Technical Publications

Direction 2243479-100
Revision 1

LOGIQ 700 Expert Series CONFORMANCE STATEMENT for DICOM V3.0

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GE Medical Systems

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TABLE OF CONTENTS

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 the GEMS equipment compliance to DICOM requirements for the implementation of a Ultrasound Information Object.

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

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

Section 6 (Modality Worklist Information Model), which specifies the GEMS equipment compliance to DICOM requirements for the implementation of the Modality Worklist service.

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.

ID/Net v3.0

Introduction to the
Integrated
DICOM/Network
v3.0 (ID/Net v3.0)
Conformance
Statement
Direction: 2118780
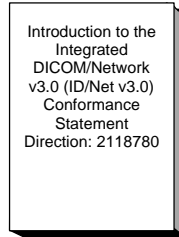
APPLICATION ENTITY SPECIFICATION
(SERVICE CLASSES, INFORMATION OBJECTS, MESSAGE EXCHANGES, ETC.)

**Product
Implementation:**

CT Advantage

MR Advantage

LOGIQ 700 Expert
Series
Conformance
Statement
Direction:
2243479-100

......
Conformance
Statement
Direction:
......
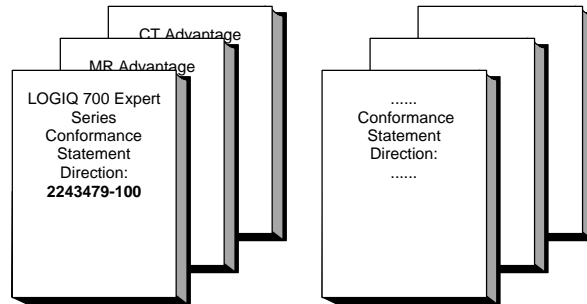
DICOM STANDARD

**Standard
Specification:**

DICOM V 3.0

Part 1

V 3.0

2

V 3.0

3

V 3.0

4

DICOM V 3.0

Part 14
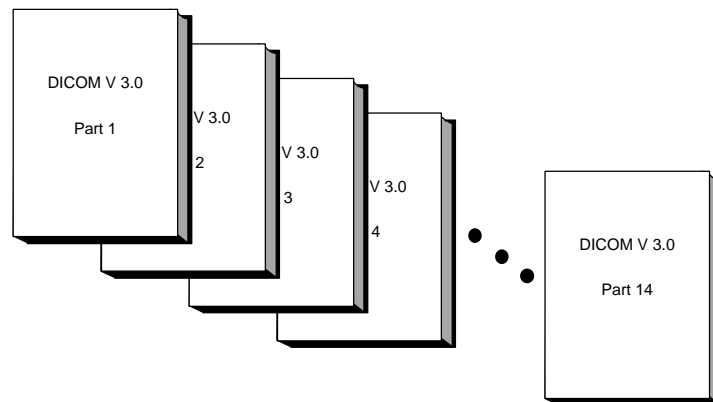
This document specifies the DICOM v3.0 implementation. It is entitled:

LOGIQ 700 Expert Series Version R2.0

Conformance Statement for DICOM v3.0
*Direction **2243479-100***

This DICOM Conformance Statement documents the DICOM v3.0 Conformance Statement and Technical Specification required to inter-operate 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

1.3 INTENDED AUDIENCE

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

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

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

Direction: 2118780

1.4 SCOPE AND FIELD OF APPLICATION

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

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

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

1.5 IMPORTANT REMARKS

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

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non–GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non–GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.

- **Validation** - Testing the complete range of possible interactions between any GE device and non–GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non–GE provider accepts full responsibility for all validation required for their connection with GE devices.   This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non–GE device and the stability of the image data for the intended applications.

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

- **Future Evolution** - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM v3.0 Standard. DICOM v3.0 will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEMS protocol is based on DICOM v3.0 as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM v3.0. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements**. The **user** should ensure that any non–GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.

