GE Medical Systems

Technical Publications

Direction 2174981
Revision 1.0

SIGNA PROFILE CONFORMANCE STATEMENT

for DICOM v3.0 (ID/Net 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, *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.

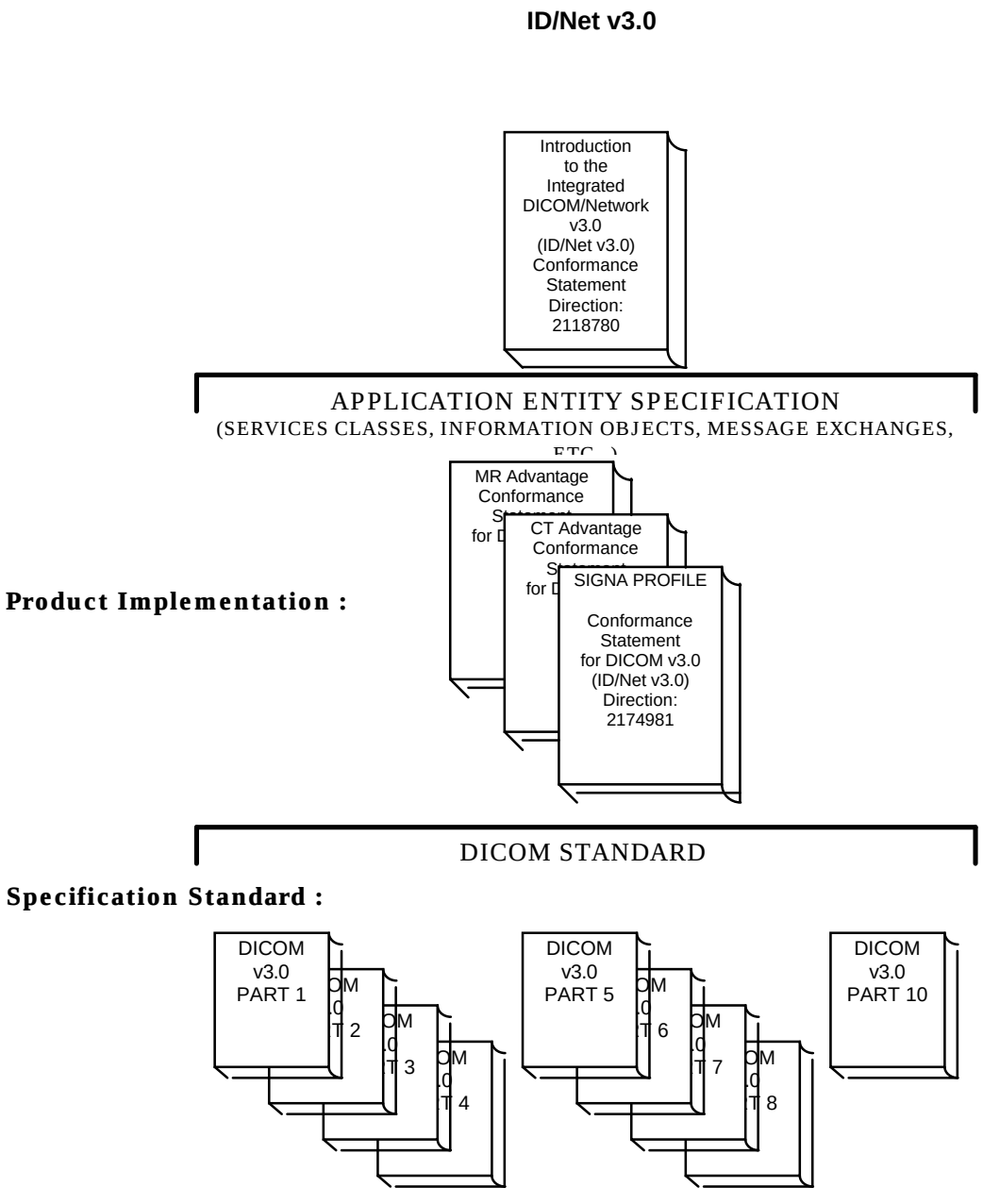
Section 3, MOD Archive Conformance, is the DICOM v3.0 Conformance Statement related to Media Storage Application Profile.

