

# **Technical Publications**

**Direction 2176781  
Revision 2**

## **LOGIQ 700 MR CONFORMANCE STATEMENT for DICOM V3.0**

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## TABLE OF CONTENTS

<b>1. INTRODUCTION.....</b>	<b>1-1</b>
1.1 OVERVIEW.....	1-1
1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE.....	1-2
1.3 INTENDED AUDIENCE.....	1-3
1.4 SCOPE AND FIELD OF APPLICATION.....	1-4
1.5 IMPORTANT REMARKS.....	1-4
1.6 REFERENCES.....	1-5
1.7 DEFINITIONS.....	1-5
1.8 SYMBOLS AND ABBREVIATIONS.....	1-5
<b>2. NETWORK CONFORMANCE STATEMENT.....</b>	<b>2-1</b>
2.1 INTRODUCTION.....	2-1
2.2 IMPLEMENTATION MODEL.....	2-1
2.3 AE SPECIFICATIONS.....	2-4
2.4 COMMUNICATION PROFILES.....	2-10
2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS.....	2-11
2.6 CONFIGURATION.....	2-11
2.7 SUPPORT OF EXTENDED CHARACTER SETS.....	2-11
<b>3. ULTRASOUND (US) INFORMATION OBJECT IMPLEMENTATION.....</b>	<b>3-1</b>
3.1 INTRODUCTION.....	3-1
3.2 US IOD IMPLEMENTATION.....	3-1
3.3 US ENTITY-RELATIONSHIP MODEL.....	3-1

3.4 IOD MODULE TABLE.....3-3

3.5 INFORMATION MODULE DEFINITIONS.....3-4

**4. SC INFORMATION OBJECT IMPLEMENTATION.....4-1**

4.1 INTRODUCTION.....4-1

4.2 SC IOD IMPLEMENTATION.....4-1

4.3 SC ENTITY-RELATIONSHIP MODEL.....4-1

4.4 IOD MODULE TABLE.....4-3

4.5 INFORMATION MODULE DEFINITIONS.....4-4

**5. PRINT MANAGEMENT SOP CLASS DEFINITION.....5-1**

5.1 INTRODUCTION.....5-1

5.2 BASIC PRINT MANAGEMENT META SOP CLASSES.....5-1

5.3 PRINT MANAGEMENT SOP CLASS DEFINITIONS.....5-2

5.4 PRINT MANAGEMENT IODS.....5-4

5.5 INFORMATION MODULE DEFINITIONS.....5-6

**6. MODALITY WORKLIST INFORMATION MODEL DEFINITION.....6-1**

6.1 INTRODUCTION.....6-1

6.2 MODALITY WORKLIST INFORMATION MODEL DESCRIPTION.....6-1

6.3 MODALITY WORKLIST INFORMATION MODEL ENTITY-RELATIONSHIP MODEL.....6-1

6.4 INFORMATION MODEL MODULE TABLE.....6-3

6.5 INFORMATION MODEL KEYS.....6-4

# 1. INTRODUCTION

## 1.1 OVERVIEW

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

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

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

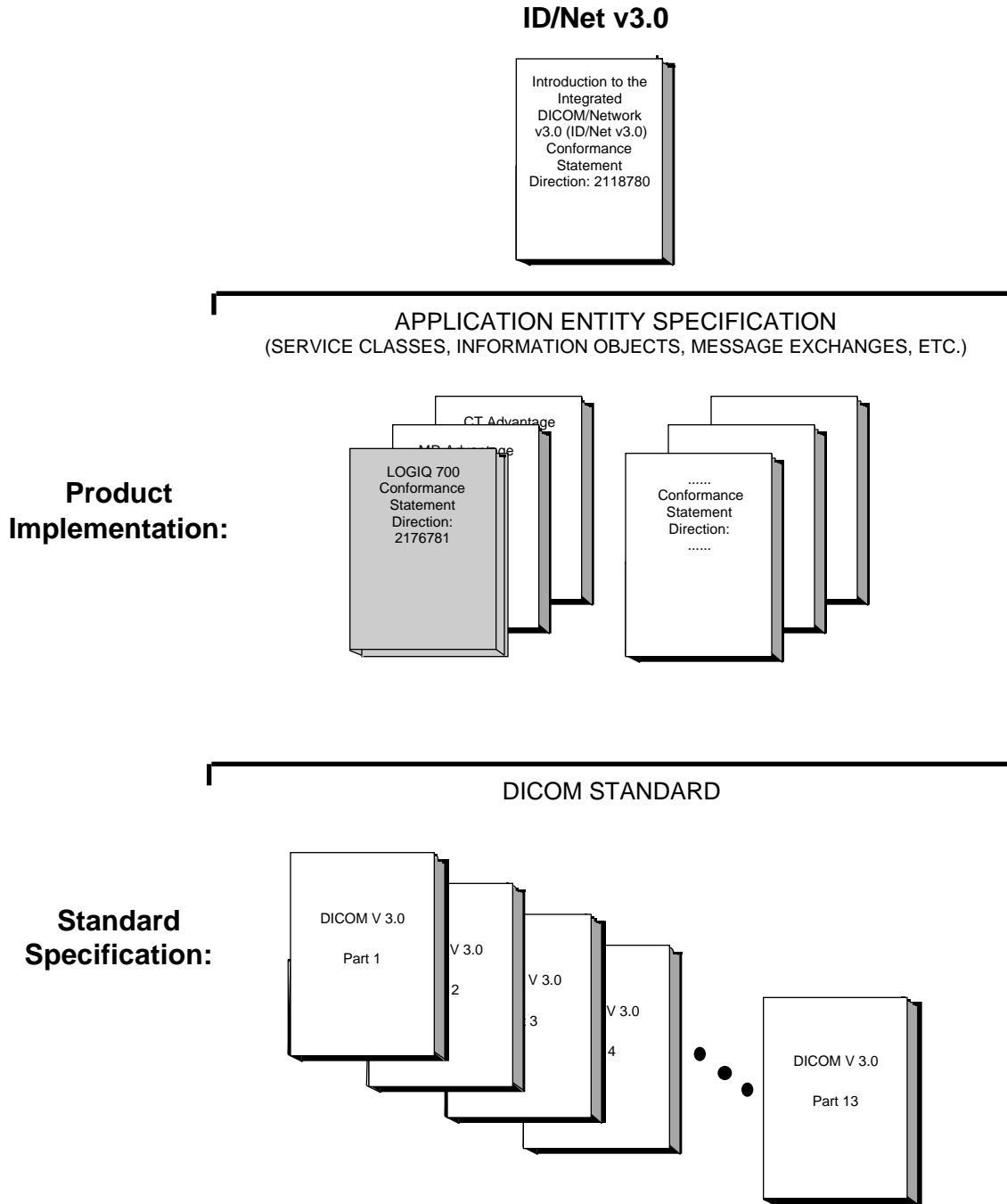
**Section 3 (Ultrasound Information Object Implementation)**, which specifies GEMS compliance to DICOM requirements for the implementation of an Ultrasound Information Object.

**Section 4 (SC Object Implementation)**, which specifies GEMS compliance to DICOM requirements for the implementation of a Secondary Capture Information Object.

**Section 5 (Print Management Implementation)**, which specifies GEMS compliance to DICOM requirements for the implementation of the Basic Print Meta SOP Classes (Gray and Color).

## 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:

***LOGIQ 700***  
*Conformance Statement for DICOM v3.0 (ID/Net v3.0)*  
*Direction 2176781*

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

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

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

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

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

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

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

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

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

### **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*

## 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 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 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 Supplement 5 (Ultrasound Application Profile, IOD, and Transfer Syntax Extensions).

## **1.7 DEFINITIONS**

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

## **1.8 SYMBOLS AND ABBREVIATIONS**

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



## **2. NETWORK CONFORMANCE STATEMENT**

### **2.1 INTRODUCTION**

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

The LOGIQ 700 is a sophisticated ultrasound scanning device that provides the user with the capability to archive images on an MOD. The archiving feature has been expanded to allow transfer of digital ultrasound images over a LAN to remote devices for archiving and/or printing, using DICOM.

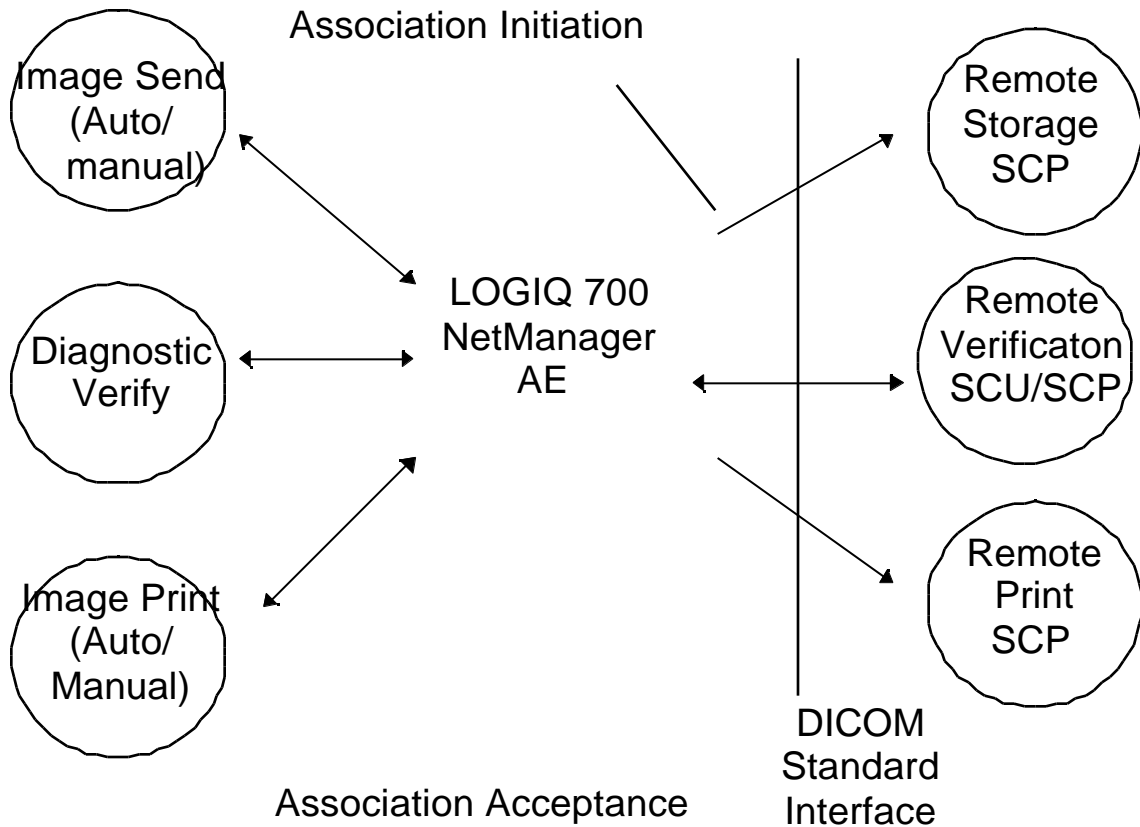
LOGIQ 700 DICOM is an optional software product which supports DICOM v3.0 and permits interoperability across equipment produced by different vendors that also utilize DICOM v3.0 services. On any given network, LOGIQ 700 can send images to multiple archive/review stations (PACS) and printers. The network is easily configured at any time, but is normally done at software installation by a GEMS Field Engineer. LOGIQ 700 has one application entity (AE) that provides all DICOM services that are required to support the 'send', 'print' and 'verify' services.