- **To be informed of the evolution of the implementation described in this document, the User is advised to regularly check the GE Internet Server, accessible via anonymous ftp (GE Internet Server Address: ftp.med.ge.com, 192.88.230.11).**

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

1.6 REFERENCES

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

The information object implementation refers to DICOM PS 3.3 (Information Object Definition).

1.7 DEFINITIONS

A set of definitions which is applicable to all GEMS Conformance Statements is included in *the Introduction to the 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', 'modality worklist', 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 :
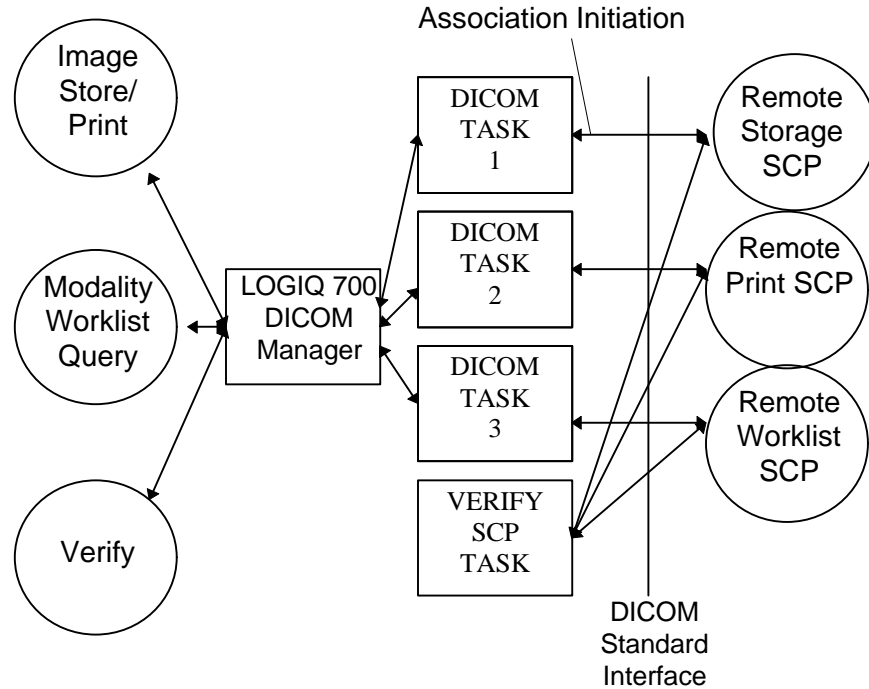
There are four local real-world activities that occur in the LOGIQ 700 - Image Send, Image Print, Modality Worklist Query, and Remote Verification. Verification of remote DICOM devices is manually performed by the user from the console.

All DICOM Image transfers are handled in a queued manner by one AE, running on the scanner. If the scanner is removed from the network for some reason (i.e., a portable exam), any images sent to a remote device will be placed into the "Holding" queue for the user to manually send once reconnected. This manual process simply involves going to the DICOM Status page, selecting the jobs to send, then pressing the "Send" button.

The proper method of transferring images to a remote device is for the user to first select "New Pt"/Yes. This is to generate a proper Study UID. If the patient is selected from the Worklist Page, then the proper Study UID is taken from what the Worklist Broker gave us for that Patient. Next, the user will begin to take images. All images are first send to the "Queue" for the mapped device. If the network is not connected the images will go directly to the "Holding Queue". Once the user has finished the study for the patient, they should push the "End Exam" button on the front panel. This button will bring up a secondary softmenu asking the user to confirm the end of exam. If the user selects "yes", the LOGIQ 700 will close any open associations and force any partial prints.

Each active DICOM device the LOGIQ 700 is connected to, will have its own task running on the LOGIQ 700. There can be up to ten active printers or storage devices, along with one worklist. This means that, if one device is down, no other images are held up waiting for that device to time out. Images are placed in the mapped active device task's queue. These images may be moved from one device's queue to another; even if the two devices are different*(i.e. printer to storage, storage to printer)*.