1.1

Overall Conformance Statement Documentation Structure

The documentation structure of the ID/Net v3.0 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 PROFILE. It is entitled:

SIGNA PROFILE
Conformance Statement for DICOM v3.0 (ID/Net v3.0)
Direction 2174981

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 ID/Net v3.0 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:

ACR-NEMA Representative
NEMA
1300 N. 17th Street, Suite 1847
Rosslyn, VA 22209 USA

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 GE ID/Net v3.0 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 GE ID/Net v3.0 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 GE ID/Net v3.0 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. ID/Net v3.0 is based on DICOM v3.0 as specified in each ID/Net DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM v3.0. In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these ID/Net DICOM Conformance Statements. The **user** should ensure that any non-GE provider, which connects with GE devices, also plans 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 - CONFORMANCE STATEMENT

2.0 INTRODUCTION

This Conformance Statement (CS) specifies the SIGNA PROFILE compliance to DICOM v3.0. It details the DICOM Service Classes and roles which are supported by this product in it's version 7.2.

The SIGNA PROFILE 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.

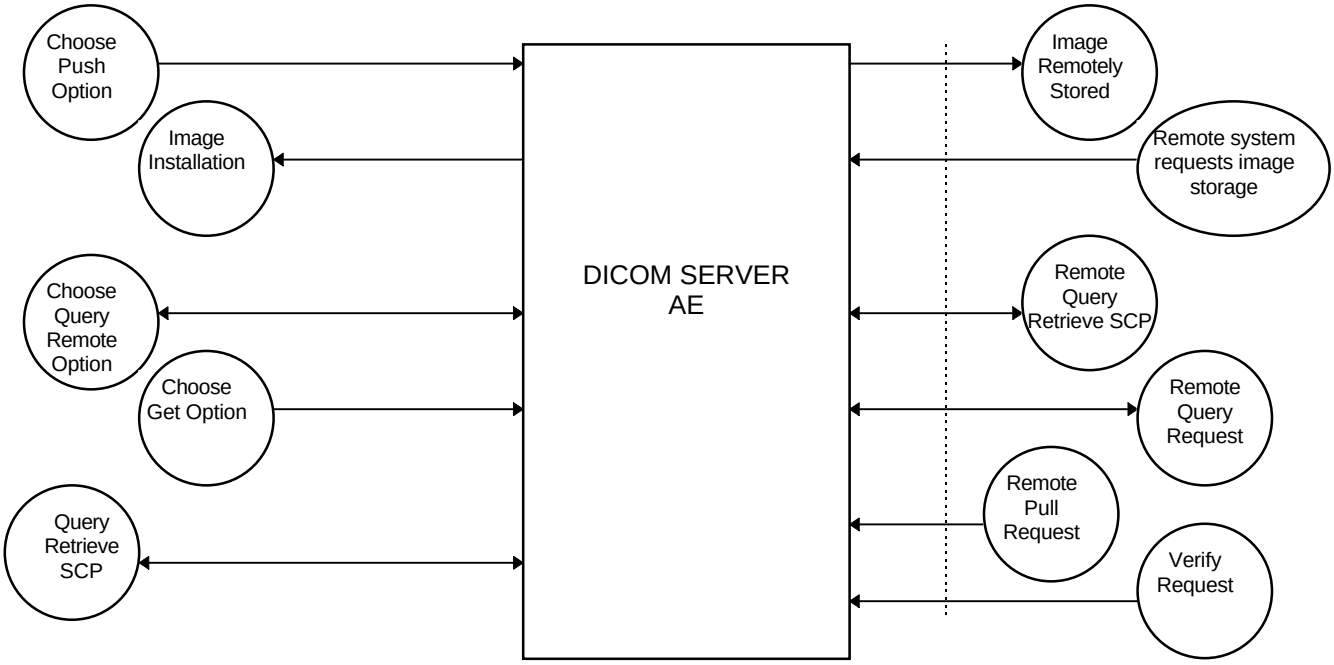
Note the format of this section follows the format of the DICOM Standard Part 2 (conformance) Annex A hence the paragraph numbering scheme. Please refer to that part of the standard while reading this section.

