



GE Medical Systems

Technical Publications

**2391078-800
Revision 1**

Seno Advantage WorkStation

**CONFORMANCE STATEMENT
for DICOM V3.0**

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REVISION HISTORY

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1. INTRODUCTION

1.1 OVERVIEW

This DICOM Conformance Statement describes only the services used by the Seno Advantage Application.

It is divided into Sections as described below:

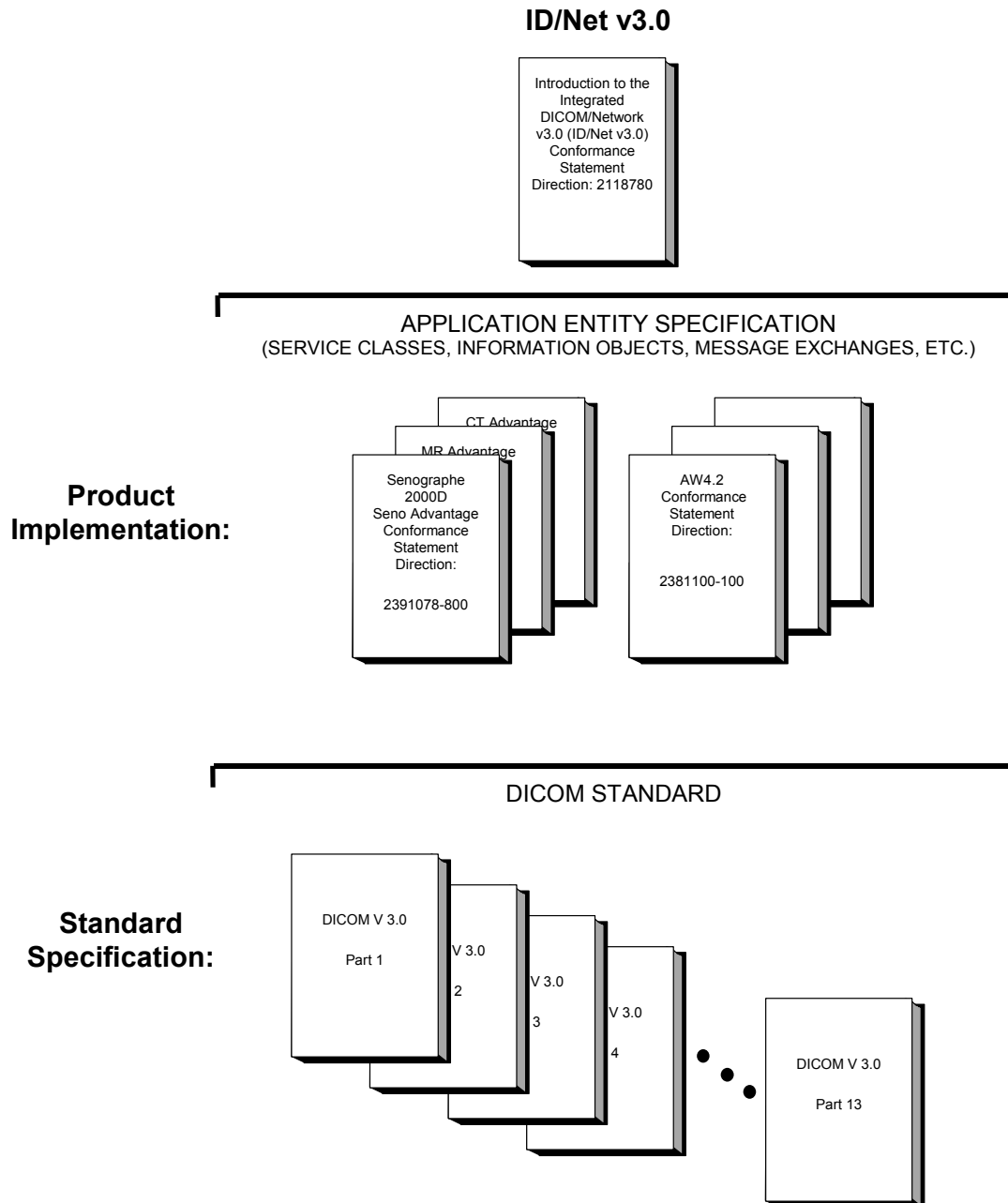
Section 1 (Introduction), which describes the overall structure, intent, and references for this Conformance Statement