The images may be configured to be stored on the hard disk, as well, for later DICOM use. If this is the case, the user would simply take the images, then go to the Archive menu, select all images to be sent, then choose a device. Once this is done, the user may see their jobs in the selected destination device's queue on the DICOM Status page.

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 DICOM Status page. The Verification Diagnostics also query the printer devices for their services and display those as well. Also running, is a separate task for Verify SCP. This will allow other DICOM devices to verify the LOGIQ 700.

The LOGIQ 700 also supports Modality Worklist Query SCU. The user can specify a set of fields to query the Worklist Broker. Once the user has configured a set of query fields, they can perform a query to bring back a list of patients that meet the defined set of criteria. The user may select any patient from the received list. If any required "New Pt" field is missing, a warning message will appear at the bottom of the screen stating which field is missing.

2.2.2 Functional Definition of AE's

The LOGIQ 700 has multiple tasks running under one Application Entity. These tasks operate independently for sending image data from the scanner to a remote DICOM device.

- The DICOM task initiates a DICOM association to send images to a Storage Device.

- A task configured for Storage may be configured to automatically choose an IOD or may be configured to force a particular IOD.

- The DICOM task initiates a DICOM association to print images

- Automatically determines printer type (color/gray-scale/both) and properties (image format, medium type, destination, magnification type)

- Manual initiation of a DICOM verification to assist in network diagnostics

- Responds to DICOM verification request from other devices.

- The DICOM task initiates a DICOM association for Modality Worklist Query.

2.2.3 Sequencing of Real-World Activities

Image Store:

- The DICOM task initiates a DICOM association with the selected archive device AE when the operator requests an image be sent

- Unless specifically configured to force a particular type of IOD, 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 DICOM task's 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-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 Box SOP Instance

- N-EVENTS are not handled and may cause jobs to be sent to the Holding Queue without printing.

Verification Test:

- Each active DICOM task's AE initiates a DICOM association with it's respected remote device.

- 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

- If the remote device is a printer, then an N-GET is performed to receive status about the printer.

Modality Worklist Query:

- The DICOM task initiates a DICOM association with the remote AE which is configured for modality worklist query server when the operator requests to retrieve the worklist information.

- The AE selects the appropriate Abstract and Transfer Syntax from those accepted by the remote AE

- The AE uses the C-FIND command to query and retrieve the worklist information.

2.3 AE SPECIFICATIONS

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
Modality Worklist Information Model - FIND	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:

Application Context Name	1.2.840.10008.3.1.1.1

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

The maximum length PDU for an association initiated by each active LOGIQ 700 DICOM task is:

Maximum Length PDU	16384 bytes

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

2.3.1.1.2 Number of Associations

The AE will initiate up to two DICOM association at a time to perform an image store, print or verify, plus one for Modality Worklist. If "Live Imaging" is turned on, the association remains open until the user presses the "End Exam" button or "New Pt"/"Yes". Given that, it is possible to have up to ten open associations, but only two are active at one given moment in time.

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

No change has been made to the Implementation UID. The Implementation UID for this DICOM v3.0 Implementation is:

LOGIQ 700 Implementation UID	1.2.840.113619.6.21

2.3.1.2 Association Initiation Policy

The AE attempts to establish a new association with a remote device due to six 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

  *Manual refers to the user selecting images from the "Archive" menu to send to a remote DICOM device.

- C. "Verification" which verifies application level communication between peer DICOM AE's for service purposes.

- D. Manual Modality Worklist Query where the user pushes the "Search" button to obtain a Modality Worklist Query.