2.1 IMPLEMENTATION MODEL

All DICOM functionality on the SIGNA PROFILE 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 the SIGNA PROFILE 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 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

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 store 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 ID/Net v3.0 Implementation is:

SIGNA PROFILE Implementation UID	1.2.840.113619.6.46

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.

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	1.2.840.10008.1.2	SCU	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	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	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	SCU	None
Secondary Capture	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	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	SCU	None
Stand-alone Overlay	1.2.840.10008.5.1.4.1.1.8	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	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	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.

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 or received and stops when the association is established. The time-out is 900 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 900 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 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 PROFILE 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 PROFILE 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.

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 it fails to parse.

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[1]	0009,00xx	GEMS_IDEN_01
Suite Id	P[2]	0009,xx02	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

[1] Private data element

[2] Private data element

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
Trigger time	O	0018,1060	Zero length
Dfov Rect	P	0019,001E	Zero Length
Midscan Time	P	0019,0024	Zero Length
Azimuth	P	0019,0026	Zero Length
Number of Echo	P	0019,007E	Zero Length
Scout Anref	P	0021,004A	Zero Length
Location RAS	P	0027,0040	Zero Length
Location	P	0027,0041	Zero Length
Center R Coordinate	P	0027,0042	Zero Length
Center A Coordinate	P	0027,0043	Zero Length
Table Start Location	P	0027,0050	Zero Length
Table End Location	P	0027,0051	Zero Length
RAS Letter for Side of Image	P	0027,0052	Zero Length
RAS Letter for Anterior/Posterior	P	0027,0053	Zero Length
RAS Letter for Scout Start Location	P	0027,0054	Zero Length
RAS Letter for Scout End Location	P	0027,0055	Zero Length
Image Dimension X	P	0027,0060	Zero Length
Image Dimension Y	P	0027,0061	Zero Length

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 2.1.3.1.

Each C-MOVE SCU operation supports an "Association Timer", "Operation Inactivity Timer" and "Session Timer" with time out values of 900 seconds, 300 seconds and 60 minutes 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 the SIGNA PROFILE.

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

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 PROFILE 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 PROFILE 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 PROFILE 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,xx01) 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 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,xx01) is present then all GE private elements originally associated with the image be preserved.

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.

2.3 SECTION 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 SECTION 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.

(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

(0018,0022) Scan Options : Defined Terms
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

2.4.2 **Private SOP's**

ID/Net v2.0 Private IOD's are based upon the April 1993 draft version of the DICOM v3.0. ID/Net v2.0 IOD's 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 SECTION 5 - CONFIGURATION

2.5.1 AE Title/Presentation Address Mapping

The SIGNA PROFILE 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

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

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

2.6 SECTION 6 - SUPPORT OF EXTENDED CHARACTER SETS

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

Appendix A

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 Detector	(0018,1110)	3	
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	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_IDEN_01)**
0009	xx01	LO	S	3	full fidelity
0009	xx02	SH	S	3	suite id
0009	xx04	SH	S	3	product id
0009	xx27	SL	S	3	image actual date
0009	xx30	SH	S	3	service id
0009	xx31	SH	S	3	mobile location number
0009	xxE3	UI	S	3	equipment UID
0009	xxE6	SH	S	3	Genesis Version - now
0009	xxE7	UL	S	3	Exam Record checksum
0009	xxE9	SL	S	3	Actual series data time stamp
0011	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_PATI_01)**
0011	xx10	SS	S	3	Patient Status
0019	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_ACQU_01)**
0019	xx02	SL	S	3	number of cells I in Detector
0019	xx03	DS	S	3	cell number at Theta
0019	xx04	DS	S	3	cell spacing
0019	xx0F	DS	S	3	Horiz. frame of ref.
0019	xx11	SS	S	3	series contrast
0019	xx13	SS	S	3	start number for baseline
0019	xx14	SS	S	3	end number for baseline
0019	xx15	SS	S	3	start number for enhanced scans
0019	xx16	SS	S	3	end number for enhanced scans
0019	xx17	SS	S	3	series plane
0019	xx18	LO	S	3	first scan ras
0019	xx19	DS	S	3	first scan location
0019	xx1A	LO	S	3	last scan ras
0019	xx1B	DS	S	3	last scan loc
0019	xx1E	DS	S	3	display field of view
0019	xx23	DS	S	3	table speed
0019	xx24	DS	S	3	mid scan time
0019	xx25	SS	S	3	mid scan flag
0019	xx26	SL	S	3	degrees of azimuth
0019	xx27	DS	S	3	gantry period
0019	xx2A	DS	S	3	X-Ray On position
0019	xx2B	DS	S	3	X-Ray Off position
0019	xx2C	SL	S	3	number of triggers
0019	xx2E	DS	S	3	angle of first view
0019	xx2F	DS	S	3	trigger frequency
0019	xx39	SS	S	3	scan FOV type
0019	xx40	SS	S	3	stat recon flag
0019	xx41	SS	S	3	compute type
0019	xx42	SS	S	3	segment number
0019	xx43	SS	S	3	total segments requested
0019	xx44	DS	S	3	interscan delay
0019	xx47	SS	S	3	view compression factor

