GE Medical Systems

Technical Publications

Direction 2171143-100
Revision 2.5

SIGNA HORIZON LX8.1 CONFORMANCE STATEMENT

for DICOM v3.0

sm - Service Manual

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WARNING

- THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.
- IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.
- DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THE SERVICE MANUAL HAS BEEN CONSULTED AND UNDERSTOOD.
- FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.

1 SECTION 1 - INTRODUCTION

1.0 Overview

Section 1, *Introduction,* provides general information about the content and scope of this document.

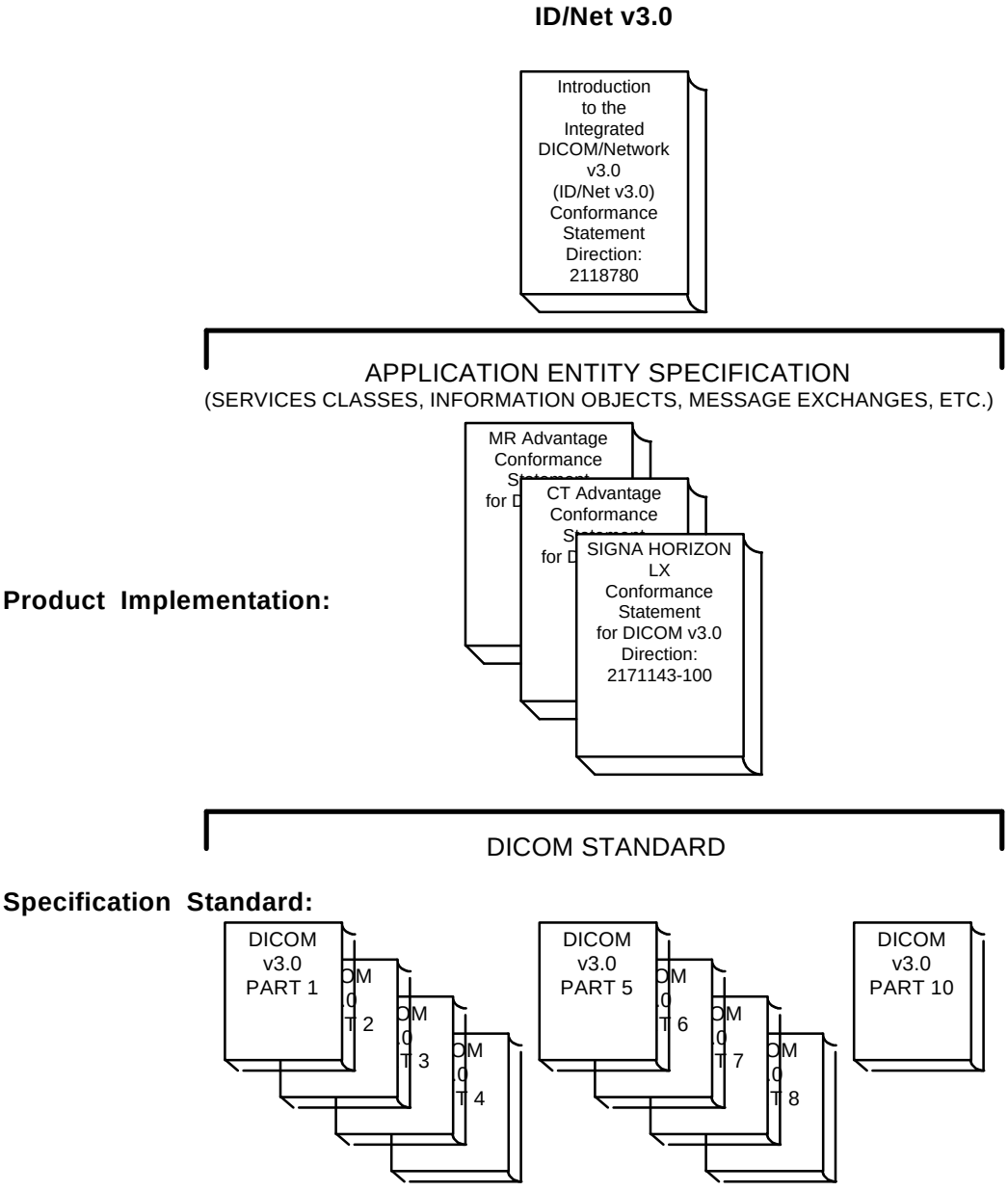
Section 2, *Network Conformance Statement***,** is the DICOM v3.0 Conformance Statement related to this product Conformance Statements define the subset of options selected from those offered by the DICOM v3.0 standard.

Section 3, *Media Storage Conformance Statement*, is the DICOM v3.0 Conformance Statement related to Media Storage Application Profile.

1.1 Overall Conformance Statement Documentation Structure

The documentation structure of the GEMS Conformance Statements and their relationship with the DICOM v3.0 Conformance Statements is shown in Illustration 1-1.

Illustration 1-1
DOCUMENTATION STRUCTURE



The Documentation structure given in Illustration 1-1 shows the overall documentation structure for all of the GE ID/Net v3.0 Conformance Statements.

ID/Net v2.0 documentation is also openly available, but the two documentation structures are independent of each other. Refer to Direction 46-269546G2.

This document specifies the DICOM v3.0 implementation supported by the SIGNA HORIZON LX. It is entitled:

SIGNA HORIZON LX
Conformance Statement for DICOM v3.0
Direction 2171143-100

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

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

This introduction familiarizes the reader with DICOM terminology and general concepts. It should be read prior to reading individual products' ID/Net v3.0 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 developers, there is a "collector" Direction available. By ordering the collector, the Introduction described above and all of the currently published ID/Net v3.0 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 by contacting:

NEMA Publication
1300 N. 17th Street
Suite 1847
Rosslyn, VA 22209
USA
Phone: (708) 841-3200

1.2 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 Conformance Statement document.

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

1.3 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 Statements 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 insure proper processing and interpretation of GE medical image data exchanged using DICOM v3.0. The GEMS Conformance Statements are available to the public.

The reader of this conformance statement should be aware that different GE devices are capable of using different Information Object Definitions. For example, a GE CT scanner may send images using the CT Information Object, MR Information Object, Secondary Capture Object, etc.

Included in this Conformance Statement are Module Definitions which define all data elements used by the GEMS implementation. If the user encounters unspecified private data elements while parsing a GE 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 retransmit all of the private data elements which are sent by GE devices.

1.4 Important Remarks

The use of these 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 insure 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 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 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 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 kept informed of the evolution of the implementation described in this document, the user should register on the GE internet server, accessible via anonymous ftp, by entering his/her e-mail address (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 communications with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.5 References

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

1.6 Definitions

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

1.7 Symbols and Abbreviations

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

2 SECTION 2 - NETWORK CONFORMANCE STATEMENT

2.0 INTRODUCTION

This Conformance Statement (CS) specifies theSIGNA HORIZON LX compliance to DICOM v3.0. It details the DICOM Service Classes and roles which are supported by this product in it's version8.1.

The SIGNA HORIZON LX product uses DICOM services to import images for possible further analysis and/or processing. It also uses DICOM services to export images to other DICOM-compliant machines.

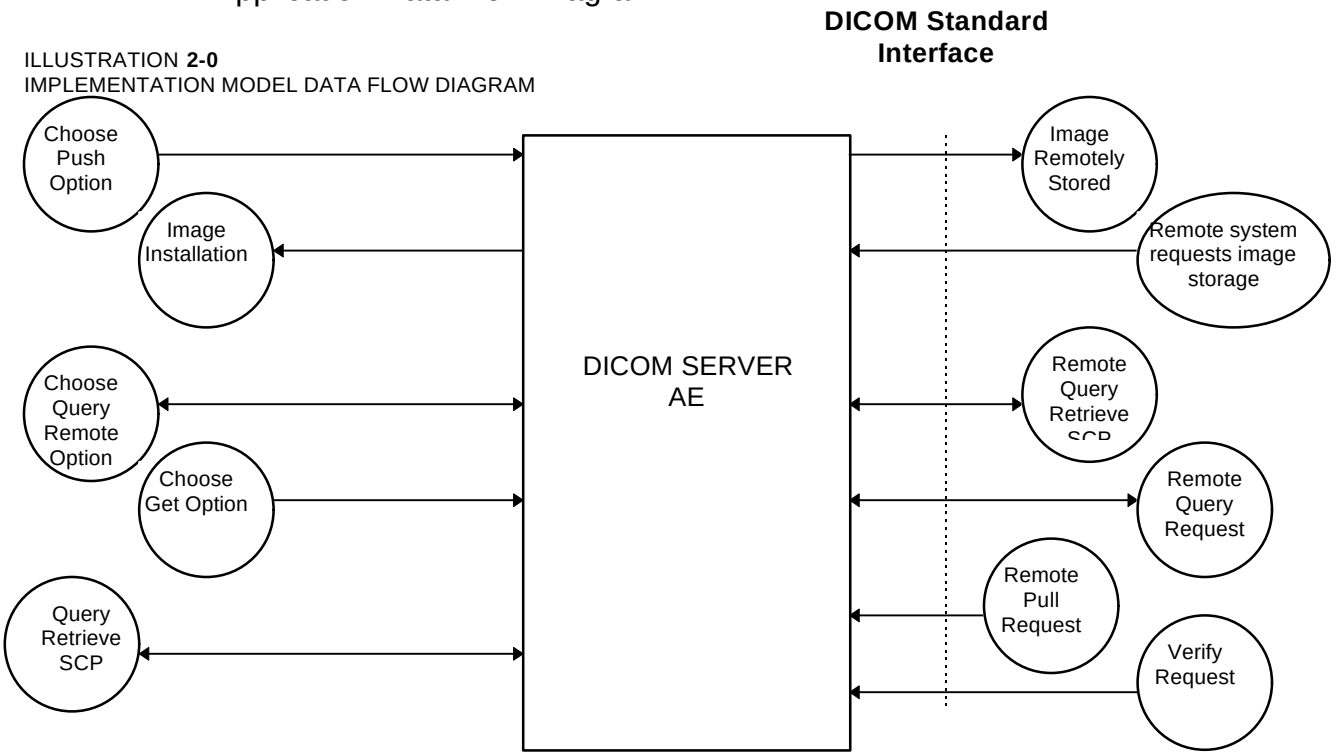
Note the format of this section follows the format of the DICOM Standard Part 2 (conformance) Annex A hence the paragraph numbering scheme. Please refer to that part of the standard while reading this section.

2.1 IMPLEMENTATION MODEL

All DICOM functionality on theSIGNA HORIZON LX product is handled by the DICOM Server Application Entity (AE). The DICOM Server AE is commanded to perform DICOM services through the buttons and menu selections on the main user interface panel. The DICOM Server AE is also listening to a pre-defined port for incoming connections.

2.1.1 Application Data Flow Diagram

ILLUSTRATION **2-0**
IMPLEMENTATION MODEL DATA FLOW DIAGRAM



There are three Real-World Activities that will cause the DICOM Server Application Entity (DICOM Server AE) to initiate a DICOM association to a remote DICOM Application Entity.

The *Choose "Push" Option* Real-World activity consists of an operator selecting one or more study, series or image in the local database manager and choosing either "Push Examination", "Push Series" or "Push Image from the "Network" pulldown menu on the local database manager to send the image(s) to a selected destination.

Real-World Activity, *Query Remote*, causes the DICOM Server AE to initiate an association to the Remote DICOM AE and request the list of all studies. Once the DICOM Server AE receives the list of studies, it will select the first study (as determined through the local database manager list sort criterion) and request the list of series for that study. After receiving the list of series the DICOM Server AE will ask for the list of images for the first series in the list. The operator can then select any study in the study list to retrieve the list of series and images.

Real-World Activity, *Choose "Pull" Option*, will be available once the *Query Remote* activity is performed. The operator can now select one or more study (series or image) and ask the DICOM Server AE to retrieve the selected image(s) from the Remote DICOM AE by choosing either "Get Examination", "Get Series", or "Get Images".

There is no Real-World activity required for the DICOM Server AE to respond to an incoming DICOM store, query or retrieve. The DICOM Server AE is always

prepared to respond to a DICOM Store, Query, or Retrieve by any remote DICOM AE.

The DICOM Server AE will perform the Real-World activity*Image Installation* after the remote AE sends an image to theSIGNA HORIZON LX product.

Once a *Query* request is received, the DICOM Server AE will search the local database for all entries that match the keys requested by the Remote DICOM AE and send back the list of matches. The DICOM Server AE will also respond to an incoming retrieval request from a Remote AE by sending the image(s) to the Destination AE.

2.1.2 Functional Definition of AE's

DICOM Server Application Entity initiates the following operations:

- Initiate an association to a Remote AE to send image(s). If the Remote AE accepts the presentation context applicable to the image(s) being sent, the DICOM Server AE will send the image(s) by invoking C-STORE-RQ operation for each image on the same association.
- Initiate an association with a Remote AE to query for images on the remote host. A Study-Root Study-Level C-FIND-RQ request will be sent to the Remote AE once an association has been established. After all responses are received, DICOM Server AE will issue a Series-Level C-FIND-RQ request to get the series for a study in the list. An Image-Level C-FIND-RQ will be issued for the first series in the series list.
- Send a C-MOVE-RQ request to a Remote AE after successful association establishment. The DICOM Server AE's Storage SCP will receive the images over a separate association.