- E. Time-outs configured on the Device Configuration page for each device describes the number of seconds to perform the action DICOM action. In other words for Storage SCU, the time-out describes the number of seconds while performing a C-STORE. Similar behavior for Print SCU(number of seconds to time-out when performing the actual send to printer). For Modality Worklist, it describes the number of seconds to time-out on a C-FIND.

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 configured per device on the device's associated "Device Configuration" menu. All images remain on the local hard disk 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. If a warning occurs during a transmission, no retries are performed and the image remains on the hard disk. In both error and warning states of an image, the retained image can be found in the "Holding Queue" for resending to either the same device or another device.

There are two ways in which an image is sent to the a Storage SCP. This is referred to as "Live Imaging". If "Live Imaging" is turned on(Configured on a per device basis from the "Device Configuration" menu), then one association is opened for that device at the time of the first image transfer. That association remains open until the user presses the "End Exam" button or "New Pt." button and answers "Yes". If "Live Imaging" is turned off, then one association is opened and closed per image transfer.

2.3.1.2.1.2 Proposed Presentation Context Table

Presentation Context Table - Proposed					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
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
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
Basic Worklist Management SOP Class	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	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 :

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Refused	A7xx	Out of resources	No action
	0122	SOP Class not Supported	No action
Error	A9xx	Data Set does not match SOP Class	No action
	Cxxx	Cannot Understand	No action
Warning	B000	Coercion of Data Elements	No action
	B007	Data Set does not match SOP Class	No action
	B006	Elements Discarded	No action
Success	0000		

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 configured per device on the device's associated "Device Configuration" menu. All images remain on the local hard disk 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. If a warning occurs during a transmission, no retries are performed and the image remains on the hard disk. In both error and warning states of an image, the retained image can be found in the "Holding Queue" for resending to either the same device or another device.

2.3.1.2.2.2 Proposed Presentation Context Table

The Device Configuration page is a User Interface that allows the user to program a device to be a printer. Furthermore, it allows the user to select if that device is a color or a gray device. Depending on whether the device was configured to be either color or gray will determine which Abstract syntax to use. Only one is negotiated.

Presentation Context Table - Proposed					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**
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
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

2.3.1.2.2.2.1 SOP Specific DICOM Conformance Statement for all Print SOP Classes

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

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Refused	A7xx	Out of resources	No action
	0122	SOP Class not Supported	No action

Error	A9xx	Data Set does not match SOP Class	No action
	Cxxx	Cannot Understand	No action
Warning	B000	Coercion of Data Elements	No action
	B007	Data Set does not match SOP Class	No action
	B006	Elements Discarded	No action
Success	0000		

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 AE.

2.3.1.2.2.2.1.2 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 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. If the active, configured device is a printer, then a N-GET is performed to retrieve Printer Status(2110, 0010) and Printer Status Info(2110, 0020). This information is displayed next to the corresponding device in the "Status" and "Info" field, respectively.

2.3.1.2.3.1 Associated Real-World Activity

The user may initiate a DICOM Verify by selecting a device to verify, then by pressing the "Verify" button on the DICOM Status menu When selected, each of the active, selected, configured network devices will be tested with a DICOM C-ECHO. The results of the C-ECHO are displayed on the screen.

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

2.3.1.2.3.2 Proposed Presentation Context Table

Print SOP's are only offered when verifying a printer.

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
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
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

2.3.1.2.3.2.1 SOP Specific DICOM Conformance Statement for Verify SOP Class

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

2.3.1.3 Association Acceptance Policy

The 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 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 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.

2.3.1.3.2 Real-World Activity - D ('Modality Worklist' Operation)

In order to perform a search on a Worklist Broker, the user should go to the Worklist menu associated with the New Patient menu. Once at the Worklist menu, the user will press the "Search" button. This will open an association with the configured Worklist SCP and send C-FIND with the configured keys. Once the results are returned, the association is closed.