0019	xx4A	SS	S	3	total no. of ref channels
0019	xx4B	SL	S	3	data size for scan data
0019	xx52	SS	S	3	recon post proc. flag
0019	xx57	SS	S	3	CT water number
0019	xx58	SS	S	3	CT bone number
0019	xx5E	SL	S	3	number of channels (1...512)
0019	xx5F	SL	S	3	increment between channels
0019	xx60	SL	S	3	starting view
0019	xx61	SL	S	3	number of views
0019	xx62	SL	S	3	increment between views
0019	xx6A	SS	S	3	dependant on #views processed
0019	xx6B	SS	S	3	field of view in detector cells
0019	xx70	SS	S	3	value of back projection button
0019	xx71	SS	S	3	set if fatq estimates were used
0019	xx72	DS	S	3	Z chan avg over views
0019	xx73	DS	S	3	avg of left ref chans over views
0019	xx74	DS	S	3	max left chan over views
0019	xx75	DS	S	3	avg of right ref chans over views
0019	xx76	DS	S	3	max right chan over views
0019	xxDA	SS	S	3	reference channel used
0019	xxDB	DS	S	3	back projector coefficient
0019	xxDC	SS	S	3	primary spped correction used
0019	xxDD	SS	S	3	overrange correction used
0019	xxDE	DS	S	3	dynamic Z alpha value
0021	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_RELA_01)**
0021	xx03	SS	S	3	Series from which Prescribed
0021	xx05	SH	S	3	Genesis Version - now
0021	xx07	UL	S	3	Series Record checksum
0021	xx18	SH	S	3	Genesis version - Now
0021	xx19	UL	S	3	Acqrecon record checksum
0021	xx37	SS	S	3	Screen Format
0021	xx4A	LO	S	3	anatomical reference for scout
0021	xx90	SS	S	3	tube focal spot position
0021	xx91	SS	S	3	biopsy position
0021	xx92	FL	S	3	biposy T location
0021	xx93	FL	S	3	biopsy ref location
0023	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_STDY_01)**
0023	xx70	FD	S	3	Start time(secs) in first axial
0023	xx74	SL	S	3	No. of updates to header
0023	xx7D	SS	S	3	indicates if the study has complete info (DICOM/genesis)
0025	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_SERS_01)**
0025	xx06	SS	S	3	Last pulse sequence used
0025	xx07	SL	S	3	Images in Series
0025	xx10	SL	S	3	Landmark Counter
0025	xx11	SS	S	3	Number of Acqisitions
0025	xx17	SL	S	3	Series Complete Flag
0025	xx18	SL	S	3	Number of images archived
0025	xx19	SL	S	3	Last image number used
0025	xx1A	SH	S	3	Primary Receiver Suite and Host
0027	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_IMAG_01)**
0027	xx06	SL	S	3	Image archive flag
0027	xx10	SS	S	3	Scout Type
0027	xx1C	SL	S	3	vma mamp