The DICOM Server AE waits for association requests from Remote AEs that wish to perform the following operations:

- *Verification*: If a C-ECHO-RQ message is received, the DICOM Server AE will send back a C-ECHO-RSP message with a status of "success".
- *Image Storage*: If a C-STORE-RQ message is received, the DICOM Server AE will receive the image and try to update the local database. If the image is stored successfully on storage media and the database updated a status of "success" will be returned in a C-STORE-RSP message.
- *Query*: If a C-FIND-RQ message is received the DICOM Server AE will search the database for the requested attributes and send back a C-FIND-RSP message containing a match and a status of "pending". After all matching records have been sent, a status of "success' will be returned in a C-FIND-RSP message. The Remote AE can terminate the query by sending a C-CANCEL-FIND-RQ message.
- *Retrieve*: If a C-MOVE-RQ message is received the DICOM Server AE will lookup its list of configured Remote AEs for the Destination AE. If the Destination AE is configured, the DICOM Server AE will open a new association to the Destination AE and use C-STORE-RQ to send the image(s). The DICOM Server AE will send a C-MOVE-RSP message with a status of "pending" after every five images are sent. When all images are sent or if DICOM Server AE receives a C-CANCEL-MOVE-RQ a final C-STORE-RSP will be sent back with an appropriate status.

2.1.3 Sequencing of Real-World Activities

Real-World Activity *Query Remote* must be performed before *Choose Pull Option* can be performed.

2.2 AE SPECIFICATIONS

2.2.1 DICOM Server AE Specification

This Application Entity provides Standard Conformance to the following DICOM v3.0 SOP Classes as an SCU:

SOP Class Name (SCU)	SOP Class UID
CT Image Information Storage	1.2.840.10008.5.1.4.1.1.2
MR Image Information Storage	1.2.840.10008.5.1.4.1.1.4
Secondary Capture image storage	1.2.840.10008.5.1.4.1.1.7
Standalone Overlay storage	1.2.840.10008.5.1.4.1.1.8
Study Root Query/Retrieve - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve - MOVE	1.2.840.10008.5.1.4.1.2.2.2

This Application Entity provides Standard Conformance to the following DICOM v3.0 SOP classes as an SCP:

SOP Class Name (SCP)	SOP Class UID
Verification (Echo)	1.2.840.10008.1.1
CT Information Storage	1.2.840.10008.5.1.4.1.1.2
MR Information Storage	1.2.840.10008.5.1.4.1.1.4
Secondary Capture image storage	1.2.840.10008.5.1.4.1.1.7
Standalone Overlay storage	1.2.840.10008.5.1.4.1.1.8
Study Root Query/Retrieve - FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve - MOVE	1.2.840.10008.5.1.4.1.2.2.2

2.2.1.1 Association Establishment Policy

2.2.1.1.1 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 association initiated by the DICOM Server AE is:

Maximum Length PDU	**10 kbytes**

SOP class Extended Negotiation is not supported.

The maximum number of Presentation Context Items that is supported is 60. 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 and,
- Implementation UID

2.2.1.1.2 Number of Associations

The DICOM Server AE (SCU) will initiate only one DICOM association at a time to perform an image store to a remote host or retrieve image(s) from a Remote AE.

The DICOM Server AE (SCP) can have a maximum of four DICOM associations open simultaneously to receive and store image or respond to an echo.

2.2.1.1.3 Asynchronous Nature

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

2.2.1.1.4 Implementation Identifying Information

The Implementation UID allows unique identification of a set of products that share the same implementation.

The Implementation UID for this GEMS Implementation is:

SIGNA HORIZON LX Implementation UID	1.2.840.113619.6.44

2.2.1.2 Association Initiation by Real-World Activity

This AE attempts to initiate a new association due to a “Push” operation initiated by the user. A new association is also initiated when the user performs a “Query Remote” operation or issues a retrieve operation by performing a “Get” operation at Study/Series/Image level.

2.2.1.2.1 Push Image(s) to Remote AE

2.2.1.2.1.1 Associated Real-World Activity

The operator must first select a destination by choosing “Select Remote Host” from the “Network” pull-down menu on the local database manager and then choose a hostname.

The “Push” operation will cause the DICOM server AE to initiate an Association when the operator selects one or more study, series, or images in the local database manager and then chooses either “Push Examination”, “Push Series”, or “Push Image” from the “Network” pull-down menu on the local database manager.

Note: If multiple study, series, or images are chosen to be pushed, one association will be established for each of the studies, series, or images. A single association for a single series will be used for the multiple C-STORE operations necessary for the images in the series.

2.2.1.2.1.2 Proposed Presentation Contexts

The following table shows the proposed presentation contexts for the DICOM Server AE after Real-World Activity “Push” Operation has been performed.

Table 2.2.1.2.1.2-1 Proposed Presentation Contexts for DICOM Server AE and Real-World activity Push Image(s)

Presentation Context Table - Proposal					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian JPEG Lossless Hierarchical First-Order Prediction	1.2.840.10008.1.2 1.2.840.10008.1.2.4.70	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian JPEG Lossless Hierarchical First-Order Prediction	1.2.840.10008.1.2 1.2.840.10008.1.2.4.70	SCU	None
Secondary Capture	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian JPEG Lossless Hierarchical First-Order Prediction	1.2.840.10008.1.2 1.2.840.10008.1.2.2.4.70	SCU	None
Stand-alone Overlay	1.2.840.10008.5.1.4.1.1.8	Implicit VR Little Endian JPEG Lossless Hierarchical First-Order Prediction	1.2.840.10008.1.2 1.2.840.10008.1.2.2.4.70	SCU	None
Study Root Query/Retrieve FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Study Root Query/Retrieve MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Note: Other Abstract Syntax and Transfer Syntax names may be offered when establishing an association. These are private syntaxes which may be ignored. See section 5.

2.2.1.2.1.2.1 SOP Specific Conformance Statement for Image Storage SOP Classes

This implementation can perform multiple C-STORE operations over a single association. A single association for a single series will be used for the multiple C-STORE operations necessary for the images in the series

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 any status that is not Success or Refused, this implementation will consider the current request to be a failure but will continue to attempt to send the remaining images in the request on the same association.

Each C-STORE operation supports an “Association Timer”. This timer starts when the association request is sent and stops when the association is established. The time-out is configurable in dcs.cfg as *bi_assoc_tio* and defaults to 30 seconds.

Each C-STORE operation also supports an “Operation Inactivity Timer”. This time-out starts once the first C-STORE request has been issued (on association) or received and is reset each time a C-STORE response has been received or when subsequent C-STORES are sent. This time-out is configurable in dcs.cfg as *bi_store_tio* and defaults to 90 seconds.

Each C-STORE operation also supports a “Session Timer”. This timer starts when the association is established and stops when the association is ended. This time-out is configurable in dcs.cfg as *bi_session_tio* and defaults to 60 minutes.

If any of the three timers mentioned above expires, the connection is closed and the operation in progress is considered failed.

When DICOM Server AE initiates an association to issue a C-STORE, one of the following two operations will be performed:
If the image is stored locally on the SIGNA HORIZON LX in DICOM format (“Dic” appears in the “Fmt” column at the exam level of the local database manager), the image will be transmitted by the DICOM Server AE with the same elements as was originally received or created locally (for the standard elements only).

If the image is stored locally on the SIGNA HORIZON LX in a non-DICOM Advantage format (“Adv appears in the “Fmt” field at the exam level of the local database manager), the image will be translated and then transmitted by the DICOM Server AE to the identical profiles specified by the CT Advantage

Conformance Statement for DICOM v3.0 (Direction 2118781) and the MR Signa Advantage Conformance Statement for DICOM v3.0 (Direction 2118782).

2.2.1.2.2 Query Remote AE

2.2.1.2.2.1 Associated Real-World Activity

The operator must first select a destination by choosing *"Select Remote Host"* from "*Network"* pull-down menu on the local database manager and then choose a hostname.

The *"Query"* operation will cause the DICOM Server AE to initiate an association to the selected Remote AE when the *"Query Remote Host"* entry is selected from the *"Network"* pull-down menu. Once a list of Study/Series/Image is retrieved, the operator can invoke the *"Pull"* operation by choosing *"Get Exam"* or *"Get Series"* or *"Get Image"* from the *"Network"* pull-down menu.

2.2.1.2.2.2 Proposed Presentation Contexts

When the Real-World activity *"Query"* or *"Pull"* is initiated all presentation contexts shown in table 2.2.1.2.1.2-1 are proposed during association establishment, but only the Query/Retrieve-FIND related contexts are applicable to this activity.

2.2.1.2.2.2.1 SOP Specific Conformance Statement for C-FIND SCU

After the *Query* operation is initiated, the DICOM Server AE will perform a study-root C-FIND-RQ request at each of the three levels (Study, Series, and Image) in succession. The Initial Study-Level request will ask for all studies in the Remote database.
The C-FIND SCU will not perform any extended negotiation and so will only perform hierarchical query.

Each C-FIND SCU operation supports an "Association Timer", "Operation Inactivity Timer" and "Session Timer" with time out values of 900 seconds, 900 seconds and 60 minutes respectively. These values are configurable in dcs.cfg.

If a "Cancel" or "Refused" status is returned from the Remote AE the association is closed and the operation terminated.

The DICOM Server AE will parse each matching C-FIND-RSP reply and ignore the entries that does not contain a valid DICOM data stream. No VR validation is performed whichmeans that syntax errors will be ignored.

Tables 2.2.1.2.2.2.1-1 - 2.2.1.2.2.2.1-3 shows the various fields that are requested at the Study, Series, and Image levels of the C-FIND request.

Table 2.2.1.2.2.2.1-1: Requested Study Level Keys

Description	Type	Tag	Value
Study date	R	0008,0020	Zero length
Study time	R	0008,0030	Zero length
Patient's name	R	0010,0010	Zero length
Study id	R	0020,0010	Zero length
Study Instance UID	U	0020,000D	Zero length
Study description	O	0008,1030	Zero length
Private Creator Indentification	P	0009,0010	GEMS_IDEN_01
Suite Id	P	0009,1002	Zero Length

Table 2.2.1.2.2.2.1-2: Requested Series Level Keys

Description	Type	Tag	Value
Modality	R	0008,0060	Zero length
Series number	R	0020,0011	Zero length
Series Instance UID	U	0020,000E	Series UID
Series description	O	0008,103E	Zero length
Manufacturer	O	0008,0070	Zero length
Images in series	O	0020,1002	Zero length

Table 2.2.1.2.2.2.1-3: Requested Image Level Keys

Description	Type	Tag	Value
Image number	R	0020,0013	Zero length
Image Instance UID	U	0008,0018	Image UID
Image type	O	0008,0008	Zero length
Rows	O	0028,0010	Zero length
Columns	O	0028,0011	Zero length
Image position	O	0020,0032	Zero length
Image orientation	O	0020,0037	Zero length
Slice thickness	O	0018,0050	Zero length
Slice spacing	O	0018,0088	Zero length
Gantry tilt	O	0018,1120	Zero length
Convolution kernel	O	0018,1210	Zero length
Reconstruction diameter	O	0018,1100	Zero length
Data collection diameter	O	0018,0090	Zero length
Flip angle	O	0018,1314	Zero length
Echo number	O	0018,0086	Zero length
Echo time	O	0018,0081	Zero length
Inversion time	O	0018,0082	Zero length
Repetition time	O	0018,0080	Zero length
Private Creator Identification	P	0019,0010	GEMS_ACQU_01
Dfov Rect	P	0019,101E	Zero Length
Midscan Time	P	0019,1024	Zero Length
Azimuth	P	0019,1026	Zero Length
Number of Echo	P	0019,107E	Zero Length
Private Creator Identification	P	0021,0010	GEMS_RELA_01
Scout Anref	P	0021,104A	Zero Length
Private Creator Identification	P	0027,0010	GEMS_IMAG_01
Location RAS	P	0027,1040	Zero Length
Location	P	0027,1041	Zero Length
Center R Coordinate	P	0027,1042	Zero Length
Center A Coordinate	P	0027,1043	Zero Length
Table Start Location	P	0027,1050	Zero Length
Table End Location	P	0027,1051	Zero Length
RAS Letter for Side of Image	P	0027,1052	Zero Length
RAS Letter for Anterior/Posterior	P	0027,1053	Zero Length
RAS Letter for Scout Start Location	P	0027,1054	Zero Length
RAS Letter for Scout End Location	P	0027,1055	Zero Length
Image Dimension X	P	0027,1060	Zero Length
Image Dimension Y	P	0027,1061	Zero Length

Note: In the above tables the type field has the following meaning:

R - Required
U - Unique
O - Optional
P - Private

2.2.1.2.3 Get Image(s) from Remote AE

2.2.1.2.3.1 Associated Real-World Activity

The operator must first select a destination by choosing *"Select Remote Host"* from "*Network"* pull-down menu on the local database manager and then choose a hostname. The operator then has to perform the Real-World activity *"Query"* to get a list of Study/Series/Image. Once the list of Study/Series/Image is retrieved, the operator can invoke the *"Get"* operation by choosing *"Get Exam"* or *"Get Series"* or *"Get Image"* from the *"Network"* pull-down menu.