2.3.1.3.2.1 Associated Real-World Activity

Modality Worklist requires a two step configuration before using it on the LOGIQ700. The first step is to configure the network and general DICOM information for a Worklist broker on the Device Configuration menu. The second step is to configure the what keys you would like in your query. This is done on the Worklist Setup menu. Once that is complete the user simply has to go to the Worklist menu and push the "Search" button for the query to actually take place.

2.3.1.3.2.2 Proposed Presentation Context Table

<table>
<tr><th colspan="6">Presentation Context Table - Proposed</th></tr>
<tr><th colspan="2">Abstract Syntax</th><th colspan="2">Transfer Syntax</th><th>Role</th><th>Extended</th></tr>
<tr><th>Name</th><th>UID</th><th>Name List</th><th>UID List</th><th></th><th>Negotiation</th></tr>
<tr><td>Basic Worklist Management SOP Class</td><td>1.2.840.10008.5.1.4.31</td><td>Implicit VR Little Endian</td><td>1.2.840.10008.1.2</td><td>SCU</td><td>None</td></tr>
<tr><td>Ultrasound Image Storage</td><td>1.2.840.10008.5.1.4.1.1.6.1</td><td>Implicit VR Little Endian</td><td>1.2.840.10008.1.2</td><td>SCU</td><td>None</td></tr>
<tr><td>Ultrasound Image Storage (Retired)</td><td>1.2.840.10008.5.1.4.1.1.6</td><td>Implicit VR Little Endian</td><td>1.2.840.10008.1.2</td><td>SCU</td><td>None</td></tr>
<tr><td>Secondary Capture</td><td>1.2.840.10008.5.1.4.1.1.7</td><td>Implicit VR Little Endian</td><td>1.2.840.10008.1.2</td><td>SCU</td><td>None</td></tr>
</table>

Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
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
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

2.3.1.3.2.2.1 SOP Specific DICOM Conformance Statement for the Modality Worklist Information Model - FIND SOP Class

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

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Refused	A700	Out of resources	Receiving process of the matches is terminated without any warnings and errors. The matches which are received before this code are stored normally.
Failed	A900	Identifier does not match SOP Class	Receiving process of the matches is terminated without any warnings and errors. The matches which are received before this code are stored normally.
	Cxxx	Unable to process	Receiving process of the matches is terminated without any warnings and errors. The matches which are received before this code are stored normally.
Success	0000	Matching is complete - No final identifier is supplied	
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Receiving process of the matches continues
	FF01	Matches are continuing - Warnings that one or more Option Keys were not supported for existence of this identifier.	Receiving process of the matches continues without any warnings or errors.

2.3.1.3.2.2.2 SOP Specific DICOM Conformance Statement for Basic Modality Worklist Management SOP Class

The AE provides standard conformance to the Basic Modality Worklist Management SOP Class as an SCU.

2.3.1.3.2.3 Transfer Syntax Selection Policies

Only Little Endian transfer syntax is supported.

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

- Retry - Number of times the LOGIQ 700 will attempt to send an image after receiving an error status.

- Retry Interval - Number of seconds between retries.

- C-ECHO on/off

- Color/Grayscale

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

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. US and US Retired IOD are the same.