0027	xx1D	SS	S	3	vma phase
0027	xx1E	SL	S	3	vma mod
0027	xx1F	SL	S	3	vma clip
0027	xx20	SS	S	3	smart scan ON/OFF flag
0027	xx30	SH	S	3	Foreign Image Revision
0027	xx35	SS	S	3	Plane Type
0027	xx40	SH	S	3	RAS letter of image location
0027	xx41	FL	S	3	Image location
0027	xx42	FL	S	3	Center R coord of plane image
0027	xx43	FL	S	3	Center A coord of plane image
0027	xx44	FL	S	3	Center S coord of plane image
0027	xx45	FL	S	3	Normal R coord
0027	xx46	FL	S	3	Normal A coord
0027	xx47	FL	S	3	Normal S coord
0027	xx48	FL	S	3	R Coord of Top Right Corner
0027	xx49	FL	S	3	A Coord of Top Right Corner
0027	xx4A	FL	S	3	S Coord of Top Right Corner
0027	xx4B	FL	S	3	R Coord of Bottom Right Corner
0027	xx4C	FL	S	3	A Coord of Bottom Right Corner
0027	xx4D	FL	S	3	S Coord of Bottom Right Corner
0027	xx50	FL	S	3	table start location
0027	xx51	FL	S	3	table end location
0027	xx52	SH	S	3	RAS letter for side of image
0027	xx53	SH	S	3	RAS letter for anterior/posterior
0027	xx54	SH	S	3	RAS letter for scout start loc
0027	xx55	SH	S	3	RAS letter for scout end loc
0029	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_IMPS_01)**
0029	xx04	SL	S	3	Lower range of Pixels1
0029	xx05	DS	S	3	Lower range of Pixels1
0029	xx06	DS	S	3	Lower range of Pixels1
0029	xx07	SL	S	3	Lower range of Pixels1
0029	xx08	SH	S	3	Lower range of Pixels1
0029	xx09	SH	S	3	Lower range of Pixels1
0029	xx0A	SS	S	3	Lower range of Pixels1
0029	xx26	SS	S	3	version of the hdr struct
0029	xx34	SL	S	3	advantage comp. overflow
0043	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_PARM_01)**
0043	xx10	US	S	3	window value
0043	xx11	US	S	3	total input views
0043	xx12	SS	3	3	X-Ray chain
0043	xx13	SS	5	3	decon kernel parameters
0043	xx14	SS	3	3	calibration parameters
0043	xx15	SS	3	3	total output views
0043	xx16	SS	5	3	number of overranges
0043	xx17	DS	S	3	IBH image scale factors
0043	xx18	DS	3	3	BBH coefficients
0043	xx19	SS	S	3	number of BBH chains to blend
0043	xx1A	SL	S	3	starting channel number
0043	xx1B	SS	S	3	Ppscan parameters
0043	xx1C	SS	S	3	GE image integrity
0043	xx1D	SS	S	3	Level value
0043	xx1E	DS	S	3	delta start time
0043	xx1F	SL	S	3	max overranges in a view
0043	xx20	DS	S	3	avg overranges all views
0043	xx21	SS	S	3	corrected after glow terms

0043	xx25	SS	6	3	reference channels
0043	xx26	US	6	3	no views ref chans blocked
0043	xx27	SH	S	3	scan pitch ratio
0043	xx28	OB	S	3	Unique image iden
0043	xx29	OB	S	3	Histogram tables
0043	xx2A	OB	S	3	User defined data
0043	xx2B	SS	4	3	Private Scan Options
0043	xx31	DS	2	3	RA cord of target recon centre
0043	xx40	FL	4	3	trigger on position
0043	xx41	FL	4	3	degree of rotation
0043	xx42	SL	4	3	DAS trigger source
0043	xx43	SL	4	3	DAS fpa gain
0043	xx44	SL	4	3	DAS output source
0043	xx45	SL	4	3	DAS ad input
0043	xx46	SL	4	3	DAS cal mode
0043	xx47	SL	4	3	DAS cal frequency
0043	xx48	SL	4	3	DAS reg xm
0043	xx49	SL	4	3	DAS auto zero
0043	xx4A	SS	4	3	starting channel of view
0043	xx4B	SL	4	3	DAS xm pattern
0043	xx4C	SS	4	3	TGGC trigger mode
0043	xx4D	FL	4	3	start scan to Xray on delay
0043	xx4E	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	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_IDEN_01)**
0009	xx01	LO	S	3	full fidelity
0009	xx02	SH	S	3	suite id
0009	xx04	SH	S	3	product id
0009	xx27	SL	S	3	image actual date
0009	xx30	SH	S	3	service id
0009	xx31	SH	S	3	mobile location number
0009	xxE3	UI	S	3	equipment UID
0009	xxE6	SH	S	3	Genesis Version - now
0009	xxE7	UL	S	3	Exam Record checksum
0009	xxE9	SL	S	3	Actual series data time stamp
0011	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_PATI_01)**
0011	xx10	SS	S	3	Patient Status
0019	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_ACQU_01)**
0019	xx0F	DS	S	3	Horiz. frame of ref.
0019	xx11	SS	S	3	series contrast
0019	xx12	SS	S	3	last pseq
0019	xx17	SS	S	3	series plane
0019	xx18	LO	S	3	first scan ras
0019	xx19	DS	S	3	first scan location
0019	xx1A	LO	S	3	last scan ras
0019	xx1B	DS	S	3	last scan loc
0019	xx1E	DS	S	3	display field of view
0019	xx5A	FL	S	3	Acquisition Duration
0019	xx7D	DS	S	3	Second echo
0019	xx7E	SS	S	3	number of echos