2.2.1.2.3.2 Proposed Presentation Contexts

When the Real-World activity *"Get"* is initiated all presentation contexts shown in table 2.2.1.2.1.2-1 are proposed during association establishment, but only the Query/Retrieve-MOVE related contexts are applicable to this activity.

2.2.1.2.3.2.1 SOP Specific Conformance Statement for C-MOVE SCU

When the operator starts a *Get* operation at any level (Study, Series, Image) the DICOM Server AE will initiate a C-MOVE-RQ request to the Remote AE with the DICOM Server AE as the Destination AE. The Storage SCP will handle the incoming images as described in section 2.2.1.3.1.

Each C-MOVE SCU operation supports an "Association Timer", "Operation Inactivity Timer" and "Session Timer" with time out values of 90 seconds, 30 seconds and 60 minutes respectively. These time-outs are configurable in dcs.cfg as *bi_assoc_tio*, *bi_store_tio* and *bi_session*_tio respectively.

The DICOM Server AE will send a C-CANCEL-MOVE-RQ to the Remote AE if the operator *"Pauses"* or *"Clears"* the job from the local database manager Network queue.

2.2.1.3 Association Acceptance Policy

The DICOM Server AE places no limitations on who may connect to it.

When the DICOM Server AE accepts an association for image storage, it will receive any images transmitted on that association and store the images on disk.

It will also respond to queries from Remote AEs by sending matching entries. Any Remote AE can request and receive a list of images on the local database. The Remote AE must be configured in the local database manager's list of Remote AE for it to be able to retrieve images from DICOM Server AE.

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

2.2.1.3.1 Receive Image(s)

This AE is indefinitely listening for associations. No operator action is required to receive an image.

2.2.1.3.1.1 Associated Real-World Activity

The Real-World Activity associated with the Receive Image(s) operation is the storage of the image on the disk drive of theSIGNA HORIZON LX.

2.2.1.3.1.2 Presentation Context Table

Table 2.2.1.3.1.2-1: Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity

Receive Image(s)

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	JPEG Lossless Hierarchical First-Order Prediction	1.2.840.10008.1.2.4.70	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	JPEG Lossless Hierarchical First-Order Prediction	1.2.840.10008.1.2.4.70	SCP	None
Secondary Capture	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Secondary Capture	1.2.840.10008.5.1.4.1.1.7	JPEG Lossless Hierarchical First-Order Prediction	1.2.840.10008.1.2.2.4.70	SCP	None
Stand-alone Overlay	1.2.840.10008.5.1.4.1.1.8	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Stand-alone Overlay	1.2.840.10008.5.1.4.1.1.8	JPEG Lossless Hierarchical First-Order Prediction	1.2.840.10008.1.2.2.4.70	SCP	None

Note: The SCP does not have a default acceptance policy if more that one acceptable transfer syntaxes are proposed by the SCU. It is the responsibility of the SCU to make a selection from more than one transfer syntanxes accepted.

2.2.1.3.1.2.1 SOP Specific Conformance to Storage SOP Classes

The DICOM Server AE conforms to the SOP's of the Storage Service Class at level 1 (base). Private elements will be discarded from the image when receiving images containing non-GE private data elements.

Each C-STORE SCP operation supports an "Association Timer", "Operation Inactivity Timer" and "Session Timer" with time out values of 900 seconds, 900 seconds and 60 minutes respectively.

Image Reception

If the DICOM Server AE returns one of the following status codes, then the C-STORE operation was unsuccessful and no image will be installed:

- 0110 (Processing Failure) Indicates that an internal system call has failed while processing an image.
- A711 (Out of Resources) Indicates that probably there was not enough disk space to store the image. The user should attempt recovery by removing some images from the SIGNA HORIZON LX system.
- A712 (Out of Resources) Indicates that there was not enough resource (such as memory) to store the image.
- A800 (SOP Class not supported)

In the event of a successful C-STORE operation, the image has successfully been written to disk. The image will then be accessed in the same manner as any other image by the applications on the SIGNA HORIZON LX system.

Images may be deleted when instructed to do so by the user. Thus the duration of the storage of the image is determined by the users of the SIGNA HORIZON LX system.

Image Installation

If the image installation is unsuccessful, a message will appear in the Message Log informing the user of the failure and the image will be removed.

If the image installation process finds that an element is not encoded according to the DICOM standard, it will fail to install the image and the file will be removed.

Image Installation of GE Created MR or CT Images

Images that were originally created on recent GE MR and CT scanners will be converted from their native Advantage Proprietary Format to DICOM format for transmission. If the images are stored as full fidelity representations and are subsequently returned to recent GE scanners, then the images will be transformed back to Advantage Proprietary Format.

There is an assumption made by such GE scanners:

The private element (0009,1001) is used as the full fidelity flag. If this flag contains the string: “GE_GENESIS_FF” when received by a scanner, then it is assumed that the image object was originally a GE created image object and contains all private elements that it was sent with.

If full fidelity flag is present and not all the elements are sent back as sent (ie, not full fidelity) there are 2 possible actions:

1. the translator will do its best to convert the image and will use default values where DICOM fields are missing
2. If certain critical information is not provided then the image will be stored as a screen save

It is strongly suggested that if GE private element (0009,1001) is present then all GE private elements originally associated with the image be preserved.

Image Installation of non-GE Created MR or CT Images

Images received from non GE products are installed as appropriate image object without any of their private data elements. Also if some critical fields (mandatory) are missing, then the image will not be installed.

2.2.1.3.2 Verification Request from Remote AE

This AE is indefinitely listening for associations. No operator action is required to respond to a *verification* message.

2.2.1.3.2.1 Associated Real-World Activity

The Real-World Activity associated with the verification request is to send a C-ECHO response message with a status of “success” to the requesting AE.

2.2.1.3.2.2 Presentation Context Table

Table 2.2.1.3.2.2-1: Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity

Verification Request

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

2.2.1.3.2.2.1 SOP Specific Conformance to Verification SOP Class

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

Each ECHO operation supports an “Association Timer”, “Operation Inactivity Timer” and “Session Timer” with a time out values of 900 seconds, 30 seconds and 60 minutes respectively.

2.2.1.3.3 Query Request from Remote AE

This AE is indefinitely listening for associations. No operator action is required to respond to a *query* request.

2.2.1.3.3.1 Associated Real-World Activity

The Real-World Activity associated with the query request is to search the local database for entries that match the request and send a C-FIND response message with a status of “pending” for each matching entry.

2.2.1.3.3.2 Presentation Context Table

Table 2.2.1.3.1.2-1: Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity

Query Request

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.1.3.3.2.1 SOP Specific Conformance to C-FIND SCP

Each C-FIND SCP operation supports an “Association Timer”, “Operation Inactivity Timer” and “Session Timer” with a time out values of 900 seconds, 900 seconds and 60 minutes respectively.

All Required(R) and Unique(U) study, series, and image level keys for the Study-Root Query/Retrieve information model are supported. Some optional (O) keys are also supported as described in the following tables.

Table 2.2.1.3.3.2.1-1 Supported study level keys

Description	Type	Tag	Usage
Study date	R	0008,0020	Matched
Study time	R	0008,0030	Matched
Accession number	R	0008,0050	Matched
Patient’s name	R	0010,0010	Matched[1]
Patient id	R	0010,0020	Matched
Study id	R	0020,0010	Matched
Study Instance UID	U	0020,000D	Matched
Study description	O	0008,1030	Returned
Private Creator Identification	P	0009,0010	GEMS_IDEN_01
Suite Id	P	0009,1002	Returned

Table 2.2.1.3.3.2.1-2 Supported series level keys

Description	Type	Tag	Usage

[1] The local database does not store the different components of the patient’s name in separate fields so it is not possible to query for studies by last name or any other component.

Description	Type	Tag	Usage
Modality	R	0008,0060	Matched
Series number	R	0020,0011	Matched
Series Instance UID	U	0020,000E	Matched
Series description	O	0008,103E	Returned
Manufacturer	O	0008,0070	Returned
Images in series	O	0020,1002	Returned

Table 2.2.1.3.3.2.1-3 Supported image level keys

Description	Type	Tag	Usage
Image number	R	0020,0013	Matched
Image Instance UID	U	0008,0018	Matched
Image type	O	0008,0008	Returned
Rows	O	0028,0010	Returned
Columns	O	0028,0011	Returned
Image position	O	0020,0032	Returned
Image orientation	O	0020,0037	Returned
Slice thickness	O	0018,0050	Returned
Slice spacing	O	0018,0088	Returned
Gantry tilt	O	0018,1120	Returned
Convolution kernel	O	0018,1210	Returned
Reconstruction diameter	O	0018,1100	Returned
Data collection diameter	O	0018,0090	Returned
Flip angle	O	0018,1314	Returned
Echo number	O	0018,0086	Returned
Echo time	O	0018,0081	Returned
Inversion time	O	0018,0082	Returned
Repetition time	O	0018,0080	Returned
Trigger time	O	0018,1060	Returned
Private Creator Identification	P	0019,0010	GEMS_ACQU_01
Dfov Rect	P	0019,101E	Returned
Midscan Time	P	0019,1024	Returned
Azimuth	P	0019,1026	Returned
Number of Echo	P	0019,107E	Returned
Private Creator Identification	P	0021,0010	GEMS_RELA_01
Scout Anref	P	0021,104A	Returned
Private Creator Identification	P	0027,0010	GEMS_IMAG_01
Location RAS	P	0027,1040	Returned
Location	P	0027,1041	Returned
Center R Coordinate	P	0027,1042	Returned
Center A Coordinate	P	0027,1043	Returned
Table Start Location	P	0027,1050	Returned
Table End Location	P	0027,1051	Returned
RAS Letter for Side of Image	P	0027,1052	Returned
RAS Letter for Anterior/Posterior	P	0027,1053	Returned
RAS Letter for Scout Start Location	P	0027,1054	Returned
RAS Letter for Scout End Location	P	0027,1055	Returned
Image Dimension X	P	0027,1060	Returned
Image Dimension Y	P	0027,1061	Returned

Note: In the above tables the type field has the following meaning:
R - Required **U** - Unique **O** - Optional **P** - Private

Only keys with Usage type *Matched* will be matched against values in the database.

Values in keys of type *Returned* will be ignored and will be filled in with data from the database.

If an optional key is requested that does not appear in any of the tables above, that key will be ignored and no corresponding element will be returned.

If the database does not have a value corresponding to any requested optional key a zero-length element will be returned.

Except sequence matching all other matchings are supported.

Only hierarchical query is supported. Therefore, the C-FIND SCP will not perform any extended negotiation.

2.2.1.3.4 Retrieve Request From Remote AE

This AE is indefinitely listening for associations. No operator action is required to respond to a *retrieve* request.

2.2.1.3.4.1 Associated Real-World Activity

The Real-World Activity associated with the Retrieve Request is to send all images corresponding to the C-MOVE request to the destination AE through a separate association.

2.2.1.3.4.2 Presentation Context Table

Table 2.2.1.3.4.2-1: Acceptable Presentation Contexts for DICOM Server AE and Real-World Activity

Retrieve Request.

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Study Root Query/Retrieve MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.1.3.4.2.1 SOP Specific Conformance to C-MOVE SCP

The DICOM Server AE provides standard conformance to the baseline Study-root C-MOVE Service Class SCP.

Each C-MOVE SCP operation supports an “Association Timer”, “Operation Inactivity Timer” and “Session Timer” with a time out values of 90 seconds, 30 seconds and 60 minutes respectively. These time-outs are configurable in dcs.cfg as *bi_assoc_tio*, *bi_store_tio* and *bi_session*_tio respectively

All images requested in a C-MOVE-RQ will be sent over a single association. A C-MOVE-RSP with a “pending” status will be returned to the requester every five images.

The C-MOVE SCP will invoke C-STORE requests for the following SOP classes:

SOP Class Name	SOP Class UID
CT Image Information Storage	1.2.840.10008.5.1.4.1.1.2
MR Image Information Storage	1.2.840.10008.5.1.4.1.1.4
Secondary Capture image storage	1.2.840.10008.5.1.4.1.1.7
Standalone Overlay storage	1.2.840.10008.5.1.4.1.1.8

In addition to the C-MOVE response status values defined in DICOM V3.0 part 4 the following status values will be returned:

- C000 - Indicates that an error occurred while retrieving records from the local database.
- C001 - Indicates all other processing error.
- C011 - If the Destination AE returns a*“Storage Full”* condition this status will be returned. This status will only be sent if the Destination AE returns a status of A711 and is only applicable if the Destination AE is an SdC-based product.

2.2.1.3.4.3 Presentation Context Acceptance Criteria

No criterion.

2.2.1.3.4.4 Transfer Syntax Selection Policy

All protocols detailed above in the tables are supported. If multiple transfer syntaxes are proposed in the same presentation context, the first supported transfer syntax will be accepted.

2.3 COMMUNICATION PROFILES

2.3.1 Supported Communication Stacks (parts 8,9)

DICOM Upper Layer (Part 8) is supported using TCP/IP.

2.3.2 TCP/IP Stack

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

2.3.2.1 Physical Media Support

Ethernet v2.0, IEEE 802.3.

2.3.3 Point-to-Point Stack

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

2.4 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

2.4.1 Specialized Information Object Definition

Following is a list of additional private attributes defined for a standard MR IOD. For incoming third-party DICOM images the values in these elements are retained without modification.

(0008,0008) Value 3: MR Image IOD specific specializations
PROJECTION IMAGE
REFORMATTED
SCREEN SAVE
PROC
COMB

Value 4 : MR Image implementation specific
COLLAPSE
VASCULAR
IVI

Note: When converting a received DICOM IOD to Advantage format if element 8,8 does not contain any of the defined values the IOD will be converted to secondary capture IOD.

(0018,0022) Scan Options : Defined Terms
NONE
VASCTOF_GEMS
VASCPC_GEMS
CINE_GEMS
FAST_GEMS
IIC_GEMS
GRAPH_GEMS
IRP_GEMS
DEP_GEMS
CL_GEMS
SAT_GEMS
NPW
RT_GEMS
VB_GEMS
POMP_GEMS
VB_GEMS
EDR_GEMS
SEQ_GEMS
CS_GEMS
MP_GEMS
SQPIX_GEMS
MT_GEMS
EPI_GEMS
TRF_GEMS
RTR_GEMS
FT_GEMS
NF_GEMS
RAMP_RL_GEMS
RAMP_LR_GEMS
RAMP_AP_GEMS

RAMP_PA_GEMS
RAMP_SI_GEMS
RAMP_IS_GEMS
FC_FREQ_AX_GEMS
FC_SLICE_AX_GEMS
SS_GEMS
VASCANGIO_GEMS

Note: When converting a received DICOM IOD to Advantage format if element 18,22 does not contain any of the defined values the received data will be interpreted as having the value “NONE”.

2.4.2 Private SOP’s

ID/Net v2.0 Private IODs are based upon the April 1993 draft version of the DICOM v3.0. ID/Net v2.0 IODs are supported for backward compatibility.

Note: See the “ID/Net v2.0 Implementation Profiles” (Direction 46-269546G2) for definitions of Information Objects.

Presentation Context Table - Accepted / Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
GE Private DICOM MR Image Information Object (ID/Net v2.0 compatible)	1.2.840.113619.4.2	Implicit VR Little Endian	1.2.840.10008.1.2	Both	None
GE Private DICOM MR Image Information Object (ID/Net v2.0 compatible)	1.2.840.113619.4.2	Implicit VR Big Endian (GE Private)	1.2.840.113619.5.2	Both	None
GE Private DICOM CT Image Information Object (ID/Net v2.0 compatible)	1.2.840.113619.4.3	Implicit VR Little Endian	1.2.840.10008.1.2	Both	None
GE Private DICOM CT Image Information Object (ID/Net v2.0 compatible)	1.2.840.113619.4.3	Implicit VR Big Endian (GE Private)	1.2.840.113619.5.2	Both	None
GE Private DICOM Display Information Object (ID/Net v2.0 compatible)	1.2.840.113619.4.4	Implicit VR Little Endian	1.2.840.10008.1.2	Both	None
GE Private DICOM Display Information Object (ID/Net v2.0 compatible)	1.2.840.113619.4.4	Implicit VR Big Endian (GE Private)	1.2.840.113619.5.2	Both	None

2.4.3 Private Data Elements

Refer to ***Appendix B*** for a complete listing of private data elements used with this implementation.

2.5 CONFIGURATION

2.5.1 AE Title/Presentation Address Mapping

The SIGNA HORIZON LX system allows the user to “add”, “Remove”, or “Update the mapping of remote AE Titles to IP Addresses and Ports. These options can be selected from the “Remote Host Selection” menu displayed by choosing “Select Remote Host” from the “Network” pull-down menu from the local database manager.

2.5.2 Configurable Parameters

The following fields are configurable for the DICOM Server AE:

- Local AE Title (the machine hostname)
- Local IP Address
- Local IP Netmask
- Max PDU length
- Time-outs,which are set for all hosts, are configurable in dcs.cfg:

note: * denotes any SOP class (time in sec)

*Association time-out	- *bi_assoc_tio*
*Inactivity time-out	- *bi_store_tio*
*Session timeout	- *bi_session_tio*
*Move operation time-out	- *bi_move_tio*
*Find time-out	- *bi_find_tio*

Note: All configurations should be performed by a GE Field Service Engineer.

Note: The local port on which the SIGNA HORIZON LX system receives DICOM incoming TCP connections is port **4006**.

2.6 SUPPORT OF EXTENDED CHARACTER SETS

In addition to the DICOM default character set, *SIGNA HORIZON LX* supports the ISO IR 100 Latin alphabet #1 supplementary set for the purpose of interchange.

3 MEDIA STORAGE CONFORMANCE STATEMENT

3.0 Introduction

This Conformance Statement (CS) specifies theSIGNA HORIZON LX compliance to DICOM v3.0. It details the DICOM Service Classes and roles which are supported by this product in it's version8.1.

The SIGNA HORIZON LXproduct uses DICOM services to provide Media Storage Application Profile.

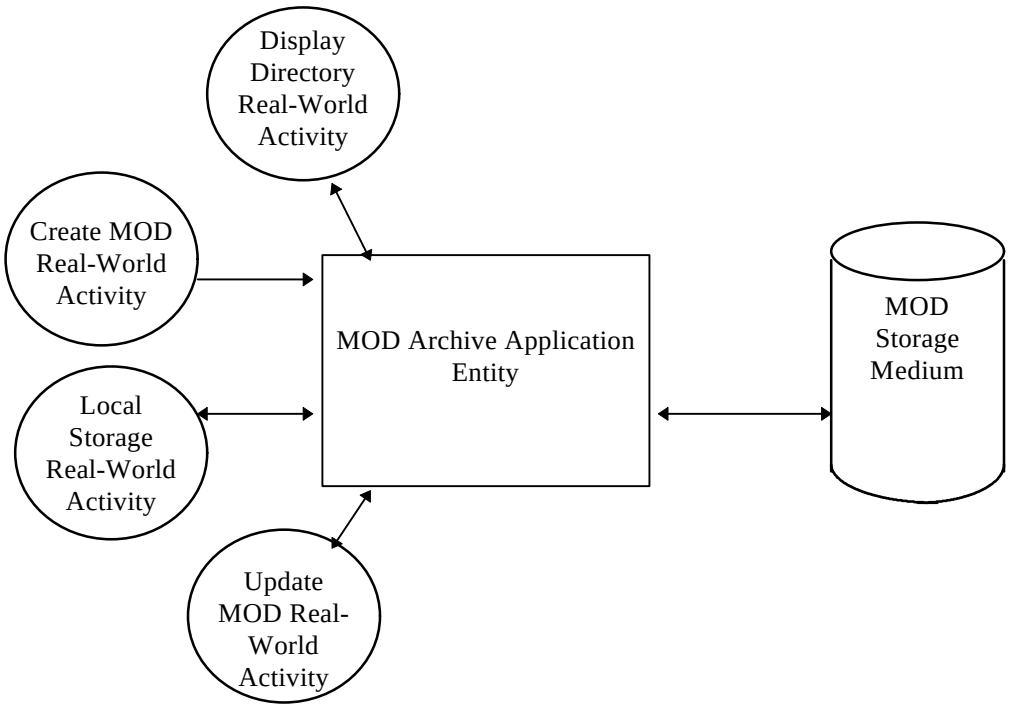
Note the format of this section follows the format of the DICOM Standard Part 2 (conformance) Annex A hence the paragraph numbering scheme. Please refer to that part of the standard while reading this section.

3.1 Implementation Model : MOD Archive Server

All DICOM functionality on the SIGNA HORIZON LX product is handled by the DICOM Server Application Entity (AE). The DICOM Server AE is commanded to perform DICOM services through the buttons and menu selections on the main user interface panel.

The MOD Archive Server creates and/or updates the 5 1/4 inch MOD media with various DICOM SOP instances. It can process CT, MR, Secondary Capture and Overlay IOD's.

3.1.1 Application Data Flow Diagram



The MOD Archive Server AE has a local storage that may contain various SOP instances. These may have been obtained by original creation, network (DICOM or proprietary) or by removable media using other application

entities. These instances are external to this conformance claim and the origin of SOP instances is outside the scope of this claim.

The MOD Archive Server AE can initialize Media by acting as an FSC to create a new DICOM File-set on 1.2GB MOD media. It initializes the DICOM File-set and writes the specified SOP instances onto the MOD. The SOP instances written will be limited to instances that match the criteria of one of the Application Profiles that is supported. When updating media, a pre-existing File-set will be updated with the selected SOP instances that match one of the supported Application Profiles

3.1.2 Functional Definitions of AE's

This Server has only one Application Entity: the MOD Archive Application

The MOD Archive Application can perform these functions:

- It can initialize (create DOS filesystem) a piece of media, writing a new label and DICOM File-set onto the media;
- It can update a piece of media by adding new SOP instances to an already existing DICOM File-set from local storage;
- It can display a directory listing of the File-set on a piece of media;
- It can copy SOP instance from the MOD onto local storage

3.1.3 Sequencing of Real World Activities

The updating function can only be performed on a piece of media that has already had a DICOM File-set created. There are no other sequencing requirements.

3.1.4 File Meta Information for Implementation Class and Version

Implementation Class UID = 1.2.840.113619.6.44
Implementation Version Name = <Software Release Build Version>

3.2 AE Specifications

3.2.1 MOD Archive Specification

The MOD Archive provides standard conformance to DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed in Table 3.1-1.

Table 3.1-1 : Application Profile, Activities and Roles for MOD Update

Application Profiles Supported	Real World Activity	Role	SC Option
PRI-CTMR-MOD12	Create MOD	FSC	Interchange

	Update MOD	FSU	Interchange
	Display Directory	FSR	Interchange
	Copy To Local Storage	FSR	Interchange

The MOD Archive Application will query the user before initializing media when a File-set is found on the media and an initialize operation has been requested.

3.2.1.1 File Meta Information for the Application Entity

The Source Application Entity Title is ***not*** set for the MOD Archive Application.

3.2.1.2 Real World Activities

3.2.1.2.1 Real World Activity: Create MOD Request

The MOD Archive Application acts as an FSC using the Interchange option when requested to initialize media.

The MOD Archive Application will label the media and take the user provided list of SOP instances eliminating any SOP instances on that list does not correspond to one of the Application Profiles in Table 3.1-1. These SOP instances are written to the media and a corresponding DICOMDIR is created. The determination of the potentially applicable Application Profile is dependent on the type of media and the associated software on which the AE has been invoked.

3.2.1.2.1.1 Application Profiles for the RWA: Create MOD

For the list of Application Profiles that invoke this AE for the Create MOD RWA, see Table 3.1-1. For extensions and specialization's see section 5.

3.2.1.2.2 Real World Activity: Display Directory

The MOD Archive Application acts as an FSR using the Interchange option when requested to provide a directory listing.

When an MOD update Application is requested to provide a directory listing it will read the File-set and display the DICOMDIR directory entries for those SOP instances in the File-set that correspond to the user selected Application Profile.

3.2.1.2.2.1 Application Profiles for the RWA: MOD Directory Listing

For the list of Application Profiles that invoke this AE for the MOD directory listing RWA, see Table 3.1-1. There are no extensions or specialization's.

3.2.1.2.3 Real World Activity: Copy to Local Storage

The MOD Archive Application acts as an FSR when copying from the MOD to local storage.

The MOD Archive Application will copy any SOP Instance selected from an MOD Directory list from the MOD to the local storage upon request. The MOD Directory listing Real-World Application will filter out the SOP Instances that do not match the Application Profile.

3.2.1.2.3.1 Application Profiles for the RWA: Copy to Local Storage

For the list of Application Profiles that invoke this AE for the MOD Copy to Local Storage RWA, see Table 3.1-1. For extensions and specialization's see section 5.

3.2.1.2.4 Real World Activity: Update MOD

The MOD Archive Application acts as an FSU using the Interchange option when requested to update an MOD.

The MOD Archive Application will take the selected list of SOP instances and eliminate any SOP instance that does not correspond to permissible SOP instances listed in the Application Profiles Table 3.1-1. The remaining SOP instances are written to the media that is found in the MOD Archive Application disk drive. The determination of the potentially applicable Application Profile is dependent on the type of media and associated software on which the AE has been invoked.

3.2.1.2.4.1 Application Profiles for the RWA: Update MOD Request

For the list of Application Profiles that invoke this AE for the MOD Copy to Local Storage RWA, see Table 3.1-1. For extensions and specialization's see section 5.

3.3 Augmented and Private Application Profiles

3.3.1 Private Application Profiles

The MOD Archive Server supports only one private Application Profile: PRI-CTMR-MOD12.

3.3.1.1 Class and Profile Identification

The Class of Application Profiles defined here is for Computed Tomography and Magnetic Resonance Imaging Clinical applications.

The identifier for this class is PRI-CTMR-MOD12.

The specific Application Profile in this class is shown in Table 3.3.1-1.

Table 3.3.1-1 : CTMR MOD Profiles

Application Profile	Identifier	Description
CT/MR Studies on MOD media	PRI-CTMR-MOD12	It handles single frame 12 or 16

		bit grayscale compressed/uncompressed images.

3.3.1.2 Clinical Contexts

This Application Profile facilitates the interchange of primary CT and MR images as well as processed CT and MR images as Secondary Capture and Standalone Overlay Images with certain defined attributes. CT, MR, SC and OV images may co-exist within the same File-set.

Typical interchanges would be between acquisition devices, archives and workstations within and between institutions.

3.3.1.2.1 Roles and Service Class Options

This Application Profile Class uses the Media Storage Service Class defined in PS3.4 with the Interchange Option.

The Application Entity shall support one or more roles of the File-set Creator, File-set Reader and File-set Updater defined in PS3.10.

3.3.1.2.1.1 File Set Creator

The Application Entity acting as a File-set Creator generates a File Set under the PRI-CTMR-MOD12 Application Profile Class. Typical entities using this role would include CT or MR equipment and archive systems which generate a patient record to transfer to another institution. File Set Creator shall be able to generate the Basic Directory SOP Class in the DICOMDIR File with all types of Directory Records related to the SOP Classes stored in the File-set.

FSC shall offer the ability to either finalize the disc at the completion of most recent write session (no additional information can be subsequently added to the disc) or to allow multi-session (additional information may be subsequently added to the volume).

3.3.1.2.1.2 File Set Reader

The role of File Set Reader is used by the Application Entities which receive a transferred File Set. Typical entities using this role would include display workstations and archive systems which receive a patient record transferred from another institution. File Set Readers shall be able to read all the SOP Classes defined for the specific Application Profile for which a Conformance Statement is made using all the defined Transfer Syntaxes.

3.3.1.2.1.3 File Set Updater

The role of File Set Updater is used by Application Entities which receive a transferred File Set and update it by the addition of information. Typical entities using this role would include analytic workstations which for instance may add to the File-set an information object containing a processed (e.g., edge-enhanced) image. File-

set Updaters do not have to read the images. File-set Updaters shall be able to generate one or more of the SOP Instances defined for the specific Application Profile for which a conformance statement is made and to read and update the DICOMDIR file.

FSU shall offer the ability to allow multi-session (additional information may be subsequently added to the volume) writes.

3.3.1.3 PRI-CTMR-MOD12 Class Profile

3.3.1.3.1 SOP Classes and Transfer Syntaxes

This class of Application Profiles is based on the Media Storage Service Class with the Interchange Option. (see PS3.4).

SOP Classes and corresponding Transfer Syntaxes supported by these Application Profiles are specified in the Table 3.3.3.1-1.

Table 3.3.3.1-1 : IOD's and Transfer Syntaxes for PRI-CTMR-MOD12

Information Object Definition	SOP Class UID	Transfer Syntax and UID	FSC Req.	FSR Req.	FSU Req.
Basic Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	M	M	M
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	O	M	O
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	JPEG Lossless Process Selection Value 14 1.2.840.10008.1.2.4.70	O	M	O
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	O	M	O
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	JPEG Lossless Process Selection Value 14 1.2.840.10008.1.2.4.70	O	M	O
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	O	M	O
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	JPEG Lossless Process Selection Value 14 1.2.840.10008.1.2.4.70	O	M	O
Standalone Overlay	1.2.840.10008.5.1.4.1.1.8	Explicit VR Big Endian Uncompressed 1.2.840.10008.1.2.2	O	O	O
Standalone Overlay	1.2.840.10008.5.1.4.1.1.8	JPEG Lossless Process Selection Value 14 1.2.840.10008.1.2.4.70	O	O	O

M : Mandatory
O : Optional

NOTE:
The MOD Archive Application chooses the JPEG Lossless compression (selection value 1) as the default transfer syntax for storing images on the media. But the transfer syntax is selectable on a per media basis at install time using a method defined by the Application.

3.3.1.3.2 Physical Media and Media Formats

The CT/MR Application Profiles in the PRI-CTMR-MOD12 require the 130mm 1.2GB Magneto-Optical Rewritable physical media with the PC File System as defined in PS3.12.

3.3.1.3.3 Logical Format

The PRI-CTMR-MOD12 Application profile media format conforms to the Logical Format specification in PS3.12. Table 3.3.3.3-1 defines the specific values used for this profile.

Table 3.3.3.3-1 : Boot Sector

Bytes(s)	Value	Description
00 - 02	0xEB3C90	Jump instruction to loader (NOPs)
03 - 10	“MSDOS4.0”	The formatting DOS (vendor specific)
11 - 12	0200H	512 bytes/sector
13	32	sectors/cluster
14-15	0001H	1 sector in boot record
16	02H	2 File Allocation Tables (FAT)
17 - 18	200H	512 root directory entries
19 - 20	0000H	Flag for more than 65536 sector/disk. Use offset 32 value
21	0xF8	Flag for disk type; F0H if not otherwise specified
22 - 23	143	sectors/FAT
24 - 25	31	sectors/track
26 - 27	1	side (head) per disk
28 - 31	00000000	0 reserved or hidden sectors
32 - 35	1163337	Total sector/disk. Varies from disk to disk
36 - 37	0000	Physical Drive number = 0
38	29H	Extended boot record signature = 41
39 - 42	*Date Stamp*	Volume serial number
43 - 53	“GEMS-DICOM”	
54 - 61	-	The file system label
62 - 509	-	Don’t care. Any contents acceptable
510 - 511	0xAA55	Signature flag

3.3.1.3.4 Directory Information in DICOMDIR

Conformant Application Entities shall include in the DICOMDIR File a Basic Directory IOD containing Directory Records at the Patient and subsidiary levels appropriate to the SOP Classes in the File-set. All DICOM files in the File-set incorporating SOP Instances defined for the specific Application Profile shall be referenced by the Directory Records.

Refer to *Appendix C* for a complete listing of all the optional modules and optional attributes used in the DICOMDIR definition. Please note that the mandatory attributes in each of the directory records as mentioned in Part 3 Addendum (Basic Directory Information Object Definition) are not listed in the appendix, but are supported by the implementation.

NOTE:
The modality attribute (0008,0060) in the DICOMDIR Series records should be CT/MR for Seconday Capture and Standalone Overlay SOP Class Images. Otherwise the SIGNA HORIZON LX DICOM media display browser will not list-up the series for contents rendering the retrieval to local storage impossible.

3.3.1.3.4.1 Additional Keys

None.

3.3.1.3.5 Other Parameters

This section defines other parameters common to all specific Application Profiles in the PRI-CTMR-MOD12 class which need to be specified in order to ensure interoperable information interchange.

3.3.1.3.5.1 Image Attribute Values

The attributes listed in Table 3.3.3.5.1-1 used within the CT/MR/SC/Standalone Overlay Image files, shall take the values specified.

Table 3.3.3.5.1-1: PRI-CTMR-MOD12 Required Image Attribute Values for CT and MR, SC and OV Images

Attribute	Tag	Value
Modality	(0008,0060)	CT/MR
Photometric Interpretation	(0028,0004)	MONOCHROME2
Bits Allocated	(0028,0100)	16
Bits Stored	(0028,0101)	16

Overlay data if present shall be encoded in Overlay Data (60XX,3000).

3.3.1.3.5.1.1 Attribute Value Precedence

None.

3.4 Extensions, Specialization's and Privatization's of SOP Classes and Transfer Syntaxes

3.4.1 Extensions, Specialization's and Privatization's of SOP Classes

The CT/MR SOP Class Images have definitions extended for Defined Terms and include GE specific Private Data elements. The following sections describe the details for these SOP classes.

3.4.1.1 SOP Specific Conformance Statement for CT SOP Class

Refer to ***section 2.4*** for standard extensions and ***Appendix B*** for private data elements.

3.4.1.2 SOP Specific Conformance Statement for MR SOP Class

Refer to ***section 2.4*** for standard extensions and ***Appendix B*** for private data elements.

3.4.2 Private Transfer Syntax Specification

None.

3.5 Configuration

The MOD Archive Application will have only 1.2GB drive installed.

Table 3.5-1 : Supported Profiles for various Drive Configurations

Disk Drive Installed	Profiles Supported
1.2GB-Only Drive	PRI-CTMR-MOD12

3.6 Support of Extended Character Sets

The MOD Archive Application will support copy of SOP instances containing the ISO IR 100 (Latin alphabet No. 1, supplementary set) and DICOM default character sets as defined in PS3.5.

4 PRINT SCU CONFORMANCE

4.0 Introduction

This Conformance Statement (CS) specifies theSIGNA HORIZON LX compliance to DICOM v3.0. It details the DICOM Service Classes and roles which are supported by this product in it's version8.1.

The SIGNA HORIZON LX product uses DICOM services to provide the DICOM Print SCU Application Profile. TheSIGNA HORIZON LX product uses DICOM Print SCU to print images on DICOM Compliant Printers.

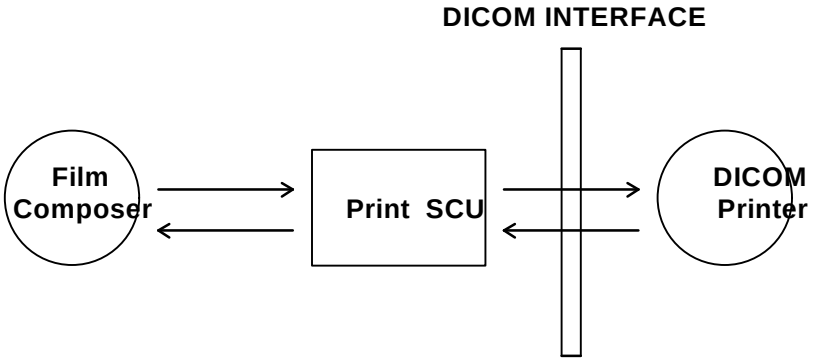
Note the format of this section follows the format of the DICOM Standard Part 2 (conformance) Annex A hence the paragraph numbering scheme. Please refer to that part of the standard while reading this section.

4.1 IMPLEMENTATION MODEL : PRINT SCU

The DICOM Print SCU is a DICOM print filter which provides the capability to print images to DICOM printers. The DICOM Print filter acts as an SCU of the DICOM print management SOP class.

4.1.1 Application Data Flow Diagram

DICOM print SCU Implementation model



Film Composer is the User interface and this is used to initiate the local real world activity. User issues the print request using Film Composer. Film composer allows printer selection and it composes the preformatted film file. This film file is interpreted by SCU and it sends the appropriate messages to DICOM print SCP running on DICOM printer.

4.1.2 Functional Definition of AE's

DICOM Print SCU Establishes the Association with requested printer to print the composed film.

4.1.3 Sequencing of Real-World Activities

- User has to select the DICOM printer from Film Composer Interface.
- The images to be printed shall be dragged and dropped into film composer slots from Viewing applications either manually or automatically.
- In case of manual drag and drop user has to press Print Button to print the images .
- The Print SCU will start the Print Session. The Print Session involves establishing association with printer followed by the next sequence of activities.
- The Print SCU gets the Printer status using N-GET service. If the Printer returns FAILURE status the print session will be terminated and the requester will be notified of the printer status.
- The film session is created using N-CREATE service. In case of error return the print session will be terminated. The attribute values for the Film session will be specified with the film session request.
- The film box is created using N-CREATE service. The print session will be terminated if the printer fails to create the film box. The film box attribute values will be sent in the film box create request.
- The image attributes for the images to be printed in this session will be set using the N-SET service. If the printer fails to accomodate the images in the image set to be printed the print session will be terminated.
- The film will be printed using the N-ACTION service. Only film box printing is supported. In case of error the print session will be terminated.
- Film box instance will be deleted using the N-DELETE service.
- The SCU does not wait for N-EVENT-REPORT from Printer after deleting the film box instance. The N-EVENT-REPORT received when the asssociation is still active are handled but the data received will be ignored.
- Finally the association will be terminated and if all the above operations are successful the requester will be notified of the successul print session. This just indicates the images to be printed have been successfully sent to the printer.

4.2 AE SPECIFICATIONS

4.2.1 DICOM Print SCU AE Specification

Print SCU provides Standard Conformance to the following DICOM 3.0 SOP classes as an SCU:

SOP CLASS name	SOP CLASS UID
Basic grayscale print management meta SOP class	**1.2.840.10008.5.1.1.9**
Print Job SOP class	**1.2.840.10008.5.1.1.14**

4.2.1.1 Association Establishment Policy

4.2.1.1.1 General

The Print SCU provides options to indicate the printer AE title, Printer host name. In this product these inputs are provided by Film Composer. Depending on these inputs the Print SCU will establish the association with the desired printer.