ILLUSTRATION 3.3-1
US IMAGE ENTITY RELATIONSHIP DIAGRAM
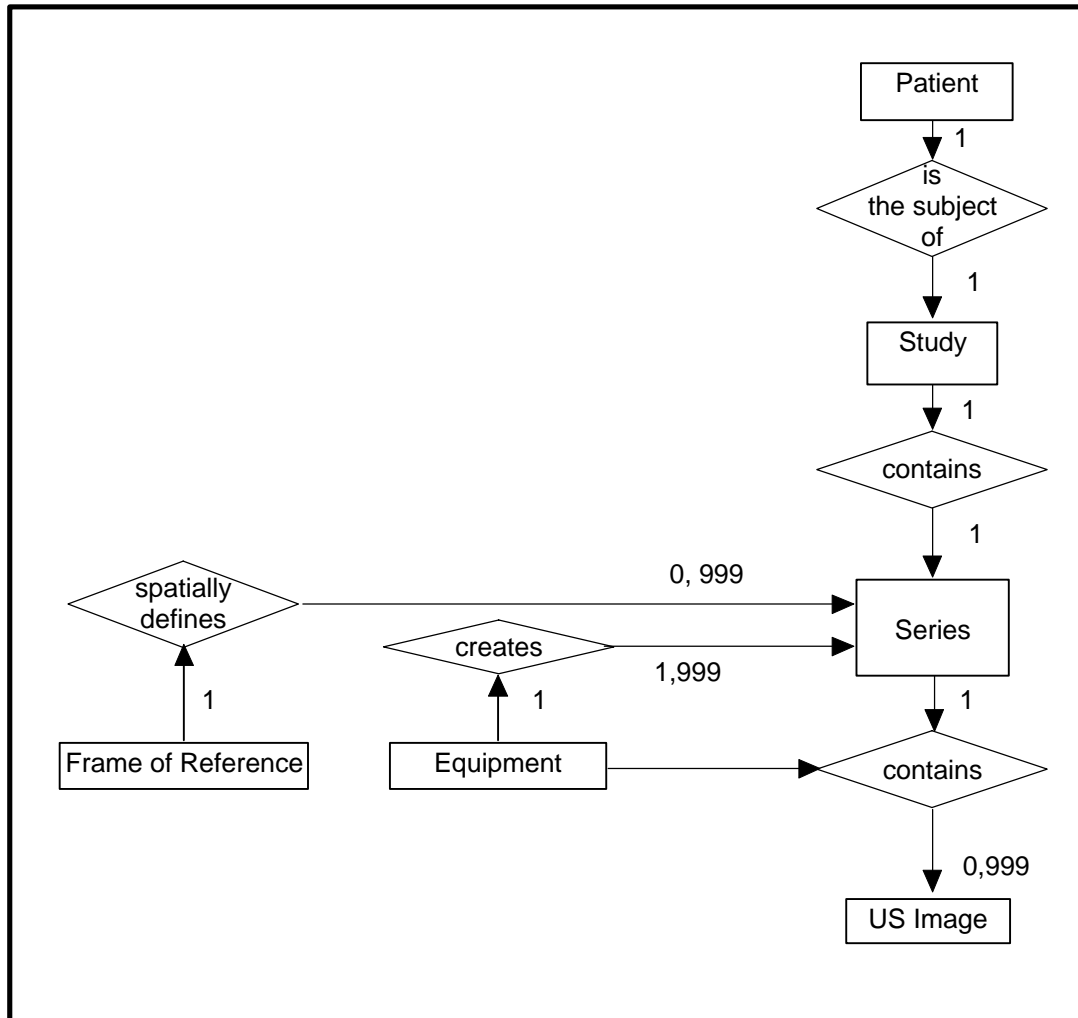
3.3.1 ENTITY DESCRIPTIONS

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. The LOGIQ 700 does not increment the Series. In other words, the LOGIQ 700 supports one series per study.

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 3.3-1
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 3.4-1 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.

<div align="center">

TABLE 3.4-1
US IMAGE IOD MODULES

</div>

Entity Name	Module Name	Reference
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	not used
Equipment	General Equipment	3.5.4.1
Image	General Image	3.5.5.1
	Image Pixel	3.5.5.2
	Contrast/Bolus	not used
	Palette Color Lookup Table	not used
	US Region Calibration	3.5.7.1
	US Image	3.5.7.2
	Overlay Plane	not used
	VOI LUT	not used
	SOP Common	3.5.6.1
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
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	User Interface/Worklist Broker, Last Name: 17 alpha-numeric displayed, up to 64 retrieved from worklist; First Name: 10 alpha-numeric displayed, up to 64 retrieved from worklist; