumerated Values:

  -1 ORIGINAL Identifies an Original Image

  -2 DERIVED An image modified by processing steps

- Value 2 shall have the following Enumerated Value:

  -1 PRIMARY Identifies a Primary Image

- Value 3 shall have the following Enumerated Values:

  -1 STATIC Identifies a Static Image

  -2 DYNAMIC Identifies a Dynamic Image

  -3 GATED Identifies a Multi-gated Image

  -4 WHOLE BODY Identifies a Whole Body Image

  -5 TOMO Identifies a Tomographic Image

  -6 RECON TOMO Identifies a reconstructed Tomographic Image

  -7 GATED TOMO Identifies a Multi-gated Tomographic Image

  -8 RECON GATED TOMO A reconstructed Multi-gated Tomographic Image

- Value 4 shall have the following Enumerated Values:

  -1 EMISSION Transmission source NOT active during image acquisition

  -2 TRANSMISSION Transmission source active during image acquisition

3.5.8.4 NM ISotope Module

This section contains Attributes that describe the isotope administered for the acquisition.

Table 3-22. NM Isotope Module Attributes

Attribute Name	Tag	Type	Attribute Description
Energy Window Information Sequence	(0054,0012)	2	Energy window information.
> Energy Window Name	(0054,0018)	3	Not Used
>Energy Window Range Sequence	(0054,0013)	3	Sequence describing window energy limits.
>> Energy Window Lower Limit	(0054,0014)	3	Lower energy limit in KeV.
>> Energy Window Upper Limit	(0054,0015)	3	Upper energy limit in KeV.
Radiopharmaceutical Information Sequence	(0054,0016)	2	Information on radiopharmaceutical(s) used.
> Radionuclide Code Sequence	(0054,0300)	2C	Null Sequence
>> Code Value	(0008,0100)	1C	Not used.
>> Coding Scheme Designator	(0008,0102)	1C	Not used.
>> Code Meaning	(0008,0104)	3	Not used.
> Radiopharmaceutical Route	(0018,1070)	3	Not used.
> Administration Route Code Sequence	(0054,0302)	3	Not used.
>> Code Value	(0008,0100)	1C	Not used.
>> Coding Scheme Designator	(0008,0102)	1C	Not used.
>> Code Meaning	(0008,0104)	3	Not used.
> Radiopharmaceutical Volume	(0018,1071)	3	Not Used
> Radiopharmaceutical Start Time	(0018,1072)	3	Not used.
> Radiopharmaceutical Stop Time	(0018,1073)	3	Not used.
> Radionuclide Total Dose	(0018,1074)	3	Total Dose field.
> Calibration Data Sequence	(0054,0306)	3	Not Used

Table 3-22. NM Isotope Module Attributes (Continued)

>> Energy Window Number	(0054,0308)	1C	Not Used
>> Syringe Counts	(0018,1045)	3	Not Used
>> Residual Syringe Counts	(0054,0017))	3	Not Used
> Radiopharmaceutical	(0018,0031)	3	Entered on Energy|Isotope card, Pharm field.
> Radiopharmaceutical Code Sequence	(0054,0304)	3	Not used.
>> Code Value	(0008,0100)	1C	Not used.
>> Coding Scheme Designator	(0008,0102)	1C	Not used.
>> Code Meaning	(0008,0104))	3	Not used.
Intervention Drug Information Sequence	(0018,0026)	3	Not used.
>Intervention Drug Name	(0018,0034)	3	Not used.
>Intervention Drug Code Sequence	(0018,0029)	3	Not used.
>> Code Value	(0008,0100)	1C	Not used.
>> Coding Scheme Designator	(0008,0102)	1C	Not used.
>> Code Meaning	(0008,0104)	3	Not used.
> Administration Route Code Sequence	(0054,0302)	3	Not used.
>> Code Value	(0008,0100))	1C	Not used.
>> Coding Scheme Designator	(0008,0102)	1C	Not used.
>> Code Meaning	(0008,0104)	3	Not used.
>Intervention Drug Start Time	(0018,0035)	3	Not used.
>Intervention Drug Stop Time	(0018,0027)	3	Not used.
>Intervention Drug Dose	(0018,0028)	3	Not used.