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

Section 3 (SC Information Object Implementation), which specifies the GEMS equipment compliance to the DICOM requirements for the implementation of SC Information Object Implementation feature.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

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



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

***Seno Advantage Workstation**
Conformance Statement for DICOM v3.0
Direction 2391078-800*

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

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

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

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

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

For more information regarding DICOM, copies of the Standard may be obtained on the Internet at <http://medical.nema.org>. Comments on the Standard may be addressed to:

DICOM Secretariat
NEMA
1300 N. 17th Street, Suite 1847
Rosslyn, VA 22209
USA
Phone: +1.703.841.3200

1.3 INTENDED AUDIENCE

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

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

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

1.4 SCOPE AND FIELD OF APPLICATION

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

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

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

1.5 IMPORTANT REMARKS

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

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

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

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

1.6 REFERENCES

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

The information object implementation refers to DICOM PS 3.3 (Information Object Definition) and DICOM supplement 32: Digital X-Ray Supplement.

1.7 DEFINITIONS

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

1.8 SYMBOLS AND ABBREVIATIONS

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

2. NETWORKING CONFORMANCE STATEMENT

All services are inherited from AW4.2 (e.g. Printing, Networking).
See AW4.2 DCS manual ref. 2381100-100.

3. SC INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

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

3.2- SC ENTITY-RELATIONSHIP MODEL

3.3- SC-IOD MODULE TABLE

3.4- SC-INFORMATION MODULE DEFINITIONS

3.5- PRIVATE DATA DICTIONARY

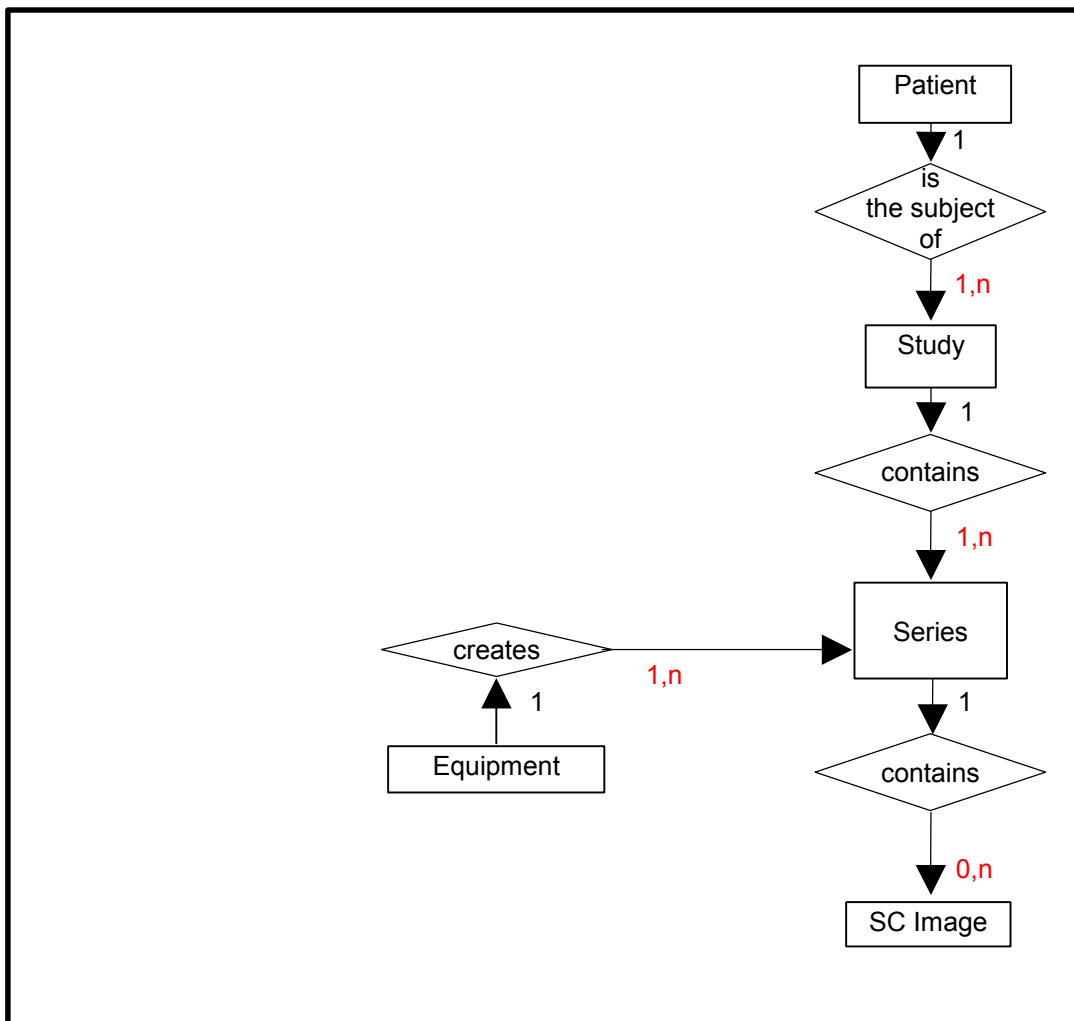
3.2 SC ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the SC Image interoperability schema is shown in **Illustration 3.2.1**. In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to **n** Images per Series, but the Patient to Study relationship has 1 Study for each Patient (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 3.2-1
SC IMAGE ENTITY RELATIONSHIP DIAGRAM