0019	xx7F	DS	S	3	table delta
0019	xx81	SS	S	3	contiguous
0019	xx84	DS	S	3	peak SAR
0019	xx85	SS	S	3	monitor SAR
0019	xx87	DS	S	3	Cardiac repetition time
0019	xx88	SS	S	3	images per cardiac cycle
0019	xx8A	SS	S	3	actual receive gain analog
0019	xx8B	SS	S	3	actual receive gain digital
0019	xx8D	DS	S	3	delay after trigger
0019	xx8F	SS	S	3	swappf
0019	xx90	SS	S	3	Pause Interval
0019	xx91	DS	S	3	Pulse Time
0019	xx92	SL	S	3	Slice offset on freq axis
0019	xx93	DS	S	3	Center Frequency
0019	xx94	SS	S	3	Transmit Gain
0019	xx95	SS	S	3	analog receiver gain
0019	xx96	SS	S	3	digital receiver gain
0019	xx97	SL	S	3	Bitmap defining CVs
0019	xx98	SS	S	3	Center freq. Method
0019	xx9B	SS	S	3	Pulse seq. mode
0019	xx9C	LO	S	3	pulse seq. name
0019	xx9D	DT	S	3	pulse seq. date
0019	xx9E	LO	S	3	internal pulse seq. name
0019	xx9F	SS	S	3	Transmitting coil
0019	xxA0	SS	S	3	Surface Coil Type
0019	xxA1	SS	S	3	Extremity Coil flag
0019	xxA2	SL	S	3	raw data run number
0019	xxA3	UL	S	3	Calibrated Field strength
0019	xxA4	SS	S	3	SAT fat/water/bone
0019	xxA5	DS	S	3	receive bandwidth
0019	xxA7	DS	S	3	user data
0019	xxA8	DS	S	3	user data
0019	xxA9	DS	S	3	user data
0019	xxAA	DS	S	3	user data
0019	xxAB	DS	S	3	user data
0019	xxAC	DS	S	3	user data
0019	xxAD	DS	S	3	user data
0019	xxAE	DS	S	3	user data
0019	xxAF	DS	S	3	user data
0019	xxB0	DS	S	3	user data
0019	xxB1	DS	S	3	user data
0019	xxB2	DS	S	3	user data
0019	xxB3	DS	S	3	user data
0019	xxB4	DS	S	3	user data
0019	xxB5	DS	S	3	user data
0019	xxB6	DS	S	3	user data
0019	xxB7	DS	S	3	user data
0019	xxB8	DS	S	3	user data
0019	xxB9	DS	S	3	user data
0019	xxBA	DS	S	3	user data
0019	xxBB	DS	S	3	user data
0019	xxBC	DS	S	3	user data
0019	xxBD	DS	S	3	user data
0019	xxBE	DS	S	3	projection angle
0019	xxC0	SS	S	3	saturation planes
0019	xxC1	SS	S	3	surface coil intensity
0019	xxC2	SS	S	3	SAT location R

0019	xxC3	SS	S	3	SAT location L
0019	xxC4	SS	S	3	SAT location A
0019	xxC5	SS	S	3	SAT location P
0019	xxC6	SS	S	3	SAT location H
0019	xxC7	SS	S	3	SAT location F
0019	xxC8	SS	S	3	SAT thickness R/L
0019	xxC9	SS	S	3	SAT thickness A/P
0019	xxCA	SS	S	3	SAT thickness H/F
0019	xxCB	SS	S	3	prescribed flow axis
0019	xxCC	SS	S	3	velocity encoding
0019	xxCD	SS	S	3	thickness disclaimer
0019	xxCE	SS	S	3	prescan type
0019	xxCF	SS	S	3	prescan status
0019	xxD0	SH	S	3	raw data type
0019	xxD2	SS	S	3	Projection Algorithm
0019	xxD3	SH	S	3	projection algorithm
0019	xxD5	SS	S	3	fractional echo
0019	xxD6	SS	S	3	prep pulse
0019	xxD7	SS	S	3	cardiac phases
0019	xxD8	SS	S	3	variable echoflag
0019	xxD9	DS	S	3	concatenated SAT
0019	xxDF	DS	S	3	user data
0019	xxE0	DS	S	3	user data
0019	xxE2	DS	S	3	Velocity Encode Scale
0019	xxF2	SS	S	3	fast phases
0019	xxF9	DS	S	3	transmission gain
0021	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_RELA_01)**
0021	xx03	SS	S	3	Series from which Prescribed
0021	xx05	SH	S	3	Genesis Version - now
0021	xx07	UL	S	3	Series Record checksum
0021	xx18	SH	S	3	Genesis version - Now
0021	xx19	UL	S	3	Acq recon record checksum
0021	xx20	DS	S	3	Table start location
0021	xx35	SS	S	3	Series from which prescribed
0021	xx36	SS	S	3	image from which prescribed
0021	xx37	SS	S	3	Screen Format
0021	xx4F	SS	S	3	locations in acquisition
0021	xx50	SS	S	3	graphically prescribed
0021	xx51	DS	S	3	rotation from source x rot
0021	xx52	DS	S	3	rotation from source y rot
0021	xx53	DS	S	3	rotation from source z rot
0021	xx54	SH	3	3	image position
0021	xx55	SH	6	3	image orientation
0021	xx56	SL	S	3	integer slop
0021	xx57	SL	S	3	integer slop
0021	xx58	SL	S	3	integer slop
0021	xx59	SL	S	3	integer slop
0021	xx5A	SL	S	3	integer slop
0021	xx5B	DS	S	3	float slop
0021	xx5C	DS	S	3	float slop
0021	xx5D	DS	S	3	float slop
0021	xx5E	DS	S	3	float slop
0021	xx5F	DS	S	3	float slop
0021	xx81	DS	S	3	auto window/level alpha
0021	xx82	DS	S	3	auto window/level beta
0021	xx83	DS	S	3	auto window/level window

0021	xx84	DS	S	3	to window/level level
0023	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_STDY_01)**
0023	xx01	SL	S	3	Number of series in Study
0023	xx02	SL	S	3	Number of unarchived Series
0023	xx10	SS	S	3	reference image field
0023	xx50	SS	S	3	summary image
0023	xx70	FD	S	3	Start time(secs) in first axial
0023	xx74	SL	S	3	No. of updates to header
0023	xx7D	SS	S	3	indicates if study has complete info (DICOM/genesis)
0025	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_SERS_01)**
0025	xx06	SS	S	3	Last pulse sequence used
0025	xx07	SL	S	3	Images in Series
0025	xx10	SL	S	3	Landmark Counter
0025	xx11	SS	S	3	Number of Acquisitions
0025	xx14	SL	S	3	indicates no. of updates to header
0025	xx17	SL	S	3	Series Complete Flag
0025	xx18	SL	S	3	Number of images archived
0025	xx19	SL	S	3	Last image number used
0025	xx1A	SH	S	3	Primary Receiver Suite and Host
0027	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_IMAG_01)**
0027	xx06	SL	S	3	Image archive flag
0027	xx10	SS	S	3	Scout Type
0027	xx30	SH	S	3	Foreign Image Revision
0027	xx31	SS	S	3	Imaging Mode
0027	xx32	SS	S	3	Pulse Sequence
0027	xx33	SL	S	3	Imaging Options
0027	xx35	SS	S	3	Plane Type
0027	xx36	SL	S	3	Oblique Plane
0027	xx40	SH	S	3	RAS letter of image location
0027	xx41	FL	S	3	Image location
0027	xx42	FL	S	3	Center R coord of plane image
0027	xx43	FL	S	3	Center A coord of plane image
0027	xx44	FL	S	3	Center S coord of plane image
0027	xx45	FL	S	3	Normal R coord
0027	xx46	FL	S	3	Normal A coord
0027	xx47	FL	S	3	Normal S coord
0027	xx48	FL	S	3	R Coord of Top Right Corner
0027	xx49	FL	S	3	A Coord of Top Right Corner
0027	xx4A	FL	S	3	S Coord of Top Right Corner
0027	xx4B	FL	S	3	R Coord of Bottom Right Corner
0027	xx4C	FL	S	3	A Coord of Bottom Right Corner
0027	xx4D	FL	S	3	S Coord of Bottom Right Corner
0027	xx60	FL	S	3	Image dimension - X
0027	xx61	FL	S	3	Image dimension - Y
0027	xx62	FL	S	3	Number of Excitations
0029	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_IMPS_01)**
0029	xx15	SL	S	3	Lower range of Pixels1
0029	xx16	SL	S	3	Lower range of Pixels1
0029	xx17	SL	S	3	Lower range of Pixels2
0029	xx18	SL	S	3	Upper range of Pixels2
0029	xx1A	SL	S	3	Len of tot hdr in bytes
0029	xx26	SS	S	3	version of the hdr struct
0029	xx34	SL	S	3	advantage comp. overflow

0029	xx35	SL	S	3	advantage comp. underflow
0043	**00xx**	**LO**	**S**	**3**	**Private Creator Identification (GEMS_PARM_01)**
0043	xx01	SS	S	3	bitmap of prescan options
0043	xx02	SS	S	3	gradient offset in X
0043	xx03	SS	S	3	gradient offset in Y
0043	xx04	SS	S	3	gradient offset in Z
0043	xx05	SS	S	3	img is original or unoriginal
0043	xx06	SS	S	3	number of EPI shots
0043	xx07	SS	S	3	views per segment
0043	xx08	SS	S	3	respiratory rate,bpm
0043	xx09	SS	S	3	respiratory trigger point
0043	xx0A	SS	S	3	type of receiver used
0043	xx0B	DS	S	3	peak rate of change of gradient field
0043	xx0C	DS	S	3	limits in units of percent
0043	xx0D	DS	S	3	PSD estimated limit
0043	xx0E	DS	S	3	PSD estimated limit in tesla per second
0043	xx0F	DS	S	3	saravghead
0043	xx10	US	S	3	Window value
0043	xx1C	SS	S	3	GE image integrity
0043	xx1D	SS	S	3	Level value
0043	xx28	OB	S	3	Unique image iden
0043	xx29	OB	S	3	Histogram tables
0043	xx2A	OB	S	3	User defined data
0043	xx2B	SS	4	3	Private Scan Options
0043	xx2C	SS	S	3	Effective echo spacing
0043	xx2D	SH	S	3	String slop field 1
0043	xx2E	SH	S	3	String slop field 2
0043	xx2F	SS	S	3	Raw data type
0043	xx30	SS	S	3	Raw data type
0043	xx31	DS	2	3	RA cord of target recon centre
0043	xx32	SS	S	3	Raw data type
0043	xx33	FL	S	3	neg_scanspacing
0043	xx34	IS	S	3	Offset Frequency
0043	xx35	UL	S	3	User_usage_tag
0043	xx36	UL	S	3	User_fill_map_MSW
0043	xx37	UL	S	3	User_fill_map_LSW
0043	xx38	FL	24	3	User25...User48
0043	xx39	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 attributes used by this implementation in the DICOMDIR definition.

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	
	(0008,0070)	3	
	(0008,103E)	3	
	(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)	3	
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	