### **2.2 IMPLEMENTATION MODEL**

#### **2.2.1 Application Data Flow Diagram**

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

**ILLUSTRATION 2.2.1-1**  
**LOGIQ 700 NetManager Specific AE implementation Model**



There are three local real-world activities that occur in the LOGIQ 700 - Image Send, Image Print and Remote Verification. Image Send and Image Print can be done in either automatic or manual mode. Verification of remote DICOM devices configured on the LOGIQ 700 is done when the scanner is powered up. It can also be triggered by a user selection from the console.

All DICOM activities are handled in a queued manner by one AE, NetManager, running on the scanner. If the scanner is removed from the network for some reason (ie, a portable exam), the requests remain queued and are executed when the network connection is restored.

Image Send can be used in automatic or manual mode, depending on the user configuration. When automatic mode is configured, console keys are used to capture the image and to store it on the harddisk. The request is queued to the NetManager Application which initiates an association with the remote device. When the Remote Storage SCP accepts the association, the NetManager 'pushes' the image to the Remote Storage SCP without user intervention. The transfer is done in the background while scanning or other operator activities continue.

In manual mode, the captured images are archived on the hard disk or MOD during the exam(s). Upon completion of the exam(s) the images are tagged using the Archive Menu and queued to any of the network devices that have been configured on the scanner (storage or print devices). The image(s) are sent sequentially in the background while scanning or other operator activities proceed.

Image Print works much the same way as Image Send, in both automatic and manual modes. The only difference being the destination is a printer.

All images which are captured and sent to either a printer or storage server or both, are deleted from the local harddisk at the end of a successful transaction. There are provisions for images to remain on the harddisk or MOD upon successful completion, by selecting the image to be archived.

Aside from the 2 local real-world activities already mentioned, there is one other called Verification Diagnostics which exists for the purpose of performing basic communication checks between the scanner and other network devices. A DICOM verification test can be initiated at any time by the user to check the current status of any network device that has been configured on the scanner. The current status of all configured devices is displayed on the Printer Control Menu. The Verification Diagnostics also query the printer devices for their services and display those as well.

### **2.2.2 Functional Definition of AE's**

Application Entity 1, NetManager supports the following functions:

- Manually or automatically initiates a DICOM association to send images
- Manually or automatically initiates a DICOM association to print images
- Automatically determines printer type (color/grayscale/both) and properties (image format, medium type, destination, magnification type)
- Initiates a DICOM verification to assist in network diagnostics
- Responds to DICOM verification requests from other devices

### **2.2.3 Sequencing of Real-World Activities**

Image Send:

- The NetManager AE initiates a DICOM association with the selected archive device AE when the operator requests an image be sent
- The AE selects the appropriate Abstract and Transfer Syntax from those accepted by the remote archive device AE. Logic to select accepted Storage Abstract Syntax:
  - Use US IOD SOP Class 1.2.840.10008.5.1.4.1.1.6.1 if accepted
  - Use US IOD SOP Class 1.2.840.10008.5.1.4.1.1.6. (Retired US IOD) if first not accepted
  - Use SC IOD SOP Class 1.2.840.10008.5.1.4.1.1.7 if Retired US IOD is not accepted
- The AE uses the C-STORE command to 'push' the image to the remote archive device

Image Print:

- The NetManager AE initiates a DICOM association with the selected printer AE when the operator presses a configured print button

- The AE selects the appropriate Abstract and Transfer Syntax from those accepted by the remote archive device AE
- The AE uses the N-GET to retrieve a printer SOP Instance
- The AE uses the N-CREATE to create a Basic Film Session SOP Instance
- The AE uses the N-CREATE to create a Basic Film Box SOP Instance
- The AE uses the N-SET to update the Basic Image Box IOD
- The AE uses the N-ACTION (PRINT, Film Session Sop Instance) command to print the image
- The AE uses the N-DELETE to delete the Film Session SOP Instance
- The AE responds to an N-EVENT-REPORT from the printer with an N-EVENT-REPORT End after all data packets have been received from the printer

Verification Test:

There are 2 real-world activities associated with verification

1. Operator initiated remote verification test

- The NetManager AE initiates a DICOM association with each remote device configured on the LOGIQ 700 Network Configuration when the operator selects 'Echo Test' from the Printer Control Menu
- The AE selects the appropriate Abstract and Transfer Syntax from those accepted by the remote AE
- The AE uses the C-ECHO to verify the communication path to a remote AE

2. Power-up remote verification test

- The NetManager AE initiates a DICOM association with each remote device configured on the LOGIQ 700 Network Configuration when an event is received from the Front End application after the DICOM application is loaded
- The AE selects the appropriate Abstract and Transfer Syntax from those accepted by the remote AE
- The AE uses the C-ECHO to verify the communication path to a remote AE

## **2.3 AE SPECIFICATIONS**

### **2.3.1 LOGIQ 700 NetManager AE Specification**

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

SOP Class Name	SOP Class UID
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
Verification SOP Class	1.2.840.10008.1.1
Basic Worklist Management SOP Class	1.2.840.10008.5.1.4.31

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

SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1

### 2.3.1.1 Association Establishment Policies

#### 2.3.1.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

<b>Application Context Name</b>	<b>1.2.840.10008.3.1.1.1</b>
---------------------------------	------------------------------

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

The maximum length PDU for an association initiated by LOGIQ 700 NetManager is:

<b>Maximum Length PDU</b>	<b>4096 bytes</b>
---------------------------	-------------------

The SOP Class Extended Negotiation is not supported.

The maximum number of Presentation Context Items that will be proposed is 10. Note that the same Abstract Syntax may be offered multiple times with different Transfer Syntax's.

The user information Items sent by this product are :

- Maximum PDU Length
- Implementation UID
- Implementation Version Name

#### **2.3.1.1.2 Number of Associations**

The NetManager AE will initiate only one DICOM association at a time to perform an image store, print or verify.

The NetManager AE can have a maximum of two DICOM associations open simultaneously to send an image (for storage or print) or to respond to an echo.

#### **2.3.1.1.3 Asynchronous Nature**

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

#### **2.3.1.1.4 Implementation Identifying Information**

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

<b>LOGIQ 700 Implementation UID</b>	<b>1.2.840.113619.6.21</b>
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#### **2.3.1.2 Association Initiation Policy**

The NetManager AE attempts to establish a new association with a remote device due to three Real-World Activities:

- A. “Manual/Auto Send” initiated by the operator for a specific image or group of images.
- B. “Manual/Auto Print” initiated by the operator for a specific image or group of images
- C. “Verification” which verifies application level communication between peer DICOM AE’s for service purposes.

##### **2.3.1.2.1 Real-World Activity - A (‘Store’ Operation)**

Although there are two different ways for the operator to initiate an image transmission the DICOM initiation and transfer process is identical.

###### **2.3.1.2.1.1 Associated Real-World Activity**

Upon a request by the operator (manual or automatic), an image will be sent to a DICOM Storage SCP. If an error occurs during the transmission, the current association is released and a new association initiated. The maximum number of retries is 5. All images remain on the local harddisk of the scanner until the image has been successfully transferred, so in the event of complete retry failure, the images can be transferred manually by the operator to another device.

**2.3.1.2.1.2 Proposed Presentation Context Table**

<b>Presentation Context Table - Proposed</b>					
<b>Abstract Syntax</b>		<b>Transfer Syntax</b>		<b>Role</b>	<b>Extended Negotiation</b>
<b>Name</b>	<b>UID</b>	<b>Name List</b>	<b>UID List</b>		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Secondary Capture	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None
Basic Worklist Management SOP Class	1.2.840.10008.5.1.4.31	Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

**2.3.1.2.1.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes**

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

<b>Service Status</b>	<b>Status Codes</b>	<b>Further Meaning</b>	<b>Application Behavior When receiving Status Codes</b>	<b>Related Fields Processed if received</b>
Refused	A7xx	Out of resources	association is terminated; image not transferred	(0000,0902)
	0122	SOP Class not Supported	association is terminated; image not transferred	(0000,0902)
Error	A9xx	Data Set does not match SOP Class	association is terminated; image not transferred	(0000,0901) (0000,0902)
	Cxxx	Cannot Understand	association is terminated; image not transferred	(0000,0901) (0000,0902)
Warning	B000	Coercion of Data Elements	treated as a ' <b>Successful</b> ' response	(0000,0901) (0000,0902)
	B007	Data Set does not match SOP Class	treated as a ' <b>Successful</b> ' response	(0000,0901) (0000,0902)

	B006	Elements Discarded	treated as a 'Successful' response	(0000,0901) (0000,0902)
Success	0000			None

### 2.3.1.2.1.2.2 SOP Specific DICOM Conformance Statement for Ultrasound Image Storage SOP Class

This implementation performs only one C-STORE operation over a single association. A new association is initiated to transfer each new image..

### 2.3.1.2.2 Real-World Activity - B ('Print' Operation)

Although there are two different methods for the operator to initiate a print, the DICOM association initiation and transfer process is identical. When a remote device is configured to have images sent automatically to it, the images are sent immediately as they are acquired by the operator. When the remote device is configured in manual mode, the operator selects one or more images from the list of saved images and transfers them to the printer as a group.

#### 2.3.1.2.2.1 Associated Real-World Activity

Upon a request by the operator (manual or automatic), an image will be sent to a DICOM Print SCP. If an error occurs during the transmission, the current association is released and a new association initiated. The maximum number of retries is 5. All images remain on the local harddisk of the scanner until the user removes them so in the event of complete retry failure, the images can be transferred manually by the operator to another device.

#### 2.3.1.2.2.2 Proposed Presentation Context Table

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

### 2.3.1.2.2.2.1 SOP Specific DICOM Conformance Statement for all Print SOP Classes

#### 2.3.1.2.2.2.1.1 SOP Specific Conformance for- Basic Grayscale Print Management

Standard conformance is provided to the DICOM Basic Grayscale Print Management Meta SOP Class as an SCU. All mandatory elements for film sessions, basic film boxes and basic grayscale images boxes are provided by the NetManager AE.



**2.3.1.2.2.1.2 SOP Specific Conformance for - Basic Color Print Management**

Standard conformance is provided to the DICOM Basic Color Print Management Meta SOP Class as an SCU. All mandatory elements for film sessions, basic film boxes and basic color images boxes are provided by the NetManager AE.

**2.3.1.2.3 Real-World Activity - C (Verification)**

Verification Service Class is used as a diagnostic and informative tool on the LOGIQ 700 to provide information to the user regarding status of network devices (PACS, printers) that have been configured on the scanner.

**2.3.1.2.3.1 Associated Real-World Activity**

The user may initiate a DICOM Verify by selecting ‘Echo Test’ on the Printer Control menu. When selected, each of the configured network devices will be tested, one at a time, with a DICOM C-ECHO. The results of the C-ECHO are displayed on the screen, opposite the device AE title.

Additionally, when the scanner is first powered up, each configured network device will be tested with a DICOM C-ECHO. This is to ensure that the hardware path to the device is tested, prior to transmitting images to Storage and Print devices.

Associations will be released upon the receipt of each C-ECHO confirmation.

**2.3.1.2.3.2 Proposed Presentation Context Table**

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

**2.3.1.2.3.2.1 SOP Specific DICOM Conformance Statement for Verify SOP Class**

The NetManager AE provides standard conformance to the Verification SOP Class as an SCU.

**2.3.1.3 Association Acceptance Policy**

The NetManager AE accepts an association only when the LOGIQ 700 scanner receives a Verification Request from another network device.

**2.3.1.3.1 Real-World Activity - Verification Request**

**2.3.1.3.1.1 Associated Real-World Activity**

An incoming Verification Request will cause the NetManager AE to accept the association and respond with a Verification Response.

### 2.3.1.3.1.2 Accepted Presentation Context Table

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

#### 2.3.1.3.1.2.1 SOP Specific DICOM Conformance Statement for Verify SOP Class

The NetManager AE provides standard conformance to the Verification SOP Class as an SCP.

#### 2.3.1.3.1.3 Presentation Context Acceptance Criterion

No criterion.

#### 2.3.1.3.1.4 Transfer Syntax Selection Policies

Only Little Endian transfer syntax is supported and there is no priority selection policy.

## 2.4 COMMUNICATION PROFILES

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

DICOM Upper Layer (Part 8) is supported using TCP/IP over Ethernet v2.0.

### 2.4.2 OSI Stack

OSI stack is not supported.

#### 2.4.2.1 International Standardized Profile (ISP)

ISP not supported

#### 2.4.2.2 API

Not applicable to this product.

#### 2.4.2.3 Physical Media Support

There are no physical media dependencies beyond Ethernet v2.0 requirements.

### 2.4.3 TCP/IP Stack

The TCP/IP stack is inherited from pSOS/pNA Operating System which the LOGIQ 700 application is built on.

#### **2.4.3.1 API**

Not applicable to this product.

#### **2.4.3.2 Physical Media Support**

Ethernet v2.0, IEEE 802.3.

#### **2.4.4 Point-to-Point Stack**

Not applicable to this product.

### **2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS**

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

Not applicable for this product.

### **2.6 CONFIGURATION**

#### **2.6.1 AE Title/Presentation Address Mapping**

The Local AE Title is configurable and is normally configured by a GEMS Service Engineer during DICOM software installation. It can also be modified by the user if the need arises. The AE Title is set from the system configuration menu as part of the user interface. It may also be set via InSite over a modem line.

#### **2.6.2 Configurable Parameters**

The following fields are configurable for this AE (local):

- Local AE title
- Listening TCP/IP port (port 104 is the default port number)
- Local IP Address
- Local IP Netmask
- Local routing table information

The following fields are configurable for remote DICOM storage and print AE's:

- Remote AE title
- Responding TCP/IP port (port 104 is the default port number)
- Remote IP Address
- Remote host name

**Note:** All configurations must be performed by a GE Service Engineer or through InSite.

### **2.7 SUPPORT OF EXTENDED CHARACTER SETS**

No extended character sets are supported.

## **3. ULTRASOUND (US) INFORMATION OBJECT IMPLEMENTATION**

### **3.1 INTRODUCTION**

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

3.2 - IOD Description

3.3 - IOD Entity-Relationship Model

3.4 - IOD Module Table

3.5 - IOD Module Definition

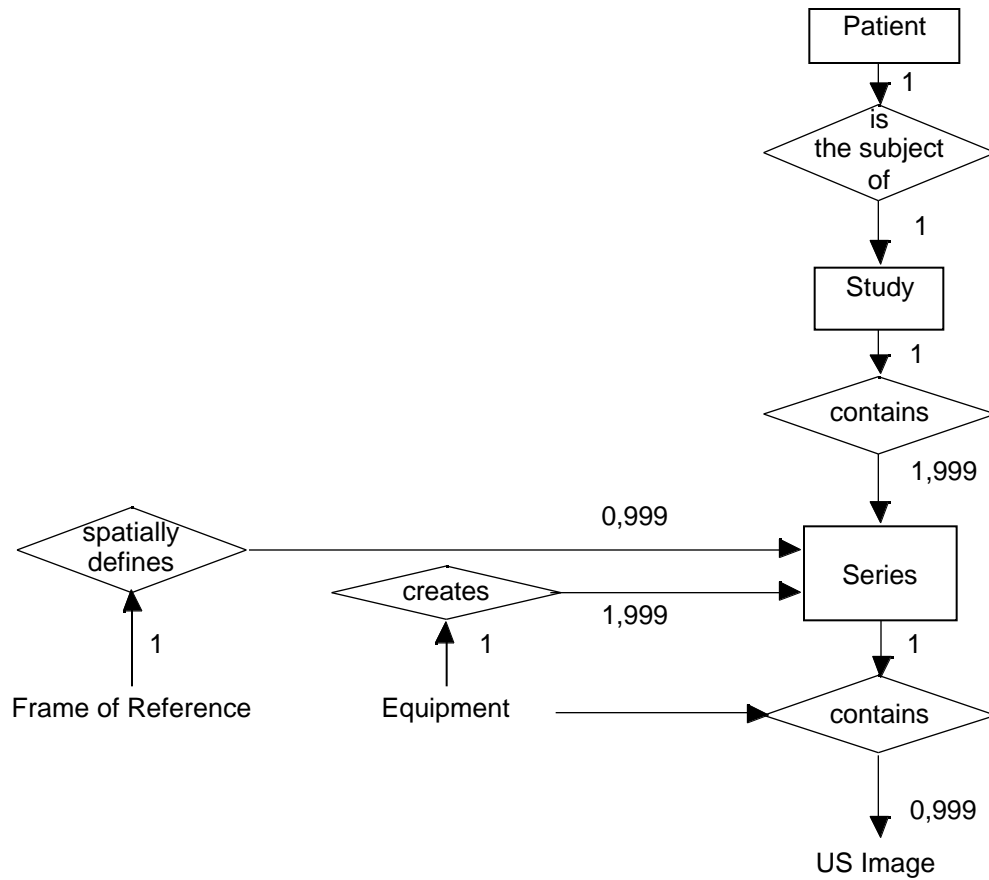
### **3.2 US IOD IMPLEMENTATION**

#### **3.3 US ENTITY-RELATIONSHIP MODEL**

The Entity-Relationship diagram for the US Image interoperability schema is shown in ILLUSTRATION 3.3-1. In this figure, the following diagrammatic convention is established to represent the information organization :

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

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to 999 Images per Series, but the Patient to Study relationship has 1 Study for each Patient (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).



**ILLUSTRATION 3.3-1 US IMAGE ENTITY RELATIONSHIP DIAGRAM**

**3.3.1 ENTITY DESCRIPTIONS**

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

**3.3.1.1 Patient Entity Description**

*Patient Entity* defines the characteristics of a Patient who is the subject of medical Studies which produce medical images. A Patient is diagnosed by one or more Studies.

**3.3.1.2 Study Entity Description**

A *Study Entity* defines a medical Study performed on a Patient. A Study is a collection of one or more Series of medical images which are logically related to each other for the purpose of diagnosing a Patient. Each Study can be associated with one, and only one Patient.

### 3.3.1.3 Series Entity Description

A *Series Entity* defines the attributes which identify distinct logical sets of images. One key criteria is used to group images into a Series. All Series within a Study are of the same modality type.

### 3.3.1.4 Equipment Entity Description

The *Equipment Entity* describes the imaging hardware which produced a particular Series of images. A single piece of Equipment may produce one or more Series within a Study.

The *Equipment Entity* does not describe the data acquisition and/or image creation attributes used to generate the medical images within a Series. The description of the image acquisition and creation parameters are specified in the Image Entity.

### 3.3.1.5 Frame of Reference Entity Description

The *Frame of Reference Entity* uniquely identifies the spatial coordinate system which has been used to produce an Image. An Image is related to one, and only one, Frame of Reference.

### 3.3.1.6 US Image Entity Description

The *Image Entity* defines the attributes which fully describe the pixel data of an Ultrasound image. The pixel data which was either generated as a direct result of Ultrasound scanning or derived from the pixel data of other US images (DEFF files stored on MODs).

## 3.3.2 LOGIQ 700 Mapping of DICOM entities

TABLE 3.3.2-1  
MAPPING OF DICOM ENTITIES TO LOGIQ 700 ENTITIES

DICOM	LOGIQ 700 Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image
Curve	not used

## 3.4 IOD MODULE TABLE

Within an entity of the DICOM v3.0 US 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 3.3.2-2 identifies the defined modules within the entities which comprise the DICOM v3.0 US IOD. Modules are identified by Module Name.

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

The LOGIQ 700 single frame US Image IOD is defined by the following table.

**TABLE 3.3.2-2  
US IMAGE IOD MODULES**

<b>Entity Name</b>	<b>Module Name</b>	<b>Reference</b>
Patient	Patient	3.5.1.1
Study	General Study	3.5.2.1
	Patient Study	3.5.2.2
Series	General Series	3.5.3.1
Frame of Reference	Frame of Reference	not used
	US Frame of Reference	3.5.8.1
Equipment	General Equipment	3.5.5.1
Image	General Image	3.5.6.1
	Image Pixel	3.5.6.2
	Contrast/Bolus	not used
	Palette Color Lookup Table	not used
	US Region Calibration	3.5.8.2
	US Image	3.5.8.3
	Overlay Plane	not used
	VOI LUT	not used
	SOP Common	3.5.7.1
Curve	Curve Identification	not used
	Curve	not used
	Audio	not used
	SOP Common	not used

The Image and Curve IEs are mutually exclusive. Each SOP Instance using this IOD shall contain exactly one of these IODs. Curve Entities are not created by this implementation..

### **3.5 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 US 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).

#### **3.5.1 Common Patient Entity Modules**

##### **3.5.1.1 Patient Module**

This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient

that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

**TABLE 3.5.1-1  
PATIENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	May be entered from User Interface. Last name limited to 13 characters; first name limited to 10 characters
Patient ID	(0010,0020)	2	May be entered from User Interface. Limited to 11 alpha numeric characters
Patient's Birth Date	(0010,0030)	2	May be entered from User Interface
Patient's Sex	(0010,0040)	2	May be entered from User Interface; limited to 'M' and 'F'
Referenced Patient Sequence	(0008,1120)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient's Birth Time	(0010,0032)	3	May be entered from User Interface (pediatrics exam only)
Other Patient IDs	(0010,1000)	3	Not used
Other Patient Names	(0010,1001)	3	Not used
Ethnic Group	(0010,2160)	3	Not used
Patient Comments	(0010,4000)	3	Not used

### 3.5.2 Common Study Entity Modules

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

#### 3.5.2.1 General Study Module

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

**TABLE 3.5.2-1  
GENERAL STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	generated using GEMS UID + LOGIQ 700 implementation UID + device serial number + patient id + study id
Study Date	(0008,0020)	2	Image capture date
Study Time	(0008,0030)	2	Image capture time
Referring Physician's Name	(0008,0090)	2	May be entered from User Interface
Study ID	(0020,0010)	2	Internal value which is incremented when User defines a New Patient.
Accession Number	(0008,0050)	2	sent with zero length
Study Description	(0008,1030)	3	Not used



Physician(s) of Record	(0008,1048)	3	Not used
Name of Physician(s) Reading Study	(0008,1060)	3	Not used
Referenced Study Sequence	(0008,1110)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	

### 3.5.2.2 Patient Study Module

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

**TABLE 3.5.2-2  
PATIENT STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Not used
Patient's Age	(0010,1010)	3	Calculated from DOB entered from User Interface
Patient's Size	(0010,1020)	3	May be entered from User Interface (vascular exams only)
Patient's Weight	(0010,1030)	3	May be entered from User Interface (vascular exams only)
Occupation	(0010,2180)	3	Not used
Additional Patient's History	(0010,21B0)	3	May be entered from User Interface

### 3.5.3 Common Series Entity Modules

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

#### 3.5.3.1 General Series Module

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

**TABLE 3.5.3-1  
GENERAL SERIES MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Defined Term "US" used
Series Instance UID	(0020,000E)	1	generated from GEMS UID + LOGIQ 700 implementation UID + device serial number + patient id + study id + series id
Series Number	(0020,0011)	2	Internal number which is incremented for each new exam type within a study (starts at '0' when user defines a New Patient)
Laterality	(0020,0060)	2C	Not used
Series Date	(0008,0021)	3	Not used
Series Time	(0008,0031)	3	Not used
Performing Physicians' Name	(0008,1050)	3	Not used
Protocol Name	(0018,1030)	3	Not used
Series Description	(0008,103E)	3	Not used
Operators' Name	(0008,1070)	3	May be entered from User Interface (limited to initials or 3-digit ID)
Referenced Study Component Sequence	(0008,1111)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Body Part Examined	(0018,0015)	3	Not used
Patient Position	(0018,5100)	2C	Not used
Smallest Pixel Value in Series	(0028,0108)	3	Not used
Largest Pixel Value in Series	(0028,0109)	3	Not used

### 3.5.4 Common Frame Of Reference Entity Modules

The following Frame of Reference IE Module is common to all Composite Image IODs which reference the Frame of Reference IE.

### 3.5.5 Common Equipment Entity Modules

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

#### 3.5.5.1 General Equipment Module

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

**TABLE 3.5.5-1  
GENERAL EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Implementation defined string "G.E. Medical Systems"
Institution Name	(0008,0080)	3	May be entered from User Interface
Institution Address	(0008,0081)	3	Not used
Station Name	(0008,1010)	3	Network host name entered from User Interface
Institutional Department Name	(0008,1040)	3	Not used
Manufacturer's Model Name	(0008,1090)	3	Implementation defined string "LOGIQ 700"
Device Serial Number	(0018,1000)	3	Implementation defined machine serial number
Software Versions	(0018,1020)	3	Implementation defined string "R1.0"
Spatial Resolution	(0018,1050)	3	Not used
Date of Last Calibration	(0018,1200)	3	Not used
Time of Last Calibration	(0018,1201)	3	Not used
Pixel Padding Value	(0028,0120)	3	See 3.5.5.1.1.1.

#### 3.5.5.1.1 General Equipment Attribute Descriptions

##### 3.5.5.1.1.1 Pixel Padding Value

Not used in this implementation

### 3.5.6 Common Image Entity Modules

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

#### 3.5.6.1 General Image Module

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

**TABLE 3.5.6-1  
GENERAL IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	2	internal value which is incremented for each captured image, within a series (within a study),
Patient Orientation	(0020,0020)	2C	See 3.5.6.1.1.1.
Image Date	(0008,0023)	2C	Not used (images not spatially related)
Image Time	(0008,0033)	2C	Not used (images not spatially related)
Image Type	(0008,0008)	3	See 3.5.6.1.1.2.
Acquisition Number	(0020,0012)	3	Not used
Acquisition Date	(0008,0022)	3	Not used
Acquisition Time	(0008,0032)	3	Not used
Referenced Image Sequence	(0008,1140)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Derivation Description	(0008,2111)	3	See 3.5.6.1.1.3
Source Image Sequence	(0008,2112)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Images in Acquisition	(0020,1002)	3	Not used
Image Comments	(0020,4000)	3	Not used
Lossy Image Compression	(0028,2110)	3	See 3.5.6.1.1.4

#### 3.5.6.1.1 General Image Attribute Descriptions

##### 3.5.6.1.1.1 Patient Orientation

This Attribute is sent with zero length.

### 3.5.6.1.1.2 Image Type

Value 1 shall have the following Enumerated Value:

- ORIGINAL identifies an Original Image when the image has been created by the LOGIQ 700.

Value 2 shall have the following Enumerated Value:

- PRIMARY identifies a Primary Image when the image has been created by the LOGIQ 700.

See 3.5.8.3.1.1 for Defined Terms used for Value 3

Value sent with zero length if image not created by the LOGIQ 700.

### 3.5.6.1.1.3 Derivation Description and Source Image Sequence

Not used in this implementation.

### 3.5.6.1.1.4 Lossy Image Compression

Not used in this implementation.

### 3.5.6.2 Image Pixel Module

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

**TABLE 3.5.6-2  
IMAGE PIXEL MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Value of '1' when Photometric Interpretation element value = 'MONOCHROME'; Value of '3' when Photometric Interpretation element value = 'RGB'
Photometric Interpretation	(0028,0004)	1	Defined Values used: MONOCHROME2 RGB
Rows	(0028,0010)	1	Value always = 480d in 60Hz Value always = 562d in 50Hz
Columns	(0028,0011)	1	Value always = 640d in 60Hz Value always = 768d in 50Hz
Bits Allocated	(0028,0100)	1	Value always = 0008H
Bits Stored	(0028,0101)	1	Value always = 0008H
High Bit	(0028,0102)	1	Value always = 0007H
Pixel Representation	(0028,0103)	1	Defined Value '0' - unsigned integer
Pixel Data	(7FE0,0010)	1	
Planar Configuration	(0028,0006)	1C	Defaults to 0000H Enumerated Value - color by pixel. Enumerated value 0001H, color-by-plane, can be configured
Pixel Aspect Ratio	(0028,0034)	1C	1\1
Smallest Image Pixel Value	(0028,0106)	3	Not used

Largest Image Pixel Value	(0028,0107)	3	Not used
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB
Red Palette Color Lookup Table Data	(0028,1201)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB
Green Palette Color Lookup Table Data	(0028,1202)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB

### 3.5.7 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

#### 3.5.7.1 SOP Common Module

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

**TABLE 3.5.7-1  
SOP COMMON MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	“1.2.840.10008.5.1.4.1.1.6.1” or “1.2.840.10008.5.1.4.1.1.6”
SOP Instance UID	(0008,0018)	1	generated from GEMS UID + patient ID+ device serial number + study id + series id + image id + timestamp (capture date/time)
Specific Character Set	(0008,0005)	1C	Not used as expanded or replacement character sets not used
Instance Creation Date	(0008,0012)	3	Not used
Instance Creation Time	(0008,0013)	3	Not used
Instance Creator UID	(0008,0014)	3	Not used

### 3.5.8 US Modules

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

#### 3.5.8.1 US Frame of Reference Module

This section contains IOD Attributes that describe an ultrasound frame of reference.

**TABLE 3.5.8-1  
US FRAME OF REFERENCE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Region Location Min $x_0$	(0018,6018)	1	Varies with scanning mode. Values = 0, 10, 320
Region Location Min $y_0$	(0018,601A)	1	Varies with scanning mode. Values = 0, 10, 252
Region Location Max $x_1$	(0018,601C)	1	Varies with scanning mode. Values = 0, 319, 625
Region Location Max $y_1$	(0018,601E)	1	Varies with scanning mode. Values = 0, 251, 319, 445
Physical Units X Direction	(0018,6024)	1	Enumerated Values created supported: 0003H cm 0004H seconds
Physical Units Y Direction	(0018,6026)	1	Enumerated Values created supported: 0003H cm 0004H seconds 0005H hertz(seconds <sup>-1</sup> ) 0007H cm/sec
Physical Delta X	(0018,602C)	1	Varies with scanning mode
Physical Delta Y	(0018,602E)	1	Varies with scanning mode
Reference Pixel $x_0$	(0018,6020)	3	Varies with scanning mode
Reference Pixel $y_0$	(0018,6022)	3	Varies with scanning mode
Ref. Pixel Physical Value X	(0018,6028)	3	Value always = '0'
Ref. Pixel Physical Value Y	(0018,602A)	3	Value always = '0'

#### 3.5.8.2 US Region Calibration Module

This section contains IOD Attributes that describe an ultrasound region calibration.

**TABLE 3.5.8-2  
US REGION CALIBRATION MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Sequence of Ultrasound Regions	(0018,6011)	1	Object always contains 4 regions but may not have data in each region
>Region Location Min $x_0$	(0018,6018)	1	Varies with scanning mode. Values = 0, 10, 320
>Region Location Min $y_0$	(0018,601A)	1	Varies with scanning mode. Values = 0, 10, 252

>Region Location Max $x_1$	(0018,601C)	1	Varies with scanning mode. Values = 0, 319, 625
>Region Location Max $y_1$	(0018,601E)	1	Varies with scanning mode. Values = 0, 251, 319, 445
>Physical Units X Direction	(0018,6024)	1	Enumerated Values supported: 0003H cm 0004H seconds
>Physical Units Y Direction	(0018,6026)	1	Enumerated Values supported: 0003H cm 0004H seconds 0005H hertz(seconds <sup>-1</sup> ) 0007H cm/sec
>Physical Delta X	(0018,602C)	1	Varies with scanning mode
>Physical Delta Y	(0018,602E)	1	Varies with scanning mode
>Reference Pixel $x_0$	(0018,6020)	3	Varies with scanning mode
>Reference Pixel $y_0$	(0018,6022)	3	Varies with scanning mode
>Ref. Pixel Physical Value X	(0018,6028)	3	Value always = '0'
>Ref. Pixel Physical Value Y	(0018,602A)	3	Value always = '0'
>Region Spatial Format	(0018,6012)	1	Enumerated Values supported: 0001H 2D 0002H M-Mode 0003H Spectral
>Region Data Type	(0018,6014)	1	Enumerated Values supported: 0001H Tissue 0006H Doppler Mode Trace
>Region Flags	(0018,6016)	1	Bit 1 Scaling Protection used Bit 2 Doppler Scale Type used
>Pixel Component Organization	(0018,6044)	1C	pixel component calibration data does not exist for any region
>Pixel Component Mask	(0018,6046)	1C	Not used since Pixel Component Organization not used
>Pixel Component Range Start	(0018,6048)	1C	Not used since Pixel Component Organization not used
>Pixel Component Range Stop	(0018,604A)	1C	Not used since Pixel Component Organization not used
>Pixel Component Physical Units	(0018,604C)	1C	Not used since Pixel Component Organization not used
>Pixel Component Data Type	(0018,604E)	1C	Not used since Pixel Component Organization not used
>Number of Table Break Points	(0018,6050)	1C	Not used since Pixel Component Organization not used
>Table of X Break Points	(0018,6052)	1C	Not used since Pixel Component Organization not used
>Table of Y Break Points	(0018,6054)	1C	Not used since Pixel Component Organization not used
>Number of Table Entries	(0018,6056)	1C	Not used since Pixel Component Organization not used