3.2.1 ENTITY DESCRIPTIONS

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

3.2.2 Seno Advantage Mapping of DICOM entities

TABLE 3.2-1
MAPPING OF DICOM ENTITIES TO SENO ADVANTAGE ENTITIES

DICOM	Seno Advantage Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image

3.3 SC-IOD MODULE TABLE

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

Table 3.3.1 identifies the defined modules within the entities which comprise the DICOM v3.0 SC IOD. Modules are identified by Module Name.

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

**TABLE 3.3.1
SC IMAGE IOD MODULES**

Entity Name	Module Name	Reference
Patient	Patient	3.4.1.1
Study	General Study	3.4.2.1
	Patient Study	3.4.2.2
Series	General Series	3.4.3.1
	SC Series	3.4.3.2
Equipment	General Equipment	3.4.4.1
	SC Equipment	3.4.9.1
Image	General Image	3.4.5.1
	Image Pixel	3.4.5.2
	SC Image	3.4.9.2
	Modality LUT	3.4.7.2
	VOI LUT	3.4.7.1
	SOP Common	3.4.8.1

3.4 SC-INFORMATION MODULE DEFINITIONS

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

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from. It should be noted that they are the same ones as defined in the DICOM v3.0 Standard Part 3 (Information Object Definitions).

3.4.1 Common Patient Entity Modules

3.4.1.1 Patient Module

This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

**TABLE 3.4-1
PATIENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Original
Patient ID	(0010,0020)	2	Original
Patient's Birth Date	(0010,0030)	2	Original
Patient's Sex	(0010,0040)	2	Original

3.4.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs which reference the Study IE. These Module contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

3.4.2.1 General Study Module

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

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

Attribute Name	Tag	Type	Notes
Study Instance UID	(0020,000D)	1	Original
Study Date	(0008,0020)	2	Original
Study Time	(0008,0030)	2	Original
Referring Physician's Name	(0008,0090)	2	Original
Study ID	(0020,0010)	2	Original
Accession Number	(0008,0050)	2	Original
Study Description	(0008,1030)	3	Original

3.4.2.2 Patient Study Module

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

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

Attribute Name	Tag	Type	Attribute Description
Patient's Age	(0010,1010)	3	Original
Patient's Size	(0010,1020)	3	Original
Patient's Weight	(0010,1030)	3	Original

3.4.3 Common Series Entity Modules

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

3.4.3.1 General Series Module

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

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

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Original.
Series Instance UID	(0020,000E)	1	Generated
Series Number	(0020,0011)	2	Generated
Laterality	(0020,0060)	2C	
Series Description	(0008,103E)	3	Screen Save
Patient Position	(0018,5100)	2C	