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 association initiated by the DICOM Print SCU AE is:

Maximum Length PDU	10 kbytes

4.2.1.1.2 Number of Associations

The Print SCU will initiate only one association with printer. This will not initiate any other associations while the current association is active.

4.2.1.1.3 Asynchronous Nature

The print SCU does not support asynchronous operations. All operations will be performed synchronously.

4.2.1.1.4 Implementation identifying information

The Implementation UID allows unique identification of a set of products that share the same implementation.

The Implementation UID for this ID/Net v3.0 Implementation is:

SIGNA HORIZON LX Implementation UID	1.2.840.113619.6.44

4.2.1.2 Association Establishment Policy

Print SCU initiates association with the Printer (which is running DICOM print SCP) provided as input to print SCU by film Composer.

4.2.1.2.1 Real World Activity

4.2.1.2.1.1 Associated Real-World Activity - "Print"

The Film Composer allows the user to select printers and it also allows the user to drag and drop the images (from viewer application) into the film. It also allows the user to manipulate some print parameters like film format and number of copies to print. When user presses the "Print" Button the Film composer communicates this request to Print SCU which then tries to establish the association with requested printer and sends the images for printing.

4.2.1.2.1.2 Proposed Presentation Contexts

The Proposed Presentation Context table for the Print SCU is as shown in following Table.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name**	**UID**		
Basic Grayscale Print Management SOP Class	**1.2.840.10008.5.1.1.9**	**DICOM Implict VRLittle Endian Transfer Syntax**	**1.2.840.10008.1.2**	**SCU**	**None**
Print Job SOP Class	**1.2.840.10008.5.1.1.14**	**DICOM Implicit VRLittle Endian Transfer Syntax**	**1.2.840.10008.1.2**	**SCU**	**None**

4.2.1.2.2 SOP Specific Conformance Statement

The Print SCU supports the following mandatory SOP classes which are defined under the Basic Grayscale Print Management Meta SOP Class.

Mandatory Print SOP Classes supported by Print SCU :

NAME	UID
Basic Film Session SOP Class	1.2.840.10008.5.1.1
Basic Film Box SOP Class	1.2.840.10008.5.1.2
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.4
Printer SOP Class	1.2.840.10008.5.1.16

The Print SCU does not support any optional SOP Classes.

4.2.1.2.2.1 Basic Film Session SOP Class

The Print SCU supports the following DIMSE Service Elements for the Basic Film Session SOP Class.

N-CREATE - Requests the Print SCP to create an instance of Basic Film Session.

The following Attribute values are supported.

Attribute	DICOM Tag	Default Value
* Number of Copies	(2000, 0010)	1
* Print Priority	(2000, 0020)	HIGH
* Medium Type	(2000, 0030)	CURRENT
* Film Destination	(2000, 0040)	CURRENT

If Failure status is returned during N-CREATE operation of Film session following action will be taken by Print SCU.
0x213 "Resource Limitation" message will be sent.
All other status "Failure" message will be sent.
In all the cases the print session will be terminated.

4.2.1.2.2.2 Basic Film box SOP Class

The Print SCU supports the following DIMSE Service Elements for the Basic Film Box SOP Class.

N-CREATE - Requests the Print SCP to create an instance of Film Box.
N-ACTION - Requests the Print SCP to print the Film Box onto Printer.
N-DELETE - Requests the Print SCP to delete the Film Box Instance.

The Following Attribute values are supported.

Attribute	DICOM Tag	Default Value
Image Display Format	(2010, 0010)	STANDARD/C,R C,R is Dependent
*Film Orientation	(2010, 0040)	PORTRAIT
*Magnification type	(2010, 0060)	BILINEAR
*Max Density	(2010, 0130)	4095
*Smoothing type	(2010, 0080)	0
*Border density	(2010, 0100)	BLACK
*Empty image density	(2010, 0110)	BLACK
*Min density	(2010, 0120)	0

*Trim	(2010, 0140)	NO

If Failure status is returned during N-CREATE operation of Film box following action will be taken by Print SCU.
0x213 "Resource Limitation" message will be sent.
0x106 "Unsupported Film Format" message will be sent.
All other status "Failure" message will be sent
In all the cases the print session will be terminated.

If Failure status is returned during N-ACTION operation of Film box following action will be taken by Print SCU.
0xC602 "Unable to Create Print Job" message will be sent.
All other status "Failure" message will be sent.
In all the cases the print session will be terminated.

If Failure status is returned during N-DELETE operation of Film box following action will be taken by Print SCU.
All the return status "Failure" message will be sent and the print session will be terminated.

4.2.1.2.2.3 Basic Grayscale Image Box SOP Class

The Print SCU supports the following DIMSE Service Elements for Grayscale Image Box SOP Class.

N-SET - Requests the Printer to set the image box attributes.

The Following Attribute values are supported.

Attribute	DICOM Tag	Default Value
*Polarity	(2020, 0020)	NORMAL
Image Position	(2020, 0010)	Dependent
Samples per pixel	(0028, 0002)	1
Photometric Interpretation	(0028, 0004)	MONOCHROME2
Rows	(0028, 0010)	Image Dependent
Columns	(0028, 0011)	Image Dependent
Pixel Aspect Ratio	(0028, 0034)	1/1
Bits Allocated	(0028, 0100)	Image Dependent
Bits Stored	(0028, 0101)	Image Dependent
High Bit	(0028, 0102)	Image Dependent
Pixel Representation	(0028, 0103)	1

If Failure status is returned during N-SET operation of Image Box following action will be taken by Print SCU.
0xC605 "Resources temporarily not available" message will be sent.
All other status "Failure" message will be sent.

In all the cases the print session will be terminated.

4.2.1.2.2.4 Printer SOP Class

N-GET and N-EVENT-REPORT DIMSE service elements are supported for Printer SOP Class. If N-EVENT-REPORT is received when association is still active, Print SCU handles all the relevant states but the data received is ignored.

Print SCU issues the request to retrieve following attributes for N-GET service.

If Printer returns Printer Status of FAILURE the association is terminated and the requester will be notified of the printer status. If the WARNING status is received the SCU will continue with the print session.

Optional Attribute	DICOM Tag	Default Value
*Printer Status	(2110, 0010)	Printer shall return Value
*Printer Status Info	(2110, 0020)	Printer shall return Value
*Printer Name	(2110, 0030)	Printer shall return Value
*Manufacturer	(0008, 0070)	Printer shall return Value
*Manufacturer Model Name	(0008, 1090)	Printer shall return Value
*Device Serial No.	(1800, 1000)	Printer shall return Value
*Software Versions	(1800, 1020)	Printer shall return Value
*Date Last Calibrated	(1800, 1200)	Printer shall return Value
*Time Last Calibrated	(1800, 1201)	Printer shall return Value

4.2.1.2.2.5 Print Job SOP Class

At present N-GET and N-EVENT-REPORT DIMSE Service Elements are not supported for Print Job Class.

Print SCU looks for following attributes in N-EVNET REPORT data received from Print SCP. If Print SCU does not receive N-EVENT_REPORT it requests the Print SCP to retrieve the following set of attributes.

Optional Attribute	DICOM Tag	Default Value
*Execution Status	(2100, 0020)	Printer shall return Value
*Execution Status info	(2100, 0030)	Printer shall return Value
*Print Priority	(2000, 0020)	Printer shall return Value
*Creation Date	(2100, 0040)	Printer shall return Value
*Creation Time	(2100, 0050)	Printer shall return Value
*Printer Name	(2110, 0030)	Printer shall return Value
*Originator	(2100, 0070)	Printer shall return Value

**** These are Optional Attributes supported by Print SCU.***

4.2.1.3 Association Acceptance Policy

The Print SCU does not accept associations.

4.3 COMMUNICATION PROFILES

4.3.1 Supported Communication Stacks (parts 8,9)

DICOM Upper Layer (Part 8) is supported using TCP/IP.

4.3.1.1 TCP/IP Stack

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

4.3.1.1.1 API

Not Applicable

4.3.1.1.2 Physical Media Support

Ethernet v2.0, IEEE 802.3.

4.4 Standard Extended/Specialised/Private SOPs

None.

4.5 Configuration

4.5.1 AE Title/Presentation Address Mapping

The Local AE title is "Print_SCU" .

The SIGNA HORIZON LX system allows the user to “add”, “Remove”, or “Update the mapping of remote DICOM Printer AE Titles to IP Addresses and Ports. These options can be selected from the “Remote Printer Selection” menu displayed by choosing “Configure” button from the Film Composer .

4.5.2 Configurable Parameters

The following fields are configurable for the DICOM Print SCU AE:

- Local IP Address
- Local IP Netmask
- Max PDU length
- Time-outs,which are set for all hosts, are configurable in dprint.cfg:
  *Association time-out - *bi_assoc_tio*
  *Session timeout - *bi_session_tio*
  *Create timeout - *bi_ncreate_tio*

Note: All configurations should be performed by a GE Field Service Engineer.

4.6 Support of Extended Character Set

The Print SCU does not support any Extended Character Set.

Appendix A Optional/Conditional Modules/Attributes

Enclosed is a listing of only the Optional/Conditional modules/attributes used by this implementation for CT/MR/SC and Standalone Overlay IOD's.

NOTE:
All other modules which are mandatory and attributes which are type 1 & 2 in nature per the DICOM standard are supported by this implementaion but are not explicitly listed here.

A.1 CT Specific IOD Definition

A.1.1 CT Image IOD Modules

IE	Module	Reference	Usage
Study	Patient Study	C.7.2.2 (DICOM PS3.3)	U
Image	Contrast Bolus	C.7.6.4 (DICOM PS3.3)	C

A.1.2 CT Image Module

Attribute Name	Tag	Type	Notes
Scan Options	(0018,0022)	3	
Date Collection Diameter	(0018,0090)	3	
Reconstruction Diameter	(0018,1100)	3	
Distance Source to	(0018,1110)	3	

Detector			
Distance Source to Patient	(0018,1111)	3	
Gantry / Detector Tilt	(0018,1120)	3	
Table Height	(0018,1130)	3	
Rotation Direction	(0018,1140)	3	
Exposure Time	(0018,1150)	3	
Xray Tube Current	(0018,1151)	3	
Exposure	(0018,1152)	3	
Filter Type	(0018,1160)	3	
Focal Spot	(0018,1190)	3	
Convolution Kernel	(0018,1210)	3	

A.2 MR Specific IOD Definition

A.2.1 MR Image IOD Modules

IE	Module	Reference	Usage
Study	Patient Study	C.7.2.2 (DICOM PS3.3)	U
Image	Contrast Bolus	C.7.6.4 (DICOM PS3.3)	C

A.2.2 MR Image Module

Attribute Name	Tag	Type	Notes
Trigger Time	(0018,1060)	2C	
Angio Flag	(0018,0025)	2C	
Number Of Averages	(0018,0083)	3	
Imaging Frequency	(0018,0084)	3	
Imaged Nucleaus	(0018,0085)	3	
Echo Number	(0018,0086)	3	
Magnetic Field Strength	(0018,0087)	3	
Spacing Between Slices	(0018,0088)	3	
Percent Sampling	(0018,0093)	3	
Percent Phase Field of View	(0018,0094)	3	
Pixel Bandwidth	(0018,0095)	3	
Nominal Interval	(0018,1062)	3	
Heart Rate	(0018,1088)	3	
Cardiac Number of Images	(0018,1090)	3	
Trigger Window	(0018,1094)	3	
Reconstruction Diameter	(0018,1100)	3	
Receiving Coil	(0018,1250)	3	
Transmitting Coil	(0018,1251)	3	
Acquisition Matrix	(0018,1310)	3	
Phase Encoding Direction	(0018,1312)	3	
Flip Angle	(0018,1314)	3	

Variable Flip Angle Flag	(0018,1315)	3	
SAR	(0018,1316)	3	
Temporal Resolution	(0020,0110)	3	

A.3 SC Specific IOD Definition

A.3.1 SC Image IOD Modules

IE	Module	Reference	Usage
Study	Patient Study	C.7.2.2 (DICOM PS3.3)	U
Equipment	General Equipment	C.7.5.1 (DICOM PS3.3)	U
Image	Overlay Plane	C.7.9.2 (DICOM PS3.3)	U

A.4 Stanalone Overlay Specific IOD Definition

A.4.1 Standalone Overlay Image IOD Modules

IE	Module	Reference	Usage
Study	Patient Study	C.7.2.2 (DICOM PS3.3)	U

A.5 CT/MR/SC/Standalone Overlay IOD Common Table Definitions

A.5.1 General Study Module

Attribute Name	Tag	Type	Notes
Study Description	(0008,1030)	3	
Name of Physician(s) Reading Study	(0008,1060)	3	

A.5.2 Patient Study Module

Attribute Name	Tag	Type	Notes
Patient's Age	(0010,1010)	3	
Patient's Weight	(0010,1030)	3	
Additional Patient's History	(0010,21b0)	3	

A.5.3 General Series Module

Attribute Name	Tag	Type	Notes
Laterality	(0020,0060)	2C	
Series Date	(008,0021)	3	
Series Time	(0008,0031)	3	
Performing Physicans' Name	(0008,1050)	3	
Protocol Name	(0008,1030)	3	
Series Description	(0008,103E)	3	
Operators Name	(0008,1070)	3	
Patient Position	(0018,5100)	2C	

A.5.4 General Equipment Module

Attribute Name	Tag	Type	Notes
Insitution Name	(0008,0080)	3	
Station Name	(0008,1010)	3	
Manufacturers Model Name	(0008,1090)	3	
Device Serial Number	(0018,1000)	3	
Software Versions	(0018,1020)	3	
Spatial Resolution	(0018,1050)	3	Only for CT/MR IOD's
Pixel Padding Value	(0028,0120)	3	Only for CT/MR IOD's

A.5.5 General Image Module

Attribute Name	Tag	Type	Notes
Image Date	(0008,0023)	2C	
Image Time	(0008,0033)	2C	
Image Type	(0008,0008)	3	
Acquisition Number	(0020,0012)	3	
Acquisition Date	(0008,0022)	3	
Acquisition Time	(0008,0032)	3	

A.5.6 Image Plane Module

Attribute Name	Tag	Type	Notes
Image Slice Location	(0020,1041)	3	

A.5.7 Contrast Bolus Module

Attribute Name	Tag	Type	Notes
Contrast/Bolus Route	(0018,1040)	2C	

A 5.8 SOP Common Module

Attribute Name	Tag	Type	Notes
Specific Character Set	(0008,0005)	1C	ISO_IR 100

A 5.9 Overlay Plane Module

Attribute Name	Tag	Type	Notes
Overlay Data	(60xx,3000)	1C	Only for SC & Standalone Overlay IOD Definitions

Appendix B Private Data Elements

Enclosed is a listing of private data elements used in this implementation for CT/MR Image IOD definition.

B.1 CT Image IOD Private Data Elements Definition

;
;Grp Elm VR VM Type Definition
;

0009	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_IDEN_01)**
0009	1001	LO	1	3	full fidelity
0009	1002	SH	1	3	suite id
0009	1004	SH	1	3	product id
0009	1027	SL	1	3	image actual date
0009	1030	SH	1	3	service id
0009	1031	SH	1	3	mobile location number
0009	10E3	UI	1	3	equipment UID
0009	10E6	SH	1	3	Genesis Version - now
0009	10E7	UL	1	3	Exam Record checksum
0009	10E9	SL	1	3	Actual series data time stamp
0011	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_PATI_01)**
0011	1010	SS	1	3	Patient Status
0019	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_ACQU_01)**
0019	1002	SL	1	3	number of cells I in Detector
0019	1003	DS	1	3	cell number at Theta
0019	1004	DS	1	3	cell spacing
0019	100F	DS	1	3	Horiz. frame of ref.
0019	1011	SS	1	3	series contrast
0019	1013	SS	1	3	start number for baseline
0019	1014	SS	1	3	end number for baseline
0019	1015	SS	1	3	start number for enhanced scans
0019	1016	SS	1	3	end number for enhanced scans
0019	1017	SS	1	3	series plane
0019	1018	LO	1	3	first scan ras
0019	1019	DS	1	3	first scan location
0019	101A	LO	1	3	last scan ras
0019	101B	DS	1	3	last scan loc
0019	101E	DS	1	3	display field of view
0019	1023	DS	1	3	table speed
0019	1024	DS	1	3	mid scan time
0019	1025	SS	1	3	mid scan flag
0019	1026	SL	1	3	degrees of azimuth
0019	1027	DS	1	3	gantry period
0019	102A	DS	1	3	X-Ray On position
0019	102B	DS	1	3	X-Ray Off position
0019	102C	SL	1	3	number of triggers
0019	102E	DS	1	3	angle of first view
0019	102F	DS	1	3	trigger frequency
0019	1039	SS	1	3	scan FOV type
0019	1040	SS	1	3	stat recon flag
0019	1041	SS	1	3	compute type
0019	1042	SS	1	3	segment number

0019	1043	SS	1	3	total segments requested
0019	1044	DS	1	3	interscan delay
0019	1047	SS	1	3	view compression factor
0019	104A	SS	1	3	total no. of ref channels
0019	104B	SL	1	3	data size for scan data
0019	1052	SS	1	3	recon post proc. flag
0019	1057	SS	1	3	CT water number
0019	1058	SS	1	3	CT bone number
0019	105E	SL	1	3	number of channels (1...512)
0019	105F	SL	1	3	increment between channels
0019	1060	SL	1	3	starting view
0019	1061	SL	1	3	number of views
0019	1062	SL	1	3	increment between views
0019	106A	SS	1	3	dependant on #views processed
0019	106B	SS	1	3	field of view in detector cells
0019	1070	SS	1	3	value of back projection button
0019	1071	SS	1	3	set if fatq estimates were used
0019	1072	DS	1	3	Z chan avg over views
0019	1073	DS	1	3	avg of left ref chans over views
0019	1074	DS	1	3	max left chan over views
0019	1075	DS	1	3	avg of right ref chans over views
0019	1076	DS	1	3	max right chan over views
0019	10DA	SS	1	3	reference channel used
0019	10DB	DS	1	3	back projector coefficient
0019	10DC	SS	1	3	primary spped correction used
0019	10DD	SS	1	3	overrange correction used
0019	10DE	DS	1	3	dynamic Z alpha value
0021	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_RELA_01)**
0021	1003	SS	1	3	Series from which Prescribed
0021	1005	SH	1	3	Genesis Version - now
0021	1007	UL	1	3	Series Record checksum
0021	1018	SH	1	3	Genesis version - Now
0021	1019	UL	1	3	Acqrecon record checksum
0021	1037	SS	1	3	Screen Format
0021	104A	LO	1	3	anatomical reference for scout
0021	1090	SS	1	3	tube focal spot position
0021	1091	SS	1	3	biopsy position
0021	1092	FL	1	3	biposy T location
0021	1093	FL	1	3	biopsy ref location
0023	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_STDY_01)**
0023	1070	FD	1	3	Start time(secs) in first axial
0023	1074	SL	1	3	No. of updates to header
0023	107D	SS	1	3	indicates if the study has complete info (DICOM/genesis)
0025	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_SERS_01)**
0025	1006	SS	1	3	Last pulse sequence used
0025	1007	SL	1	3	Images in Series
0025	1010	SL	1	3	Landmark Counter
0025	1011	SS	1	3	Number of Acqisitions
0025	1017	SL	1	3	Series Complete Flag
0025	1018	SL	1	3	Number of images archived
0025	1019	SL	1	3	Last image number used

0025	101A	SH	1	3	Primary Receiver Suite and Host
0027	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_IMAG_01)**
0027	1006	SL	1	3	Image archive flag
0027	1010	SS	1	3	Scout Type
0027	101C	SL	1	3	vma mamp
0027	101D	SS	1	3	vma phase
0027	101E	SL	1	3	vma mod
0027	101F	SL	1	3	vma clip
0027	1020	SS	1	3	smart scan ON/OFF flag
0027	1030	SH	1	3	Foreign Image Revision
0027	1035	SS	1	3	Plane Type
0027	1040	SH	1	3	RAS letter of image location
0027	1041	FL	1	3	Image location
0027	1042	FL	1	3	Center R coord of plane image
0027	1043	FL	1	3	Center A coord of plane image
0027	1044	FL	1	3	Center S coord of plane image
0027	1045	FL	1	3	Normal R coord
0027	1046	FL	1	3	Normal A coord
0027	1047	FL	1	3	Normal S coord
0027	1048	FL	1	3	R Coord of Top Right Corner
0027	1049	FL	1	3	A Coord of Top Right Corner
0027	104A	FL	1	3	S Coord of Top Right Corner
0027	104B	FL	1	3	R Coord of Bottom Right Corner
0027	104C	FL	1	3	A Coord of Bottom Right Corner
0027	104D	FL	1	3	S Coord of Bottom Right Corner
0027	1050	FL	1	3	table start location
0027	1051	FL	1	3	table end location
0027	1052	SH	1	3	RAS letter for side of image
0027	1053	SH	1	3	RAS letter for anterior/posterior
0027	1054	SH	1	3	RAS letter for scout start loc
0027	1055	SH	1	3	RAS letter for scout end loc
0029	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_IMPS_01)**
0029	1004	SL	1	3	Lower range of Pixels1
0029	1005	DS	1	3	Lower range of Pixels1
0029	1006	DS	1	3	Lower range of Pixels1
0029	1007	SL	1	3	Lower range of Pixels1
0029	1008	SH	1	3	Lower range of Pixels1
0029	1009	SH	1	3	Lower range of Pixels1
0029	100A	SS	1	3	Lower range of Pixels1
0029	1026	SS	1	3	version of the hdr struct
0029	1034	SL	1	3	advantage comp. overflow
0043	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_PARM_01)**
0043	1010	US	1	3	window value
0043	1011	US	1	3	total input views
0043	1012	SS	3	3	X-Ray chain
0043	1013	SS	5	3	decon kernel parameters
0043	1014	SS	3	3	calibration parameters
0043	1015	SS	3	3	total output views
0043	1016	SS	5	3	number of overranges
0043	1017	DS	1	3	IBH image scale factors
0043	1018	DS	3	3	BBH coefficients

0043	1019	SS	1	3	number of BBH chains to blend
0043	101A	SL	1	3	starting channel number
0043	101B	SS	1	3	Ppscan parameters
0043	101C	SS	1	3	GE image integrity
0043	101D	SS	1	3	Level value
0043	101E	DS	1	3	delta start time
0043	101F	SL	1	3	max overranges in a view
0043	1020	DS	1	3	avg overranges all views
0043	1021	SS	1	3	corrected after glow terms
0043	1025	SS	6	3	reference channels
0043	1026	US	6	3	no views ref chans blocked
0043	1027	SH	1	3	scan pitch ratio
0043	1028	OB	1	3	Unique image iden
0043	1029	OB	1	3	Histogram tables
0043	102A	OB	1	3	User defined data
0043	102B	SS	4	3	Private Scan Options
0043	1031	DS	2	3	RA cord of target recon centre
0043	1040	FL	4	3	trigger on position
0043	1041	FL	4	3	degree of rotation
0043	1042	SL	4	3	DAS trigger source
0043	1043	SL	4	3	DAS fpa gain
0043	1044	SL	4	3	DAS output source
0043	1045	SL	4	3	DAS ad input
0043	1046	SL	4	3	DAS cal mode
0043	1047	SL	4	3	DAS cal frequency
0043	1048	SL	4	3	DAS reg xm
0043	1049	SL	4	3	DAS auto zero
0043	104A	SS	4	3	starting channel of view
0043	104B	SL	4	3	DAS xm pattern
0043	104C	SS	4	3	TGGC trigger mode
0043	104D	FL	4	3	start scan to Xray on delay
0043	104E	FL	4	3	duration of xray on

B.2 MR Image IOD Private Data Elements Definition

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;Grp	Elm	VR	VM	Type	Definition
;					
0009	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_IDEN_01)**
0009	1001	LO	1	3	full fidelity
0009	1002	SH	1	3	suite id
0009	1004	SH	1	3	product id
0009	1027	SL	1	3	image actual date
0009	1030	SH	1	3	service id
0009	1031	SH	1	3	mobile location number
0009	10E3	UI	1	3	equipment UID
0009	10E6	SH	1	3	Genesis Version - now
0009	10E7	UL	1	3	Exam Record checksum
0009	10E9	SL	1	3	Actual series data time stamp
0011	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_PATI_01)**
0011	1010	SS	1	3	Patient Status
0019	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_ACQU_01)**
0019	100F	DS	1	3	Horiz. frame of ref.