>Table of Pixel Values	(0018,6058)	1C	Not used since Pixel Component Organization not used
>Table of Parameter Values	(0018,605A)	1C	Not used since Pixel Component Organization not used
>Transducer Frequency	(0018,6030)	3	Hexadecimal value of current probe frequency, scaled by 16 bits
>Pulse Repetition Frequency	(0018,6032)	3	Value always = '0'
>Doppler Correction Angle	(0018,6034)	3	Not Used
>Steering Angle	(0018,6036)	3	Not Used
>Doppler Sample Volume X Position	(0018,6038)	3	Not Used
>Doppler Sample Volume Y Position	(0018,603A)	3	Not Used
>TM-Line Position $x_0$	(0018,603C)	3	Not Used
>TM-Line Position $y_0$	(0018,603E)	3	Not Used
>TM-Line Position $x_1$	(0018,6040)	3	Not Used
>TM-Line Position $y_1$	(0018,6042)	3	Not Used

### 3.5.8.3 US Image Module

This section specifies the Attributes that describe ultrasound images.

**TABLE 3.5.8-3  
US IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Samples Per Pixel	(0028,0002)	1	Value of '1' when Photometric Interpretation element value = 'MONOCHROME'; Value of '3' when Photometric Interpretation element value = 'RGB'
Photometric Interpretation	(0028,0004)	1	Defined Terms supported: MONOCHROME2 RGB only values supported
Bits Allocated	(0028,0100)	1	Value always = 0008H
Bits Stored	(0028,0101)	1	Value always = 0008H
High Bit	(0028,0102)	1	Value always = 0007H
Planar Configuration	(0028,0006)	1	Defaults to 0000H Enumerated Value - color by pixel. Enumerated value 0001H, color-by-plane, can be configured
Pixel Representation	(0028,0103)	1	Always 0000H = unsigned integer.
Frame Increment Pointer	(0028,0009)	1C	absent since image is single frame
Image Type	(0008,0008)	2	See 3.5.8.3.1.1.
Lossy Image Compression	(0028,2110)	1C	Not used
Number of Stages	(0008,2124)	2C	Value always = '1'
Number of Views in Stage	(0008,212A)	2C	Value always = '1'
Ultrasound Color Data Present	(0028,0014)	3	Not Used
Referenced Overlay Sequence	(0008,1130)	3	Not Used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Referenced Curve Sequence	(0008,1145)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Stage Name	(0008,2120)	3	Field sent with NULL value
Stage Number	(0008,2122)	3	Value always = '0'
View Number	(0008,2128)	3	Value always = '0'
Number of Event Timers	(0008,2129)	3	Not used
Event Elapsed Time(s)	(0008,2130)	3	Not used
Event Timer Name(s)	(0008,2132)	3	Not used
Anatomic Region Sequence	(0008,2218)	3	Not used
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	3	
>Anatomic Region Modifier Sequence	(0008,2220)	3	Not used

>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	
Primary Anatomic Structure Sequence	(0008,2228)	3	Not used
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	3	
>Primary Anatomic Structure Modifier Sequence	(0008,2230)	3	Not used
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	
Transducer Position Sequence	(0008,2240)	3	Not used
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	3	
> Transducer Position Modifier Sequence	(0008,2242)	3	Not used
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	
Transducer Orientation Sequence	(0008,2244)	3	Not used
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Code Meaning	(0008,0104)	3	Not used
> Transducer Orientation Modifier Sequence	(0008,2246)	3	Not used
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Code Meaning	(0008,0104)	3	Not used
Trigger Time	(0018,1060)	3	Not used
Nominal Interval	(0018,1062)	3	Not used
Beat Rejection Flag	(0018,1080)	3	Not used
Low R-R Value	(0018,1081)	3	Not used
High R-R Value	(0018,1082)	3	Not used
Heart Rate	(0018,1088)	3	Not used
Output Power	(0018,5000)	3	Not used
Transducer Data	(0018,5010)	3	Not used
Transducer Type	(0018,6031)	3	Not used
Focus Depth	(0018,5012)	3	Not used
Preprocessing Function	(0018,5020)	3	Not used
Mechanical Index	(0018,5022)	3	Not used
Bone Thermal Index,	(0018,5024)	3	Not used

Cranial Thermal Index	(0018,5026)	3	Not used
Soft Tissue Thermal Index	(0018,5027)	3	Not used
Soft Tissue-focus Thermal Index	(0018,5028)	3	Not used
Soft Tissue-surface Thermal Index	(0018,5029)	3	Not used
Depth of Scan Field	(0018,5050)	3	Not used
Image Transformation Matrix	(0018,5210)	3	Not used
Image Translation Vector	(0018,5212)	3	Not used
Overlay Subtype	(60xx,0045)	3	Not used

### 3.5.8.3.1 US Image Attribute Descriptions

#### 3.5.8.3.1.1 Image Type

The following Defined Terms for Value 3 are created:

ABDOMINAL  
SMALL PARTS

VASCULAR  
PEDIATRIC

OBSTETRICAL

## **4. SC INFORMATION OBJECT IMPLEMENTATION**

### **4.1 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:

4.2 - IOD Description

4.3 - IOD Entity-Relationship Model

4.4 - IOD Module Table

4.5 - IOD Module Definition

### **4.2 SC IOD IMPLEMENTATION**

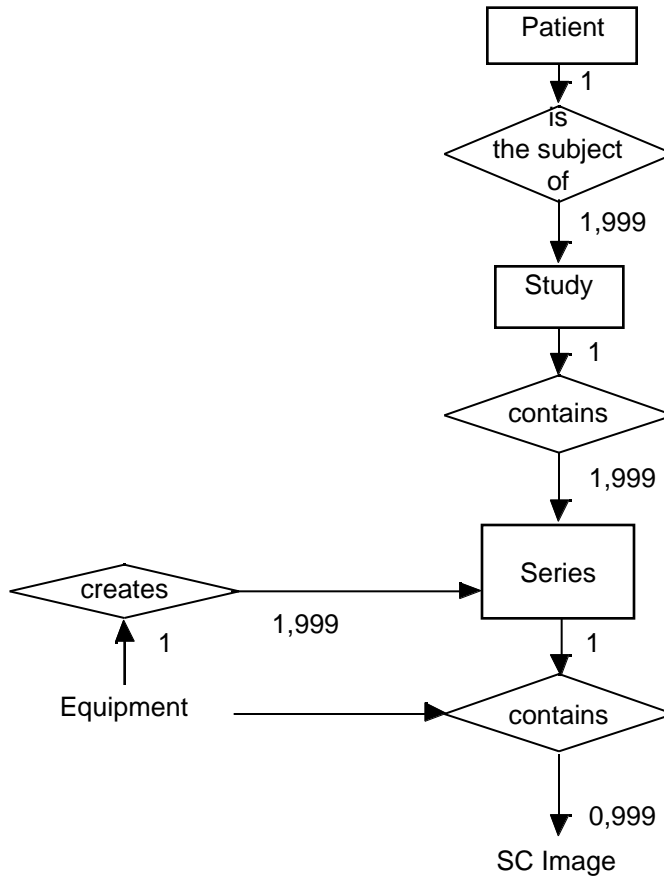
### **4.3 SC ENTITY-RELATIONSHIP MODEL**

The Entity-Relationship diagram for the SC Image interoperability schema is shown in ILLUSTRATION 4.3-1. In this figure, the following diagrammatic convention is established to represent the information organization :

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

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to 999 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 4.3-1  
SC IMAGE ENTITY RELATIONSHIP DIAGRAM**



**4.3.1 ENTITY DESCRIPTIONS**

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

**4.3.1.1 Patient Entity Description**

*Patient Entity* defines the characteristics of a Patient who is the subject of medical Studies which produce medical images. A Patient is diagnosed by one or more Studies.

**4.3.1.2 Study Entity Description**

A *Study Entity* defines a medical Study performed on a Patient. A Study is a collection of one or more Series of medical images which are logically related to each other for the purpose of diagnosing a Patient. Each Study can be associated with one, and only one Patient.

#### 4.3.1.3 Series Entity Description

A *Series Entity* defines the attributes which identify distinct logical sets of images. One key criteria is used to group images into a Series. All Series within a Study are of the same modality type.

#### 4.3.1.4 Equipment Entity Description

The *Equipment Entity* describes the imaging hardware which produced a particular Series of images. A single piece of Equipment may produce one or more Series within a Study.

The *Equipment Entity* does not describe the data acquisition and/or image creation attributes used to generate the medical images within a Series. The description of the image acquisition and creation parameters are specified in the Image Entity.

#### 4.3.1.5 SC Image Entity Description

#### 4.3.1.6 Overlay Entity Description

#### 4.3.1.7 VOI Lookup Table Entity Description

### 4.3.2 LOGIQ 700 Mapping of DICOM entities

TABLE 4.3.2-1  
MAPPING OF DICOM ENTITIES TO LOGIQ 700 ENTITIES

DICOM	LOGIQ 700 Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image
Frame	Not Applicable

## 4.4 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 4.3.2-2 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 4.3.2-2  
SC IMAGE IOD MODULES**

<b>Entity Name</b>	<b>Module Name</b>	<b>Reference</b>
Patient	Patient	4.5.1.1
Study	General Study	4.5.2.1
	Patient Study	4.5.2.2
Series	General Series	4.5.3.1
Equipment	General Equipment	4.5.4.1
	SC Equipment	4.5.8.1
Image	General Image	4.5.5.1
	Image Pixel	4.5.5.2
	SC Image	4.5.8.2
	Overlay Plane	not used
	Modality LUT	not used
	VOI LUT	not used
	SOP Common	4.5.7.1

#### **4.5 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).



## 4.5.1 Common Patient Entity Modules

### 4.5.1.1 Patient Module

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

**TABLE 4.5.1-1  
PATIENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	May be entered from User Interface. Last name limited to 13 characters; first name limited to 10 characters
Patient ID	(0010,0020)	2	May be entered from User Interface. Limited to 11 alphanumeric characters
Patient's Birth Date	(0010,0030)	2	May be entered from User Interface
Patient's Sex	(0010,0040)	2	May be entered from User Interface; limited to 'M' and 'F'
Referenced Patient Sequence	(0008,1120)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient's Birth Time	(0010,0032)	3	May be entered from User Interface (pediatrics exam only)
Other Patient IDs	(0010,1000)	3	Not used
Other Patient Names	(0010,1001)	3	Not used
Ethnic Group	(0010,2160)	3	Not used
Patient Comments	(0010,4000)	3	Not used

## 4.5.2 Common Study Entity Modules

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

#### 4.5.2.1 General Study Module

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

**TABLE 4.5.2-1  
GENERAL STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	generated using GEMS UID + LOGIQ 700 implementation UID + device serial number + patient id + study id
Study Date	(0008,0020)	2	Image capture date
Study Time	(0008,0030)	2	Image capture date
Referring Physician's Name	(0008,0090)	2	May be entered from User Interface
Study ID	(0020,0010)	2	Internal value which is incremented when User defines a New Patient.
Accession Number	(0008,0050)	2	sent with zero value
Study Description	(0008,1030)	3	Not used
Physician(s) of Record	(0008,1048)	3	Not used
Name of Physician(s) Reading Study	(0008,1060)	3	Not used
Referenced Study Sequence	(0008,1110)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	

#### 4.5.2.2 Patient Study Module

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

**TABLE 4.5.2-2  
PATIENT STUDY MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Not used
Patient's Age	(0010,1010)	3	Calculated from DOB entered from User Interface
Patient's Size	(0010,1020)	3	May be entered from User Interface (vascular exam only)
Patient's Weight	(0010,1030)	3	May be entered from User Interface (vascular exam only)
Occupation	(0010,2180)	3	Not used
Additional Patient's History	(0010,21B0)	3	May be entered from User Interface

### 4.5.3 Common Series Entity Modules

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

#### 4.5.3.1 General Series Module

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

**TABLE 4.5.3-1  
GENERAL SERIES MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Defined Term "US" value used
Series Instance UID	(0020,000E)	1	generated from GEMS UID + LOGIQ 700 implementation UID + device serial number + patient id + study id + series id
Series Number	(0020,0011)	2	Internal number which is incremented for each new exam type within a study (starts at '0' when user defines a New Patient)
Laterality	(0020,0060)	2C	Not used
Series Date	(0008,0021)	3	Not used
Series Time	(0008,0031)	3	Not used
Performing Physicians' Name	(0008,1050)	3	Not used
Protocol Name	(0018,1030)	3	Not used
Series Description	(0008,103E)	3	Not used
Operators' Name	(0008,1070)	3	May be entered from User Interface (limited to initials only)
Referenced Study Component Sequence	(0008,1111)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Body Part Examined	(0018,0015)	3	Not used
Patient Position	(0018,5100)	2C	Not used
Smallest Pixel Value in Series	(0028,0108)	3	Not used
Largest Pixel Value in Series	(0028,0109)	3	Not used

#### 4.5.4 Common Equipment Entity Modules

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

##### 4.5.4.1 General Equipment Module

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

**TABLE 4.5.4-1  
GENERAL EQUIPMENT MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Implementation defined string "G.E. Medical Systems"
Institution Name	(0008,0080)	3	May be entered from User Interface
Institution Address	(0008,0081)	3	Not used
Station Name	(0008,1010)	3	Network host name entered from User Interface
Institutional Department Name	(0008,1040)	3	Not used
Manufacturer's Model Name	(0008,1090)	3	Implementation defined string "LOGIQ 700"
Device Serial Number	(0018,1000)	3	Implementation defined machine serial number
Software Versions	(0018,1020)	3	Implementation defined string "R1.0"
Spatial Resolution	(0018,1050)	3	Not used
Date of Last Calibration	(0018,1200)	3	Not used
Time of Last Calibration	(0018,1201)	3	Not used
Pixel Padding Value	(0028,0120)	3	See 4.5.4.1.1.1.

##### 4.5.4.1.1 General Equipment Attribute Descriptions

###### 4.5.4.1.1.1 Pixel Padding Value

Not used in this implementation.

#### 4.5.5 Common Image Entity Modules

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

##### 4.5.5.1 General Image Module

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

**TABLE 4.5.5-1  
GENERAL IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	2	internal value which is incremented for each captured image, within a series (within a study),

Patient Orientation	(0020,0020)	2C	See 4.5.5.1.1.1.
Image Date	(0008,0023)	2C	Not used (images not spatially related)
Image Time	(0008,0033)	2C	Not used (images not spatially related)
Image Type	(0008,0008)	3	See 4.5.5.1.1.2.
Acquisition Number	(0020,0012)	3	Not used
Acquisition Date	(0008,0022)	3	Not used
Acquisition Time	(0008,0032)	3	Not used
Referenced Image Sequence	(0008,1140)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Derivation Description	(0008,2111)	3	See 0
Source Image Sequence	(0008,2112)	3	See 0
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Images in Acquisition	(0020,1002)	3	Not used
Image Comments	(0020,4000)	3	Not used
Lossy Image Compression	(0028,2110)	3	See 4.5.5.1.1.4

#### 4.5.5.1.1 General Image Attribute Descriptions

##### 4.5.5.1.1.1 Patient Orientation

This attribute is always sent with zero length.

##### 4.5.5.1.1.2 Image Type

Value 1 shall have the following Enumerated Value:

- ORIGINAL identifies an Original Image when the image has been created by the LOGIQ 700.

Value 2 shall have the following Enumerated Value:

- PRIMARY identifies a Primary Image when the image has been created by the LOGIQ 700.

Value sent with zero length if image not created by the LOGIQ 700.

##### 4.5.5.1.1.3 Derivation Description and Source Image Sequence

Not used in this implementation.

##### 4.5.5.1.1.4 Lossy Image Compression

Not used in this implementation.

#### 4.5.5.2 Image Pixel Module

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

**TABLE 4.5.5-2  
IMAGE PIXEL MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>Type</b>	<b>Attribute Description</b>
Samples per Pixel	(0028,0002)	1	Value of '1' when Photometric Interpretation element value = 'MONOCHROME'; Value of '3' when Photometric Interpretation element value = 'RGB'
Photometric Interpretation	(0028,0004)	1	Defined Values used: MONOCHROME2 RGB
Rows	(0028,0010)	1	Value always = 480d in 60Hz Value always = 562d in 50Hz
Columns	(0028,0011)	1	Value always = 640d in 60Hz Value always = 768d in 50Hz
Bits Allocated	(0028,0100)	1	Value always = 0008H
Bits Stored	(0028,0101)	1	Value always = 0008H
High Bit	(0028,0102)	1	Value always = 0007H
Pixel Representation	(0028,0103)	1	Defined Value '0' - unsigned integer
Pixel Data	(7FE0,0010)	1	
Planar Configuration	(0028,0006)	1C	Defaults to 0000H Enumerated Value - color by pixel. Enumerated value 0001H, color-by-plane, can be configured
Pixel Aspect Ratio	(0028,0034)	1C	Not used as Aspect Ratio maintained at 1/1
Smallest Image Pixel Value	(0028,0106)	3	Not used
Largest Image Pixel Value	(0028,0107)	3	Not used
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB
Red Palette Color Lookup Table Data	(0028,1201)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB
Green Palette Color Lookup Table Data	(0028,1202)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Not used since (0028, 0004) value never PALETTE COLOR or ARGB

## 4.5.6 Common Overlay Modules

### 4.5.6.1 Overlay plane module

Not used in this implementation.

## 4.5.7 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

### 4.5.7.1 SOP Common Module

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

**TABLE 4.5.7-1**  
**SOP COMMON MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	(0008,0018)	1	generated from GEMS UID + patient ID+ device serial number + study id + series id + image id + timestamp (capture date/time)
Specific Character Set	(0008,0005)	1C	Not used as expanded or replacement character sets not used
Instance Creation Date	(0008,0012)	3	Not used
Instance Creation Time	(0008,0013)	3	Not used
Instance Creator UID	(0008,0014)	3	Not used

#### 4.5.8 SC Modules

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

##### 4.5.8.1 SC Equipment Module

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

**TABLE 4.5.8-1  
SC IMAGE EQUIPMENT MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>Type</b>	<b>Attribute Description</b>
Conversion Type	(0008,0064)	1	Defined Term DI = Digital Interface used
Modality	(0008,0060)	3	Defined Valued "US" used
Secondary Capture Device ID	(0018,1010)	3	
Secondary Capture Device Manufacturer	(0018,1016)	3	Implementation defined string "G.E. Medical Systems"
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	3	Implementation defined string "LOGIQ 700"
Secondary Capture Device Software Version	(0018,1019)	3	Implementation defined string "R1.0"
Video Image Format Acquired	(0018,1022)	3	Not used
Digital Image Format Acquired	(0018,1023)	3	Not used

##### 4.5.8.2 SC Image Module

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

**TABLE 4.5.8-2  
SC IMAGE MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>Type</b>	<b>Attribute Description</b>
Date of Secondary Capture	(0018,1012)	3	Image capture date
Time of Secondary Capture	(0018,1014)	3	Image capture time



## 5. PRINT MANAGEMENT SOP CLASS DEFINITION

### 5.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the supported Print Management SOP and Meta SOP Classes, the optional attributes and service elements supported, the valid range of values for mandatory and optional attributes, and the status code behavior.

5.2 - Basic Print Management Meta SOP Classes

5.3 - Print Management SOP Class Definitions

5.4 - Print Management IODs

5.5 - IOD Module Definition

### 5.2 BASIC PRINT MANAGEMENT META SOP CLASSES

The Basic Print Management Meta SOP Classes correspond with the minimum functionality that an implementation of the Print Management Service Class shall support.

The LOGIQ 700 supports the Basic Grayscale Print Management Meta SOP Class and the Basic Color Print Management Meta SOP Class. These are defined in Table 5.2.1-1 and Table 5.2.2-1.

#### 5.2.1 Basic Grayscale Print Management Meta SOP Class

The Basic Grayscale Print Management Meta SOP Class is defined by the following set of supported SOP Classes.

**TABLE 5.2.1-1 BASIC GRAYSCALE PRINT MANAGEMENT META SOP CLASS**

SOP Class Name	Usage SCU/SCP	Reference
Basic Film Session SOP Class	M/M	see 5.3.1
Basic Film Box SOP Class	M/M	see 5.3.2
Basic Grayscale Image Box SOP Class	M/M	see 5.3.3.1
Printer SOP Class	M/M	see 5.3.4

#### 5.2.2 Basic Color Print Management Meta SOP Class

The Basic Color Print Management Meta SOP Class is defined by the following set of supported SOP Classes

**TABLE 5.2.2-1 BASIC COLOR PRINT MANAGEMENT META SOP CLASS**

<b>SOP Class Name</b>	<b>Usage SCU</b>	<b>Reference</b>
Basic Film Session SOP Class	M	see 5.3.1
Basic Film Box SOP Class	M	see 5.3.2
Basic Color Image Box SOP Class	M	see 5.3.3.2
Printer SOP Class	M	see 5.3.4

### **5.3 PRINT MANAGEMENT SOP CLASS DEFINITIONS**

#### **5.3.1 Basic Film Session SOP Class**

The Basic Film Session IOD describes the presentation parameters which are common for all the films of a film session. The DIMSE services that are applicable to the IOD are shown in Table 5.3.1-1..

**TABLE 5.3.1-1 DIMSE SERVICE GROUP**

<b>DIMSE Service Element</b>	<b>Usage SCU</b>	<b>Reference</b>
N-CREATE	M	see 5.3.1.1.1
N-SET	U	see 5.3.1.1.2
N-DELETE	U	see 5.3.1.1.3
N-ACTION	U	see 5.3.1.1.4

##### **5.3.1.1 DIMSE Service Group**

###### **5.3.1.1.1 N-CREATE**

The N-CREATE DIMSE Service is used by the LOGIQ 700 to request that the SCP (printer) create a Film Session SOP Instance. Table 5.4.2-1 defines the Basic Film Session Presentation Module attributes used in this request.

###### **5.3.1.1.2 N-SET**

Not used in this implementation.

###### **5.3.1.1.3 N-DELETE**

The N-DELETE DIMSE Service is used by the LOGIQ 700 to request the SCP (printer) to delete the complete Film Session SOP Hierarchy. The root Film Session SOP Instance UID is sent to the SCP to accomplish this.

###### **5.3.1.1.4 N-ACTION**

Not used in this implementation

### 5.3.2 Basic Film Box SOP Class

The Basic Film Box IOD is an abstraction of the presentation of one film of the film session. The DIMSE services that are applicable to the IOD are shown in Table 5.3.2-1.

**TABLE 5.3.2-1 DIMSE SERVICE GROUP**

DIMSE Service Element	Usage SCU	Reference
N-CREATE	M	see 5.3.2.1.1
N-ACTION	M	see 5.3.2.1.2
N-DELETE	U	see 5.3.2.1.3
N-SET	U	see 5.3.2.1.4

#### 5.3.2.1 DIMSE Service Group

##### 5.3.2.1.1 N-CREATE

The N-CREATE DIMSE Service is used by the LOGIQ 700 to request that the SCP create a Film Box SOP Instance. Table 5.4.2-1 defines the Basic Film Box Presentation Module attributes used in this request.

##### 5.3.2.1.2 N-ACTION

The N-ACTION DIMSE Service is used by the LOGIQ 700 to request the SCP (printer) to print one copy of a single film of the film session.

##### 5.3.2.1.3 N-DELETE

Not used in this implementation.

##### 5.3.2.1.4 N-SET

Not used in this implementation.

### 5.3.3 Image Box SOP Class

#### 5.3.3.1 Basic Grayscale Image Box SOP Class

The Basic Grayscale Image Box IOD is an abstraction of the presentation of an image and image related data in the image area of a film. The DIMSE services that are applicable to the IOD are shown in Table 5.3.3-1.

**TABLE 5.3.3-1 DIMSE SERVICE GROUP**

DIMSE Service Element	Usage SCU	Reference
N-SET	M	see 5.3.3.1.1

### 5.3.3.1.1 DIMSE Service Group (N-SET)

The N-SET DIMSE Service is used by the LOGIQ 700 to update the Basic Grayscale Image Box SOP Instance. Table 5.5.2-5 defines the Basic Image Box Presentation Module attributes used.

### 5.3.3.2 Basic Color Image Box SOP Class

The Basic Color Image Box IOD is an abstraction of the presentation of an image and image related data in the image area of a film. The DIMSE services that are applicable to the IOD are shown in Table 5.3.3-2.

**TABLE 5.3.3-2 DIMSE SERVICE GROUP**

DIMSE Service Element	Usage SCU	Reference
N-SET	M	see 5.3.3.2.1

### 5.3.3.2.1 DIMSE Service Group (N-SET)

The N-SET DIMSE Service is used by the LOGIQ 700 to update the Basic Color Image Box SOP Instance. Table 5.5.2-5 defines the Basic Image Box Presentation Module attributes used.

### 5.3.4 Printer SOP Class

The Printer IOD is an abstraction of the hard copy printer and is the basic Information Entity to monitor the status of the printer. The DIMSE services that are applicable to the IOD are shown in **Error! Reference source not found.**

### 5.3.4.1 DIMSE Service Group

**TABLE 5.3.4-1 DIMSE SERVICE GROUP**

DIMSE Service Element	Usage SCU	Reference
N-EVENT-REPORT	M	see 0
N-GET	U	see 5.3.4.1.2

### 5.3.4.1.1 N-EVENT\_REPORT

The LOGIQ 700 confirms the N-EVENT-REPORT initiated by the SCP (printer).

### 5.3.4.1.2 N-GET

Used by the LOGIQ 700 to request the SCP to get a Printer SOP Instance. Table 5.5.2-6 defines the Printer Module attributes.

## 5.4 PRINT MANAGEMENT IODS

Within an entity of a DICOM v3.0 Print Management, attributes are grouped into a 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 5.4.1-1, Table 5.4.2-1, Table 5.4.3-1, and Table 5.4.4-1 identify the defined modules within the entities which comprise the DICOM v3.0 Print Management Service IODs. Modules are identified by Module Name.

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

**5.4.1 Film Session IOD Module**

**TABLE 5.4.1-1 FILM SESSION IOD MODULES**

<b>Module Name</b>	<b>Reference</b>	<b>Module Description</b>
SOP Common Module	5.5.1.1	Contains SOP Common information
Basic Film Session Presentation Module	5.5.2.1	Contains Film Session presentation information
Basic Film Session Relationship Module	5.5.2.2	References to related SOPs

**5.4.2 Basic Film Box IOD Module Table**

**TABLE 5.4.2-1 BASIC FILM BOX IOD MODULES**

<b>Module Name</b>	<b>Reference</b>
SOP Common Module	5.5.1.1
Image Box Pixel Presentation Module	5.5.2.3
Basic Film Box Relationship Module	5.5.2.2

**5.4.3 Basic Image Box IOD Module Table**

**TABLE 5.4.3-1 BASIC IMAGE BOX IOD MODULES**

<b>Module Name</b>	<b>Reference</b>
SOP Common Module	5.5.1.1
Image Box Pixel Presentation Module	5.5.2.5
Image Box Relationship Module	not used

#### 5.4.4 Printer IOD Module Table

**TABLE 5.4.4-1 PRINTER IOD MODULES**

Module Name	Reference
SOP Common Module	5.5.1.1
Printer Module	5.5.2.6

#### 5.5 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 that comprise the Print Management.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported..

##### 5.5.1 General Modules

###### 5.5.1.1 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 5.5.1-1 SOP COMMON MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Varies with Module Instance and DIMSE Service being used. 1.2.840.10008.5.1.1.1 (Film Session) 1.2.840.10008.5.1.1.2 (Film Box) 1.2.840.10008.5.1.1.4 (Image Box) 1.2.840.10008.5.1.1.16 (Printer Job)
SOP Instance UID	(0008,0018)	1	provided by SCP (printer)
Specific Character Set	(0008,0005)	1C	Not used as expanded or replacement character sets not used
Instance Creation Date	(0008,0012)	3	Not used
Instance Creation Time	(0008,0013)	3	Not used
Instance Creator UID	(0008,0014)	3	Not used

##### 5.5.2 Print Management Modules

###### 5.5.2.1 Basic Film Session Presentation Module

This section defines the Attributes which are common for all films of a film session.

**TABLE 5.5.2-1 BASIC FILM SESSION PRESENTATION MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>USAGE (SCU)</b>	<b>Attribute Description</b>
Number of Copies	(2000,0010)	U	Always '1'
Print Priority	(2000,0020)	U	Always 'MED'
Medium Type	(2000,0030)	U	Defined Terms used (user configurable): PAPER BLUE FILM CLEAR FILM DEFAULT
Film Destination	(2000,0040)	U	Defined Terms used (user configurable): MAGAZINE PROCESSOR DEFAULT
Film Session Label	(2000,0050)	U	NULL value
Memory Allocation	(2000,0060)	U	NULL value

**5.5.2.2 Basic Film Session Relationship Module****TABLE 5.5.2-2 BASIC FILM SESSION RELATIONSHIP MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>USAGE (SCU)</b>	<b>Attribute Description</b>
Referenced Film Box Sequence	(2000,0500)	U	Not used
>Referenced SOP Class UID	(0008,1150)	U	
>Referenced SOP Instance UID	(0008,1155)	U	

**5.5.2.3 Basic Film Box Presentation Module**

The attributes described in Table 5.5.2-3 apply when the DIMSE Services N-CREATE, N-SET, N-DELETE or N-SET are used.

**TABLE 5.5.2-3 BASIC FILM BOX PRESENTATION MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>USAGE (SCU)</b>	<b>Attribute Description</b>
Image Display Format	(2010,0010)	U	Enumerated values used (user configurable): STANDARD\1,1 STANDARD\2,2 STANDARD\2,3 STANDARD\3,2 STANDARD\3,3 STANDARD\3,4 STANDARD\4,3 STANDARD\4,4
Annotation Display Format ID	(2010,0030)	U	NULL value
Film Orientation	(2010,0040)	U	Defined Terms used (user configurable): PORTRAIT LANDSCAPE
Film Size ID	(2000,0050)	U	Defined Terms used(user configurable) : 8INX10IN 10INX12IN 10INX14IN 11INX14IN 14INX14IN 14INX17IN 24CMX24CM 24CMX30CM
Magnification Type	(2010,0060)	U	Defined Terms Used (user configurable) : REPLICATE BILINEAR CUBIC NONE
Smoothing Type	(2010,0080)	U	Use value returned by printer if available
Border Density	(2010,0100)	U	Defined Terms Used (user configurable) : BLACK WHITE 50 %
Empty Image Density	(2010,0110)	U	Defined Terms Used (user configurable): BLACK WHITE 50 %
Min Density	(2010,0120)	U	10
Max Density	(2010,0130)	U	340



Trim	(2010,0140)	U	Enumerated Values Used: YES NO
Configuration Information	(2010,0150)	U	Use printer defined string

#### 5.5.2.4 Basic Film Box Relationship Module

This section defines the attributes which describe the common parameters which apply for all images on a given sheet of film.

**TABLE 5.5.2-4 BASIC FILM BOX RELATIONSHIP MODULE ATTRIBUTES**

Attribute Name	Tag	USAGE (SCU)	Attribute Description
Referenced Film Session Sequence	(2010,0500)	U	
>Referenced SOP Class UID	(0008,1150)	U	1.2.840.10008.5.1.1.1
>Referenced SOP Instance UID	(0008,1155)	U	provided by SCP (printer)
Referenced Image Box Sequence	(2010,0510)	U	Not used
>Referenced SOP Class UID	(0008,1150)	U	
>Referenced SOP Instance UID	(0008,1155)	U	
Referenced Basic Annotation Sequence	(2010,0520)	U	Not used
>Referenced SOP Class UID	(0008,1150)	U	
>Referenced SOP Instance UID	(0008,1155)	U	

#### 5.5.2.5 Image Box Pixel Presentation Module

The attributes described in apply when the DIMSE Service N-SET is used.

**TABLE 5.5.2-5 IMAGE BOX PIXEL PRESENTATION MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>USAGE (SCU)</b>	<b>Attribute Description</b>
Image Position	(2020,0010)	M	NULL value
Polarity	(2020,0020)	U	NULL value
Magnification Type	(2010,0060)	U	Defined Terms Used (user configurable): REPLICATE BILINEAR CUBIC NONE
Smoothing Type	(2010,0080)	U	NULL value
Requested Image Size	(2020,0030)	U	NULL value
Preformatted Grayscale Image Sequence	(2020,0110)	M	
>Samples Per Pixel	(0028,0002)	M	Value = '1'
>Photometric Interpretation	(0028,0004)	M	Defined Term MONOCHROME2 used
>Rows	(0028,0010)	M	Value always = 480d in 60Hz Value always = 562d in 50Hz
>Columns	(0028,0011)	M	Value always = 640d in 60Hz Value always = 768d in 50Hz
>Pixel Aspect Ratio	(0028,0034)	MC	1\1
>Bits Allocated	(0028,0100)	M	Value always = 0008H
>Bits Stored	(0028,0101)	M	Value always = 0008H
>High Bit	(0028,0102)	M	Value always = 0007H
>Pixel Representation	(0028,0103)	M	Defined Value '0' - unsigned integer
>Pixel Data	(7FE0,0010)	M	
Preformatted Color Image Sequence	(2020,0111)	M	
>Samples Per Pixel	(0028,0002)	M	Value = '3'
>Photometric Interpretation	(0028,0004)	M	Defined Term RGB used
>Rows	(0028,0010)	M	Value always = 480d in 60Hz Value always = 562d in 50Hz
>Columns	(0028,0011)	M	Value always = 640d in 60Hz Value always = 768d in 50Hz
>Pixel Aspect Ratio	(0028,0034)	M	1\1
>Bits Allocated	(0028,0100)	M	Value always = 0008H
>Bits Stored	(0028,0101)	M	Value always = 0008H
>High Bit	(0028,0102)	M	Value always = 0007H
>Pixel Representation	(0028,0103)	M	Defined Value '0' - unsigned integer
>Pixel Data	(7FE0,0010)	M	

### 5.5.2.6 Printer Module

This section defines the attributes that are used to monitor the status of the printer. The attributes described in Table 5.5.2-6 apply when the DIMSE Service N-GET is used.

**TABLE 5.5.2-6 PRINTER MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>USAGE (SCU)</b>	<b>Attribute Description</b>
Printer Status	(2110,0010)	U	No behavior defined for any Enumerated Values
Printer Status Info	(2110,0020)	U	No behavior defined for any Defined Terms
Printer Name	(2110,0030)	U	Not used
Manufacturer	(0008,0070)	U	Not used
Manufacturer Model Name	(0008,1090)	U	Not used
Device Serial Number	(0018,1000)	U	Not used
Software Versions	(0018,1020)	U	Not used
Date Last Calibration	(0018,1200)	U	Not used
Last Calibration	(0018,1201)	U	Not used

## **6. MODALITY WORKLIST INFORMATION MODEL DEFINITION**

### **6.1 INTRODUCTION**

This section specifies the use of the DICOM Modality Worklist Information Model used to organize data and against which a Modality Worklist Query will be performed. The contents of this section are:

6.2 - Information Model Description

6.3 - Information Model Entity-Relationship Model

6.4 - Information Model Module Table

6.5 - Information Model Keys

### **6.2 MODALITY WORKLIST INFORMATION MODEL DESCRIPTION**

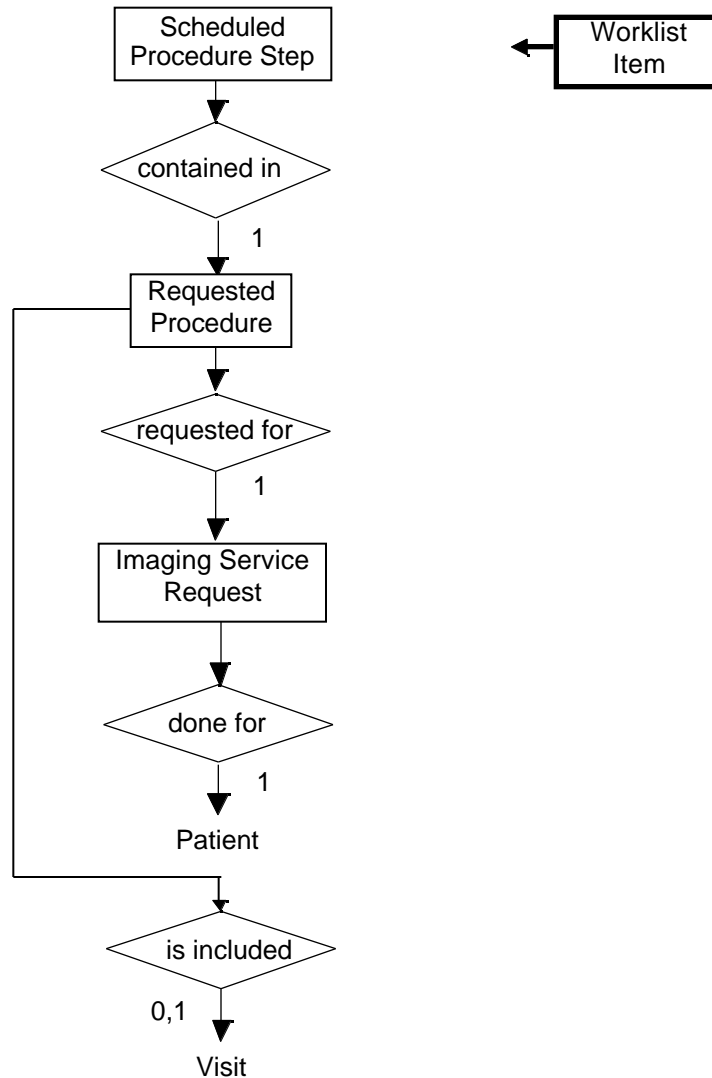
The implementation of the Modality Worklist Information Model is in a preliminary implementation phase. At this time, the Logiq 700 will query a Worklist Broker for the information it needs to fill in the New Patient Screen on the Logiq 700.

### **6.3 MODALITY WORKLIST INFORMATION MODEL ENTITY-RELATIONSHIP MODEL**

The Entity-Relationship diagram for the Modality Worklist Information Model schema is shown in Illustration 6.3-2. It represents the information that composes a Worklist Item. 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.

**ILLUSTRATION 6.3-2  
MODALITY WORKLIST INFORMATION MODEL E/R DIAGRAM**



**6.3.1 ENTITY DESCRIPTIONS**

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) and PS 3.4 (Service Class Specifications) for a description of each of the Entities contained within the Modality Worklist Information Model.

**6.3.1.1 Scheduled Procedure Step**

Schedule Procedure Step is implemented in its most basic form.

### 6.3.1.2 Requested Procedure Entity Description

Requested Procedure is implemented in its most basic form.

### 6.3.1.3 Imaging Service Request Entity Description

Image Service Request is used to query the patients Accession Number.

### 6.3.1.4 Visit Entity Description

Visit Entity is not implemented on the Logiq 700.

### 6.3.1.5 Patient Entity Description

Patient Entity is used to derive demographic information about the patient such as Patient Name and Patient ID.

## 6.3.2 Logiq 700 Mapping of DICOM entities

**TABLE 6.3-1**  
**MAPPING OF DICOM ENTITIES TO LOGIQ 700 ENTITIES**

DICOM	Logiq 700 Entity
Scheduled Procedure Step	
Requested Procedure	
Imaging Service Request	
Visit	
Patient	Patient

## 6.4 INFORMATION MODEL MODULE TABLE

Within an entity of the DICOM v3.0 Modality Worklist Information Model, 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 6.4-1 identifies the defined modules within the entities which comprise the DICOM v3.0 Modality Worklist Information Model. Modules are identified by Module Name.

See DICOM v3.0 PS 3.3 and PS 3.4 for a complete definition of the entities, modules, and attributes.

**TABLE 6.4-1  
MODALITY WORKLIST INFORMATION MODEL MODULES**

<b>Entity Name</b>	<b>Module Name</b>	<b>Reference</b>
Scheduled Procedure Step	SOP Common	
	Scheduled Procedure Step	6.5.1.1
Requested Procedure	Requested Procedure	6.5.2.1
Imaging Service Request	Imaging Service Request	6.5.3.1
Visit	Visit Identification	not used
	Visit Status	not used
	Visit Relationship	not used
	Visit Admission	not used
Patient	Patient Relationship	not used
	Patient Identification	6.5.3.2
	Patient Demographic	6.5.3.3
	Patient Medical	not used

### **6.5 INFORMATION MODEL KEYS**

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) and PS 3.4 (Service Class Specifications) for a description of each of the Entities contained within the Modality Worklist Information Model.

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

## 6.5.1 Scheduled Procedure Step Entity

### 6.5.1.1 Scheduled Procedure Step Module

**-TABLE 6.5-2  
SCHEDULED PROCEDURE STEP MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>Expected Matching Key Type</b>	<b>Expected Returned Key Type</b>	<b>Mapped into the Image</b>	<b>Note</b>
Scheduled Procedure Step Sequence	(0040,0100)	R	1	No	
>Scheduled Station AE Title	(0040,0001)	R	1	No	
>Scheduled Procedure Step Start Date	(0040,0002)	R	1	No	
>Scheduled Procedure Step Start Time	(0040,0003)	R	1	No	
>Modality	(0008,0060)	R	1	Yes	
>Scheduled Procedure Step ID	(0040,0009)	O	1	No	

## 6.5.2 Requested Procedure Entity

### 6.5.2.1 Requested Procedure Module

**TABLE 6.5-3  
REQUESTED PROCEDURE MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>Expected Matching Key Type</b>	<b>Expected Returned Key Type</b>	<b>Mapped into the Image</b>	<b>Note</b>
Requested Procedure ID	(0040,1001)	O	1	No	
Study Instance UID	(0020,000D)	O	1	Yes	
>Referenced SOP Class UID	(0008,1150)	O	1C	Yes	
>Referenced SOP Instance UID	(0008,1155)	O	1C	Yes	



### 6.5.3 Imaging Service Request Entity

#### 6.5.3.1 Imaging Service Request Module

**TABLE 6.5-4  
IMAGING SERVICE REQUEST MODULE ATTRIBUTES**

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Accession Number	(0008,0050)	O	2	Yes	Truncated to 12 characters

#### 6.5.3.2 Patient Identification

**TABLE 6.5-5  
PATIENT IDENTIFICATION MODULE ATTRIBUTES**

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Patient's Name	(0010,0010)	R	1	Yes	Truncated to 13 characters for Last Name and 10 characters for First Name
Patient ID	(0010,0020)	R	1	Yes	Truncated to 12 characters

#### 6.5.3.3 Patient Demographic

**TABLE 6.5-6  
PATIENT DEMOGRAPHIC MODULE ATTRIBUTES**

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Patients Birth Date	(0010,0030)	O	2	Yes	
Patient's Sex	(0010,0040)	O	2	Yes	