3.4.4 Common Equipment Entity Modules

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

3.4.4.1 General Equipment Module

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

**TABLE 3.4-5
GENERAL EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	derived from Original image
Institution Name	(0008,0080)	3	derived from Original image
Institution Address	(0008,0081)	3	derived from Original image
Station Name	(0008,1010)	3	derived from Original image
Manufacturer's Model Name	(0008,1090)	3	derived from Original image
Software Versions	(0018,1020)	3	derived from Original image

3.4.4.1.1 General Equipment Attribute Descriptions

3.4.4.1.1.1 Pixel Padding Value

Not used

3.4.5 Common Image Entity Modules

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

3.4.5.1 General Image Module

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

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

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	2	Generated
Patient Orientation	(0020,0020)	2C	See 3.4.5.1.1.1.
Image Date	(0008,0023)	2C	derived from original
Image Time	(0008,0033)	2C	derived from original
Image Type	(0008,0008)	3	See 3.4.5.1.1.2.

3.4.5.1.1 General Image Attribute Descriptions

3.4.5.1.1.1 Patient Orientation

derived from original

3.4.5.1.1.2 Image Type

This type is set to:

DERIVED\SECONDARY\<<Originaltype>\SCREEN SAVE in case of Screen Save

3.4.5.1.1.3 Derivation Description and Source Image Sequence

This sequence is not encoded

3.4.5.1.1.4 Lossy Image Compression

Not Supported

3.4.5.2 Image Pixel Module

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

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

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	1
Photometric Interpretation	(0028,0004)	1	Set to MONOCHROME1 or MONOCHROME2 according to Original Image.
Rows	(0028,0010)	1	
Columns	(0028,0011)	1	
Bits Allocated	(0028,0100)	1	
Bits Stored	(0028,0101)	1	
High Bit	(0028,0102)	1	
Pixel Representation	(0028,0103)	1	
Pixel Data	(7FE0,0010)	1	

3.4.6 Common Overlay Modules

This module is not implemented for this IOD.

3.4.7 Common Lookup Table Modules

3.4.7.1 VOI LUT module

This section specifies the Attributes that describe the VOI LUT.

**TABLE 3.4-8
VOI LUT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Window Center	(0028,1050)	3	One value is set. This value is derived from the Window Center present in the image when the operator asked for the Screen Save.
Window Width	(0028,1051)	1C	One value is set. This value is derived from the Window Width present in the image when the operator asked for the Screen Save.

3.4.7.2 Modality LUT module

This section specifies the Attributes that describe the Modality LUT.

**TABLE 3.4-9
MODALITY LUT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Rescale Intercept	(0028,1052)	1C	0
Rescale Slope	(0028,1053)	1C	1
Rescale Type	(0028,1054)	1C	US

3.4.8 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

3.4.8.1 SOP Common Module

This section defines the Attributes which are required for proper functioning and identification of the associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

**TABLE 3.4-10
SOP COMMON MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.7
SOP Instance UID	(0008,0018)	1	Generated from GE Based UID; <station configuration> and timestamp.
Specific Character Set	(0008,0005)	1C	ISO_IR 100

3.4.9 SC Modules

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

3.4.9.1 SC Equipment Module

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

**TABLE 3.4-11
SC IMAGE EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Conversion Type	(0008,0064)	1	WSD
Modality	(0008,0060)	3	Original
Secondary Capture Device ID	(0018,1010)	3	real UNIX station host name
Secondary Capture Device Manufacturer	(0018,1016)	3	GE MEDICAL SYSTEMS
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	3	A.W.4.2
Secondary Capture Device Software Version	(0018,1019)	3	build: <date and time of software creation>

3.4.9.2 SC Image Module

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

**TABLE 3.4-12
SC IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Date of Secondary Capture	(0018,1012)	3	Creation date of the Secondary Capture
Time of Secondary Capture	(0018,1014)	3	Creation time of the Secondary Capture

3.5 PRIVATE DATA DICTIONARY

No private elements are being used for this IOD.

4. DIGITAL MAMMOGRAPHY XRAY INFORMATION OBJET IMPLEMENTATION

Seno Advantage Application supports DICOM MG images as input created by the Senographe 2000D (See DCS manual 2246811-100 rev.2).