3.5.8.5 NM Detector Module

This section contains IOD Attributes that describe Nuclear Medicine Detectors used to produce an image.

Table 3-23. NM Detector Module Attributes

Attribute Name	Tag	Type	Attribute Description
Detector Information Sequence	(0054,0022)	2	Detector information.
> Collimator/Grid Name	(0018,1180)	3	Name of collimator used on this detector.
> Collimator Type	(0018,1181)	2C	Defined Terms used: PARA = Parallel PINH = Pinhole FANB = Fan-beam CONE = Cone-beam SLNT = Slant hole ASTG = Astigmatic DIVG = Diverging NONE = No collimator UNKN = Unknown
> Field of View Shape	(0018,1147)	3	Defined Terms used: RECTANGLE ROUND HEXAGONAL
> Field of View Dimension(s)	(0018,1149)	3	Dimensions of the field of view.
> Focal Distance	(0018,1182)	2C	Focal distance.
> X Focus Center	(0018,1183)	3	Center point of the focus position.
> Y Focus Center	(0018,1184)	3	Center point of the focus position.
> Zoom Center	(0028,0032)	3	Image center offset from field of view center.
> Zoom Factor	(0028,0031)	3	Zoom factor, typical range: 1.00 to 4.00.
> Center of Rotation Offset	(0018,1145)	3	Offset between detector center and mechanical center
> Gantry/Detector Tilt	(0018,1120)	3	Detector tilt position
> Distance Source to Detector	(0018,1110)	2C	Distance between transmission source and detector during transmission scanning.
> Start Angle	(0054,0200)	3	Start Angle

Table 3-23. NM Detector Module Attributes (Continued)

> Radial Position	(0018,1142)	3	Detector radial position at start of acquisition.
> Image Orientation (Patient)	(0020,0037)	2C	Set for first frame in dataset
> Image Position (Patient)	(0020,0032)	2C	Set for first frame in dataset
> View Code Sequence	(0054,0220)	3	Not used.
>> Code Value	(0008,0100)	1C	Not used.
>> Coding Scheme Designator	(0008,0102)	1C	Not used.
>> Code Meaning	(0008,0104)	3	Not used.
>> View Angulation Modifier Code Sequence	(0054,0222)	2C	Not used.
>>> Code value	(0008,0100)	1C	Not used.
>>> Coding Scheme Desi	(0008,0102))	1C	Not used.
>>> Code Meaning	(0008,0104)	3	Not used.

3.5.8.6 NM TOMO Acquisition Module

This section contains Attributes that describe Rotation information of a tomographic image performed on the patient. This module is present when the Image Type (0008,0008) Value 3, is equal to TOMO, GATED TOMO, RECON TOMO or RECON GATED TOMO.

Table 3-24. NM TOMO Acquisition Module Attributes

Attribute Name	Tag	Type	Attribute Description
Rotation Information Sequence	(0054,0052)	2	Provides TOMO rotation information.
> Start Angle	(0054,0200)	1C	Detector start angle at start of acquisition.
> Angular Step	(0018,1144)	1C	Incremental rotational angle change per view.
> Rotation Direction	(0018,1140)	1C	Direction of rotation.
> Scan Arc	(0018,1143)	1C	Total rotation angle.
> Actual Frame Duration	(0018,1242)	1C	Duration of a view.
> Radial Position	(0018,1142)	3	Detector radial position at start of acquisition.
> Distance Source to Detector	(0018,1110)	2C	Distance between transmission source and detector during transmission scanning.
> Number of Frames in Rotation	(0054,0053)	1C	Number of tomographic views acquired.
> Table Traverse	(0018,1131)	3	Table longitudinal position at acquisition start.
> Table Height	(0018,1130)	3	Height of table above floor at acquisition start.
Type of Detector Motion	(0054,0202)	3	Enumerated Values used: STEP AND SHOOT CONTINUOUS ACQ DURING STEP

3.5.8.7 NM Multi-Gated Acquisition Module

This section contains Attributes that describe a multi-gated acquisition performed on the patient. This refers to frames acquired while the patient is connected to a gating device. This module is present when the Image Type (0008,0008) Value 3, is equal to GATED or GATED TOMO.

Table 3-25. NM Multi-Gated Acquisition Module Attributes

Attribute Name	Tag	Type	Attribute Description
Beat Rejection Flag	(0018,1080)	3	Whether a bad beat rejection algorithm used. Enumerated values: Y = bad beat rejection algorithm used N = bad beat rejection algorithm NOT used
PVC Rejection	(0018,1085)	3	Not used
Skip Beats	(0018,1086)	3	Beats skipped for each rejected beat
Heart Rate	(0018,1088)	3	Average heart rate during acquisition.
Gated Information Sequence	(0054,0062)	2C	One set of attributes per R-R acceptance window
> Trigger Time	(0018,1060)	3	Not used.
> Framing Type	(0018,1064)	3	Not used.
> Data Information Sequence	(0054,0063)	2C	Only one set is used (all sets have same attributes)
>> Frame Time	(0018,1063)	1C	Gated frame duration in the imageset.
>> Nominal Interval	(0018,1062)	3	Not used.
>> Low R-R Value	(0018,1081)	3	Minimum R-R interval value accepted.
>> High R-R Value	(0018,1082)	3	Maximum R-R interval value accepted.
>> Intervals Acquired	(0018,1083)	3	Number of accepted intervals.
>> Intervals Rejected	(0018,1084)	3	Number of rejected intervals.
>> Time Slot Information Sequence	(0054,0072)	2C	Not used.
>>> Time Slot Time	(0054,0073)	3	Not used.

3.5.8.8 NM Phase Module

This section contains Attributes that describe dynamic phases of a dynamic acquisition image performed on the patient. This module is present when the Image Type (0008,0008) Value 3, is equal to DYNAMIC.

Table 3-26. NM Phase Module Attributes

Attribute Name	Tag	Type	Attribute Description
Phase Information Sequence	(0054,0032)	2C	One sequence item per dynamic phase.
> Phase Delay	(0054,0036)	1C	Phase Delay
> Actual Frame Duration	(0018,1242)	1C	Frame Duration (same for all frames in this phase)
> Pause Between Frames	(0054,0038)	1C	Pause Between Frames
> Number of Frames in Phase	(0054,0033)	1C	Number of frames in this phase.
>Trigger Vector	(0054,0210)	3	Trigger Vector for gated data
>Number of Triggers in Phase	(0054,0211)	1C	Number of Triggers in Phase

3.5.8.9 NM Reconstruction Module

This section contains Attributes that describe Nuclear Medicine reconstructed volumes. Reconstructed volumes are created by applying a transformation (reconstruction) process to the acquired TOMO frames. Define the conditions under which this module is present. This module is present only when the Image Type (0008,0008), Value 3, is equal to RECON TOMO or RECON GATED TOMO**.**

Table 3-27. NM Reconstruction Module Attributes

Attribute Name	Tag	Type	Attribute Description
Spacing Between Slices	(0018,0088)	2	Spacing Between Slices
Reconstruction Diameter	(0018,1100)	3	Not used
Convolution Kernel	(0018,1210)	3	Not used
Slice Thickness	(0018,0050)	2	Slice Thickness
Slice Location	(0020,1041)	3	Not used

3.5.8.10 Infinia Private SPECT Reconstruction Module

This section contains Attributes that describe Nuclear Medicine reconstructed volumes. Reconstructed volumes are created by applying a transformation (reconstruction) process to the acquired TOMO frames. This module is present only when the Image Type (0008,0008), Value 3, is equal to RECON TOMO or RECON GATED TOMO**.** This Module contains *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Module. Note that each of these attributes may have multiple values when gated reconstructed data is combined into a single DICOM dataset.

Table 3-28. Infinia Private SPECT Reconstruction Module Attributes

Attribute Name	Tag	Type	Attribute Description
Heart Beat Vector	0009, xx12	3	heart beat vector
Sequence Type	0009, xx13	3	
Sequence Name	0009, xx14	3	
Avr RR Time Vector	0009, xx15	3	average r-r time vector
Low Limit Vector	0009, xx16	3	Low window limit vector
High Limit Vector	0009, xx17	3	High window limit vector
Begin Index Vector	0009, xx18	3	begin index vector: link to heart beat vector
End Index Vector	0009, xx19	3	end index vector: link to heart beat vector
Raw Time Vector	0009, xx1A	3	Raw time vector

3.6 PRIVATE DATA DICTIONARY

This section provides value representation and multiplicity information for all of the Private Attributes used by this implementation. Private Attributes contained within the Information Model are described in the preceding sections

Table 3-29. Private Creator Identification - Infinia (QUASAR_INTERNAL_USE)

Attribute Name	Tag	VR	VM	Attribute Description
Rate Vector	0009, xx01			rate for each frame
Count Vector	0009, xx02			count accumulated for each frame
Time Vector	0009, xx03			time for each frame
Params	0009, xx04			scan blob
CLIST Buffer	0009, xx05			buffer of CLIST chunks
CLIST UID	0009, xx06			UID of the CLIST
Angle Vector	0009, xx07			angle for each TOMO frame. For each frame is tells what is the angle of the detector
Camera Shape	0009, xx08			camera shape H mode, L mode
Protocol Params	0009, xx09			protocol description blob
WholeBody Spots	0009, xx10			QUASAR private flags
Worklist Flag	0009, xx11			
Heart Beat Vector	0009, xx12			heart beat vector (for gspect)
Sequence Type	0009, xx13			
Sequence Name	0009, xx14			
Avr RR Time Vector	0009, xx15			average r-r time vector (for gspect)
Low Limit Vector	0009, xx16			Low window limit vector (for gspect)
High Limit Vector	0009, xx17			High window limit vector (for gspect)
Begin Index Vector	0009, xx18			begin index vector: link to heart beat vector (for gspect)
End Index Vector	0009, xx19			end index vector: link to heart beat vector (for spect)
Raw Time Vector	0009, xx1A			raw time vector (for gspect)
Image Type String	0009, xx1B			Image type string as passed in the scan request
Image Installed Flag	0009, xx1C			define if image is already installed in the database

Table 3-30. Private Creator Identification - Infinia (APEX_ PRIVATE)

Attribute Name	Tag	VR	VM
Bed Position	0027, xx11		

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Table 3-31. Private Creator Identification - Infinia (GEMS_GENIE_1)

Attribute Name	Tag	VR	VM
Study Name	(0009,xx10)	LO	1
Study Flags	(0009,xx11)	SL	1
Study Type	(0009,xx12)	SL	1
Patient Object Name	(0009,xx40)	PN	1
Patient Flags	(0009,xx41)	SL	1
Patient Creation Date	(0009,xx42)	DA	1
Patient Creation Time	(0009,xx43)	TM	1
Radio Nuclide Name	(0011,xx0D)	LO	1
Dataset Name	(0011,xx12)	LO	1
Detector Number	(0011,xx15)	SL	1
Source Translator	(0013,xx11)	SL	1
Study Comments	(0013,xx26)	LT	1
GENIE Data Object Type	(0033,xx08)	CS	1
Modified	(0033,xx10)	SL	1
Name	(0033,xx11)	LO	1
ProtocolDataUID	(0033,xx16)	LO	1
Date	(0033,xx17)	SH	1
Time	(0033,xx18)	SH	1
ProtocoldataFlags	(0033,xx19)	UL	1

Table 3-31. Private Creator Identification - Infinia (GEMS_GENIE_1) (Continued)

ProtocolName	(0033,xx1A)	UL	1
RelevantDataUID	(0033,xx1B)	LO	1
BulkData	(0033,xx1C)	LO	1
IntData	(0033,xx1D)	SL	1-n
DoubleData	(0033,xx1E)	FD	1-n
StringData	(0033,xx1F)	LT	1-n
BulkDataFormat	(0033,xx20)	LT	1-n
StringDataFormat	(0033,xx23)	LT	1-n
Description	(0033,xx24)	LT	1

SECTION 4
Infinia Modality Worklist Object Implementation

4.1 INTRODUCTION

The Infinia data objects described in this section include the Modality Worklist Data Object.
This object is implemented standard DICOM Modality SOP class.

4.2 IOD MODULE TABLE

Table 4-1. Infinia Modality Worklist DICOM Attributes Mapping

Attribute	Tag	VR	Note
Accession Number	(0008,0050)	SH	
Additional Patient History	(0010,21B0)	LT	
Admitting Diagnosis Description	(0008,1080)	LO	
Comments on the Scheduled Procedure Step	(0040,0400)	LT	
Contrast Allergies	(0010,2110)	LO	
Current Patient Location	(0038,0300)	LO	
Ethnic Group	(0010,2160)	SH	
Imaging Service Request Comments	(0040,2400)	LT	
Medical Alerts	(0010,2000)	LO	
Modality	(0008,0060)	CS	
Names of Intended Recipients Of Results	(0040,1010)	PN	
Occupation	(0010,2180)	SH	
Other Patient Ids	(0010,1000)	LO	

Table 4-1. Infinia Modality Worklist DICOM Attributes Mapping (Continued)

Other Patient Names	(0010,1001)	PN	
Patient Comments	(0010,4000)	LT	
Patient ID	(0010,0020)	LO	
Patient State	(0038,0500)	LO	
Patient Transport Arrangements	(0040,1004)	LO	
Patient's Age	(0010,1010)	AS	
Patient’s Birth Date	(0010,0030)	DA	
Patient's Name	(0010,0010)	PN	
Patient's Sex	(0010,0040)	CS	
Patient's Size	(0010,1020)	DS	
Patient's Weight	(0010,1030)	DS	
Pregnancy Status	(0010,21C0)	US	
Pre-Medication	(0040,0012)	LO	
Reason for the Imaging Service Request	(0040,2001)	LO	
Reason for the Requested Procedure	(0040,1002)	LO	
Referring Physician's Name	(0008,0090)	PN	
Requested Contrast Agent	(0032,1070)	LO	
Requested Procedure Comments	(0040,1400)	LT	
Requested Procedure Description	(0032,1060)	LO	
Requested Procedure ID	(0040,1001)	SH	
Requested Procedure Location	(0040,1005)	LO	
Requested Procedure Priority	(0040,1003)	SH	
Requesting Physician	(0032,1032)	PN	

Table 4-1. Infinia Modality Worklist DICOM Attributes Mapping (Continued)

Scheduled Performing Physician's Name	(0040,0006)	PN	
Scheduled Procedure Step Description	(0040,0007)	LO	
Scheduled Procedure Step End Date	(0040,0004)	DA	
Scheduled Procedure Step End Time	(0040,0005)	TM	
Scheduled Procedure Step ID	(0040,0009)	SH	
Scheduled Procedure Step Start Date	(0040,0002)	DA	
Scheduled Procedure Step Start Time	(0040,0003)	TM	
Scheduled Procedure Step Status	(0040,0020)	CS	
Scheduled Station AE Title	(0040,0001)	AE	
Scheduled Station Name	(0040,0010)	SH	
Special Needs	(0038,0050)	LO	
Study Instance UID	(0020,000D)	UI	

SECTION 5
INFINIA PROTOCOL DATA OBJECT IMPLEMENTATION

5.1 INTRODUCTION

The Infinia non–image data objects described in this section include the Protocol Data Object, the Series Data Object, and the Q Script Object. A related object for Review Data is defined in another section. All of these objects are implemented using a Infinia private DICOM SOP class. The object type is determined by the use of an object type attribute, as defined in the tables.

5.2 INFINIA PROTOCOL DATA IOD IMPLEMENTATION

The Infinia protocol data objects are used for storage of image processing data that is beyond the image attributes defined in the Infinia database. The format for protocol data is defined individually by application software for an unlimited number of different protocols. A protocol data object is associated with a Study or a Series, and not associated with an Image. For this reason a stand–alone private object is defined for transferring protocol data to Xeleris systems.

5.3 IOD MODULE TABLE

This section of the mapping document defines a Infinia private Protocol Data Object that consists of the DICOM standard Patient, Study, Series, and SOP Common modules, and the Infinia Private Protocol Data Module. The private module is based on the Protocol Data Table and Series Data Table that are defined in the Infinia Database Schema Document.

The Infinia Private Protocol Data Object Module Table is shown below. The Patient, Study, and other standard modules use all of the standard mapping tables defined in the image data parts of the mapping document. The Nuclear Medicine specific tables and the Infinia private tables from the image IODs are not a part of the Protocol Data Object. Only the modules shown are included in the private object.

The Infinia private data dictionary (appendix A) shows the value representation and other characteristics of the private elements shown in the table.

The Infinia Protocol Data Object contains the modules listed in table Table 5-1. Series Data object instances use all of the modules shown. Protocol Data object instances use all but the Series module.

Table 5-1. Protocol Data IOD Modules

Entity	Module	Reference	Usage
Patient	Patient	Section 3.5.1.1	PDO,SDO
Study	General Study	Section 3.5.2.1	PDO,SDO
Series	General Series	Section 3.5.3.1	SDO
Infinia Data	Infinia Protocol Data	Section 5.4.1	PDO,SDO
	SOP Common	Section 3.5.7.1	PDO,SDO

5.4 INFORMATION MODULE DEFINITIONS

The table below shows the Infinia to DICOM mappings for the Protocol Data Object and the Series Data Object. The same private object definition is used for both of the Infinia objects. Most of the module attributes are identical between the two objects. Two of the attributes have separate entries for the PDO and SDO, but the types are the same, and the export/import rules are the same.

5.4.1 Infinia Protocol Data Module Attributes

The following table shows the mapping for Protocol Data Objects and Series Data Objects to the Infinia object.

Table 5-2. Protocol Data Dicom Attributes Mapping

Attribute Name	Tag	VR	VM
Group Length	(0008,0000)	UL	
SOP Class UID	(0008,0016)	UI	
SOP Instance UID	(0008,0018)	UI	
Study Date	(0008,0020)	DA	
Study Time	(0008,0030)	TM	
Accession Number	(0008,0050)	SH	
Referring Physician's name	(0008,0090)	PN	
Study Description	(0008,1030)	LO	
Name of Physician(s) Reading Study	(0008,1060)	PN	
Private Creator Element	(0009,xx01)	SH	
Study Name	(0009,xx10)	LO	
Study Flags	(0009,xx11)	SL	
Study Type	(0009,xx12)	SL	
Patient Name	(0009,xx40)	PN	
Patient Flags	(0009,xx41)	SL	
Creation Date	(0009,xx42)	DA	
Creation Time	(0009,xx43)	TM	

Table 5-2. Protocol Data Dicom Attributes Mapping (Continued)

Group Length	(0010,0000)	UL	
Patient Name	(0010,0010)	PN	
Patient ID	(0010,0020)	LO	
Patient's Birth Date	(0010,0030)	DA	
Patient's Sex	(0010,0040)	CS	
Other Patient IDs	(0010,1000)	LO	
Other Patient Names	(0010,1001)	PN	
Patient's Size	(0010,1020)	DS	
Patient's Weight	(0010,1030)	DS	
Ethnic Group	(0010,2160)	SH	
Occupation	(0010,2180)	SH	
Study Comments	(0013,xx26)	LT	
Group Length	(0020,0000)	UL	
Study Instance UID	(0020,000D)	UI	
Study ID	(0020,0010)	SH	
Group Length	(0032,0000)	UL	
Study comments	(0032,4000)	LT	
Private Message Type	(0033,xx08)	CS	See Note 1
Modified	(0033,xx10)	SL	
Protocol Data Name	(0033,xx11)	LO	
Protocol data UID	(0033,xx16)	LO	
Protocol Data Date	(0033,xx17)	SH	
Protocol Data Time	(0033,xx18)	SH	

Table 5-2. Protocol Data Dicom Attributes Mapping (Continued)

Protocol Data Flags	(0033,xx19)	UL	
Protocol Name	(0033,xx1A)	LO	
Relevant Series	(0033,xx1B)	LO	
Bulk Data	(0033,xx1C)	OB	
Int Data	(0033,xx1D)	SL	
Double Data	(0033,xx1E)	FD	See Note 2
String Data	(0033,xx1F)	LT	See Note 3
Bulk Data Format	(0033,xx20)	LT	See Note 3
String Data Format	(0033,xx23)	LT	
Protocol Data Description	(0033,xx24)	LT	

Note

1. The Object Type attribute is created when the data is exported. Its value can be PROTOCOL DATA | SERIES DATA | Q SCRIPT | REVIEW DATA. When the Protocol Data object is imported, this attribute is used to create the appropriate Infinia database object
2. The Bulk Data is formatted as OB type.
3. These attributes are stored as two dimensional array of strings in Infinia SDO/PDO objects. While formatting to DICOM NULL strings are represented as ”**” which are ignored by the Infinia SCP.

5.4.2 General Mapping Rules for Protocol Data

All of the Infinia database attributes in the Patient, Study, and Series modules are copied directly to or from the DICOM dataset as defined in the image mapping tables for the parent Patient/Study/Series.

5.4.3 Export Notes for Protocol Datasets

Every Infinia database attribute in the protocol data module is copied directly into the DICOM dataset. There are no defaults on export. If there is no value in the database, then the elements may be left out of the DICOM dataset.

5.4.4 Import Notes for Protocol Datasets

A Infinia PDO or SDO is created, header attributes are copied, created or set by default, and the protocol data and data formats are copied directly. There are no mandatory attributes

APPENDIX A
INFINIA PRIVATE DATA DICTIONARY

Table A-1. Infinia Private Study Module Attributes (QUASAR_INTERNAL_USE)

Attribute Name	Tag	Type	Attribute Description
Worklist Flag	0009, xx11		

Table A-2. Infinia Private Series Module Attributes (QUASAR_INTERNAL_USE)

Attribute Name	Tag	Type	Attribute Description
Params	0009, xx04		scan blob
Angle Vector	0009, xx07		angle for each TOMO frame. For each frame is tells what is the angle of the detector
Camera Shape	0009, xx08		camera shape H mode, L mode
Protocol Params	0009, xx09		protocol description blob
Sequence Type	0009, xx13		

Table A-3. Infinia Private Image Module Attributes (QUASAR_INTERNAL_USE)

Attribute Name	Tag	Type	Attribute Description
WholeBody Spots	0009, xx10		QUASAR private flags
Heart Beat Vector	0009, xx12		heart beat vector (for gspect)
Sequence Name	0009, xx14		
Image Type String	0009, xx1B		Image type string as passed in the scan request
Image Installed Flag	0009, xx1C		define if image is already installed in the database

Table A-4. Infinia Private GSPECT Reconstruction Module Attributes (QUASAR_INTERNAL_USE)

Attribute Name	Tag	Type	Attribute Description
Heart Beat Vector	0009, xx12		heart beat vector
Sequence Type	0009, xx13		
Sequence Name	0009, xx14		
Avr RR Time Vector	0009, xx15		average r-r time vector
Low Limit Vector	0009, xx16		Low window limit vector
High Limit Vector	0009, xx17		High window limit vector
Begin Index Vector	0009, xx18		begin index vector: link to heart beat vector
End Index Vector	0009, xx19		end index vector: link to heart beat vector
Raw Time Vector	0009, xx1A		Raw time vector

Table A-5. Private Creator Identification - Infinia (QUASAR_INTERNAL_USE)

Attribute Name	Tag	VR	VM	Attribute Description
Rate Vector	0009, xx01	UL	1-n	rate for each frame
Count Vector	0009, xx02	UL	1-n	count accumulated for each frame
Time Vector	0009, xx03	UL	1-n	time for each frame
Params	0009, xx04	OB	1	scan blob
CLIST Buffer	0009, xx05			buffer of CLIST chunks
CLIST UID	0009, xx06			UID of the CLIST
Angle Vector	0009, xx07	UL	1-n	angle for each TOMO frame. For each frame is tells what is the angle of the detector
Camera Shape	0009, xx08	US	1	camera shape H mode, L mode
Protocol Params	0009, xx09			protocol description blob
WholeBody Spots	0009, xx10	US	1	QUASAR private flags
Worklist Flag	0009, xx11	OB	1	
Heart Beat Vector	0009, xx12			heart beat vector (for gspect)

Table A-5. Private Creator Identification - Infinia (QUASAR_INTERNAL_USE)

Sequence Type	0009, xx13	PN	1	
Sequence Name	0009, xx14	PN	1	
Avr RR Time Vector	0009, xx15			average r-r time vector (for gspect)
Low Limit Vector	0009, xx16			Low window limit vector (for gspect)
High Limit Vector	0009, xx17			High window limit vector (for gspect)
Begin Index Vector	0009, xx18			begin index vector: link to heart beat vector (for gspect)
End Index Vector	0009, xx19			end index vector: link to heart beat vector (for spect)
Raw Time Vector	0009, xx1A	UL	1-n	raw time vector (for gspect)
Image Type String	0009, xx1B	LO	1	Image type string as passed in the scan request
Image Installed Flag	0009, xx1C	US	1	// define if image is already installed in the database

Table A-6. Private Creator Identification - Infinia (APEX_ PRIVATE)

Attribute Name	Tag	VR	VM
Bed Position	0027, xx11		

.

Table A-7. Private Creator Identification - Infinia (GEMS_GENIE_1)

Attribute Name	Tag	VR	VM
Study Name	(0009,xx10)	LO	1
Study Flags	(0009,xx11)	SL	1
Study Type	(0009,xx12)	SL	1
Patient Object Name	(0009,xx40)	PN	1
Patient Flags	(0009,xx41)	SL	1
Patient Creation Date	(0009,xx42)	DA	1
Patient Creation Time	(0009,xx43)	TM	1
Radio Nuclide Name	(0011,xx0D)	LO	1
Dataset Name	(0011,xx12)	LO	1
Detector Number	(0011,xx15)	SL	1
Source Translator	(0013,xx11)	SL	1
Study Comments	(0013,xx26)	LT	1
GENIE Data Object Type	(0033,xx08)	CS	1

Table A-7. Private Creator Identification - Infinia (GEMS_GENIE_1) (Continued)

Modified	(0033,xx10)	SL	1
Name	(0033,xx11)	LO	1
ProtocolDataUID	(0033,xx16)	LO	1
Date	(0033,xx17)	SH	1
Time	(0033,xx18)	SH	1
ProtocoldataFlags	(0033,xx19)	UL	1
ProtocolName	(0033,xx1A)	UL	1
RelevantDataUID	(0033,xx1B)	LO	1
BulkData	(0033,xx1C)	LO	1
IntData	(0033,xx1D)	SL	1-n
DoubleData	(0033,xx1E)	FD	1-n
StringData	(0033,xx1F)	LT	1-n
BulkDataFormat	(0033,xx20)	LT	1-n
StringDataFormat	(0033,xx23)	LT	1-n
Description	(0033,xx24)	LT	1