0019	1011	SS	1	3	series contrast
0019	1012	SS	1	3	last pseq
0019	1017	SS	1	3	series plane
0019	1018	LO	1	3	first scan ras
0019	1019	DS	1	3	first scan location
0019	101A	LO	1	3	last scan ras
0019	101B	DS	1	3	last scan loc
0019	101E	DS	1	3	display field of view
0019	105A	FL	1	3	Acquisition Duration
0019	107D	DS	1	3	Second echo
0019	107E	SS	1	3	number of echos
0019	107F	DS	1	3	table delta
0019	1081	SS	1	3	contiguous
0019	1084	DS	1	3	peak SAR
0019	1085	SS	1	3	monitor SAR
0019	1087	DS	1	3	Cardiac repetition time
0019	1088	SS	1	3	images per cardiac cycle
0019	108A	SS	1	3	actual receive gain analog
0019	108B	SS	1	3	actual receive gain digital
0019	108D	DS	1	3	delay after trigger
0019	108F	SS	1	3	swappf
0019	1090	SS	1	3	Pause Interval
0019	1091	DS	1	3	Pulse Time
0019	1092	SL	1	3	Slice offset on freq axis
0019	1093	DS	1	3	Center Frequency
0019	1094	SS	1	3	Transmit Gain
0019	1095	SS	1	3	analog receiver gain
0019	1096	SS	1	3	digital receiver gain
0019	1097	SL	1	3	Bitmap defining CVs
0019	1098	SS	1	3	Center freq. Method
0019	109B	SS	1	3	Pulse seq. mode
0019	109C	LO	1	3	pulse seq. name
0019	109D	DT	1	3	pulse seq. date
0019	109E	LO	1	3	internal pulse seq. name
0019	109F	SS	1	3	Transmitting coil
0019	10A0	SS	1	3	Surface Coil Type
0019	10A1	SS	1	3	Extremity Coil flag
0019	10A2	SL	1	3	raw data run number
0019	10A3	UL	1	3	Calibrated Field strength
0019	10A4	SS	1	3	SAT fat/water/bone
0019	10A5	DS	1	3	receive bandwidth
0019	10A7	DS	1	3	user data
0019	10A8	DS	1	3	user data
0019	10A9	DS	1	3	user data
0019	10AA	DS	1	3	user data
0019	10AB	DS	1	3	user data
0019	10AC	DS	1	3	user data
0019	10AD	DS	1	3	user data
0019	10AE	DS	1	3	user data
0019	10AF	DS	1	3	user data
0019	10B0	DS	1	3	user data
0019	10B1	DS	1	3	user data
0019	10B2	DS	1	3	user data
0019	10B3	DS	1	3	user data

0019	10B4	DS	1	3	user data
0019	10B5	DS	1	3	user data
0019	10B6	DS	1	3	user data
0019	10B7	DS	1	3	user data
0019	10B8	DS	1	3	user data
0019	10B9	DS	1	3	user data
0019	10BA	DS	1	3	user data
0019	10BB	DS	1	3	user data
0019	10BC	DS	1	3	user data
0019	10BD	DS	1	3	user data
0019	10BE	DS	1	3	projection angle
0019	10C0	SS	1	3	saturation planes
0019	10C1	SS	1	3	surface coil intensity
0019	10C2	SS	1	3	SAT location R
0019	10C3	SS	1	3	SAT location L
0019	10C4	SS	1	3	SAT location A
0019	10C5	SS	1	3	SAT location P
0019	10C6	SS	1	3	SAT location H
0019	10C7	SS	1	3	SAT location F
0019	10C8	SS	1	3	SAT thickness R/L
0019	10C9	SS	1	3	SAT thickness A/P
0019	10CA	SS	1	3	SAT thickness H/F
0019	10CB	SS	1	3	prescribed flow axis
0019	10CC	SS	1	3	velocity encoding
0019	10CD	SS	1	3	thickness disclaimer
0019	10CE	SS	1	3	prescan type
0019	10CF	SS	1	3	prescan status
0019	10D0	SH	1	3	raw data type
0019	10D2	SS	1	3	Projection Algorithm
0019	10D3	SH	1	3	projection algorithm
0019	10D5	SS	1	3	fractional echo
0019	10D6	SS	1	3	prep pulse
0019	10D7	SS	1	3	cardiac phases
0019	10D8	SS	1	3	variable echoflag
0019	10D9	DS	1	3	concatenated SAT
0019	10DF	DS	1	3	user data
0019	10E0	DS	1	3	user data
0019	10E2	DS	1	3	Velocity Encode Scale
0019	10F2	SS	1	3	fast phases
0019	10F9	DS	1	3	transmission gain
0021	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_RELA_01)**
0021	1003	SS	1	3	Series from which Prescribed
0021	1005	SH	1	3	Genesis Version - now
0021	1007	UL	1	3	Series Record checksum
0021	1018	SH	1	3	Genesis version - Now
0021	1019	UL	1	3	Acq recon record checksum
0021	1020	DS	1	3	Table start location
0021	1035	SS	1	3	Series from which prescribed
0021	1036	SS	1	3	image from which prescribed
0021	1037	SS	1	3	Screen Format
0021	104F	SS	1	3	locations in acquisition
0021	1050	SS	1	3	graphically prescribed
0021	1051	DS	1	3	rotation from source x rot

0021	1052	DS	1	3	rotation from source y rot
0021	1053	DS	1	3	rotation from source z rot
0021	1054	SH	3	3	image position
0021	1055	SH	6	3	image orientation
0021	1056	SL	1	3	integer slop
0021	1057	SL	1	3	integer slop
0021	1058	SL	1	3	integer slop
0021	1059	SL	1	3	integer slop
0021	105A	SL	1	3	integer slop
0021	105B	DS	1	3	float slop
0021	105C	DS	1	3	float slop
0021	105D	DS	1	3	float slop
0021	105E	DS	1	3	float slop
0021	105F	DS	1	3	float slop
0021	1081	DS	1	3	auto window/level alpha
0021	1082	DS	1	3	auto window/level beta
0021	1083	DS	1	3	auto window/level window
0021	1084	DS	1	3	to window/level level
0023	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_STDY_01)**
0023	1001	SL	1	3	Number of series in Study
0023	1002	SL	1	3	Number of unarchived Series
0023	1010	SS	1	3	reference image field
0023	1050	SS	1	3	summary image
0023	1070	FD	1	3	Start time(secs) in first axial
0023	1074	SL	1	3	No. of updates to header
0023	107D	SS	1	3	indicates if study has complete info (DICOM/genesis)
0025	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_SERS_01)**
0025	1006	SS	1	3	Last pulse sequence used
0025	1007	SL	1	3	Images in Series
0025	1010	SL	1	3	Landmark Counter
0025	1011	SS	1	3	Number of Acquisitions
0025	1014	SL	1	3	indicates no. of updates to header
0025	1017	SL	1	3	Series Complete Flag
0025	1018	SL	1	3	Number of images archived
0025	1019	SL	1	3	Last image number used
0025	101A	SH	1	3	Primary Receiver Suite and Host
0027	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_IMAG_01)**
0027	1006	SL	1	3	Image archive flag
0027	1010	SS	1	3	Scout Type
0027	1030	SH	1	3	Foreign Image Revision
0027	1031	SS	1	3	Imaging Mode
0027	1032	SS	1	3	Pulse Sequence
0027	1033	SL	1	3	Imaging Options
0027	1035	SS	1	3	Plane Type
0027	1036	SL	1	3	Oblique Plane
0027	1040	SH	1	3	RAS letter of image location
0027	1041	FL	1	3	Image location
0027	1042	FL	1	3	Center R coord of plane image
0027	1043	FL	1	3	Center A coord of plane image
0027	1044	FL	1	3	Center S coord of plane image
0027	1045	FL	1	3	Normal R coord

0027	1046	FL	1	3	Normal A coord
0027	1047	FL	1	3	Normal S coord
0027	1048	FL	1	3	R Coord of Top Right Corner
0027	1049	FL	1	3	A Coord of Top Right Corner
0027	104A	FL	1	3	S Coord of Top Right Corner
0027	104B	FL	1	3	R Coord of Bottom Right Corner
0027	104C	FL	1	3	A Coord of Bottom Right Corner
0027	104D	FL	1	3	S Coord of Bottom Right Corner
0027	1060	FL	1	3	Image dimension - X
0027	1061	FL	1	3	Image dimension - Y
0027	1062	FL	1	3	Number of Excitations
0029	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_IMPS_01)**
0029	1015	SL	1	3	Lower range of Pixels1
0029	1016	SL	1	3	Lower range of Pixels1
0029	1017	SL	1	3	Lower range of Pixels2
0029	1018	SL	1	3	Upper range of Pixels2
0029	101A	SL	1	3	Len of tot hdr in bytes
0029	1026	SS	1	3	version of the hdr struct
0029	1034	SL	1	3	advantage comp. overflow
0029	1035	SL	1	3	advantage comp. underflow
0043	**0010**	**LO**	**1**	**3**	**Private Creator Identification (GEMS_PARM_01)**
0043	1001	SS	1	3	bitmap of prescan options
0043	1002	SS	1	3	gradient offset in X
0043	1003	SS	1	3	gradient offset in Y
0043	1004	SS	1	3	gradient offset in Z
0043	1005	SS	1	3	img is original or unoriginal
0043	1006	SS	1	3	number of EPI shots
0043	1007	SS	1	3	views per segment
0043	1008	SS	1	3	respiratory rate,bpm
0043	1009	SS	1	3	respiratory trigger point
0043	100A	SS	1	3	type of receiver used
0043	100B	DS	1	3	peak rate of change of gradient field
0043	100C	DS	1	3	limits in units of percent
0043	100D	DS	1	3	PSD estimated limit
0043	100E	DS	1	3	PSD estimated limit in tesla per second
0043	100F	DS	1	3	saravghead
0043	1010	US	1	3	Window value
0043	101C	SS	1	3	GE image integrity
0043	101D	SS	1	3	Level value
0043	1028	OB	1	3	Unique image iden
0043	1029	OB	1	3	Histogram tables
0043	102A	OB	1	3	User defined data
0043	102B	SS	4	3	Private Scan Options
0043	102C	SS	1	3	Effective echo spacing
0043	102D	SH	1	3	String slop field 1
0043	102E	SH	1	3	String slop field 2
0043	102F	SS	1	3	Raw data type
0043	1030	SS	1	3	Raw data type
0043	1031	DS	2	3	RA cord of target recon centre
0043	1032	SS	1	3	Raw data type
0043	1033	FL	1	3	neg_scanspacing
0043	1034	IS	1	3	Offset Frequency

0043	1035	UL	1	3	User_usage_tag
0043	1036	UL	1	3	User_fill_map_MSW
0043	1037	UL	1	3	User_fill_map_LSW
0043	1038	FL	24	3	User25...User48
0043	1039	IS	4	3	slop_int_6... slop_int_9

Appendix C DICOMDIR Directory Information

C.1 DICOMDIR Directory Information

Enclosed here is a listing of only the optional (conditional) modules and optional attributes used by this implementation in the DICOMDIR definition. All standard attributes as defined in Part 3 Addendum (Basic Directory Information Object) are supported by this implmentation but not listed here.

C.1.1 Basic Directory IOD Definition

Module	Reference	Usage	Notes
Directory Information	B.X.3.2.1 (DICOM PS3.10)	U	

C.1.2 Directory Information Module

Attribute Name	Tag	Type	Notes
Offset of the Next Directory Record	(0004,1400)	1C	
Record In-use Flag	(0004,1410)	1C	
Offset of Referenced Lower-Level Directory Entity	(0004,1420)	1C	
Directory Record Type	(0004,1430)	1C	PATIENT, STUDY, SERIES and IMAGE
Referenced File ID	(0004,1500)	1C	Present only in IMAGE Directory Record
Referenced SOP Class UID in file	(0004,1510)	1C	Present only in IMAGE Directory Record
Referenced SOP Instance UID in File	(0004,1511)	1C	Present only in IMAGE Directory Record
Referenced Transfer Syntax UID in File	(0004,1512)	1C	Present only in IMAGE Directory Record

C.1.3 Directory Record Selection Keys

As indicated in table C.1.2, the PRI-CTMR-MOD12 application profile will have only the Patient, Study, Series and Image directory record types. Given below are the list of attributes supported under each of these directories.

C.1.3.1 Patient Keys

Attribute Name	Tag	Type	Notes
Specific Character Set	(0008,0005)	1C	ISO_IR 100

C.1.3.2 Study Keys

Attribute Name	Tag	Type	Notes
Specific Character Set	(0008,0005)	1C	ISO_IR 100

C.1.3.3 Series Keys

Attribute Name	Tag	Type	Notes
Specific Character Set	(0008,0005)	1C	ISO_IR 100

Image Type	(0008,0008)	3	
Manufacturer's Id	(0008,0070)	3	
Series Description	(0008,103E)	3	
Manuf. Model Name	(0008,1090)	3	

C.1.3.4 Image Keys

Attribute Name	**Tag**	**Type**	**Notes**
Specific Character Set	(0008,0005)	1C	ISO_IR 100
SOP Instance UID	(0008,0018)	3	
Sequence Variant	(0018,0021)	3	
Slice Thickness	(0018,0050)	3	
Repetition Time	(0018,0080)	3	
Echo Time	(0018,0081)	3	
Inversion Time	(0018,0082)	3	
Number of Averages	(0018,0083)	3	
Echo Number	(0018,0086)	3	
Spacing Between Slices	(0018,0088)	3	
Data Collection Diameter	(0018,0090)	3	
Contrast/Bolus Route	(0018,1040)	3	
Trigger Time	(0018,1060)	3	
Reconstruction Diameter	(0018,1100)	3	
Gantry/Detector Tilt	(0018,1120)	3	
Convolution Kernel	(0018,1210)	3	
Flip Angle	(0018,1314)	3	
Image Number	(0020,0013)	1	
Image Position (Patient)	(0020,0032)	3	
Image Orientation (Patient)	(0020,0037)	3	
Slice Location	(0020,1041)	3	
Rows	(0028,0010)	3	
Columns	(0028,0011)	3	
Pixel Spacing	(0028,0030)	3	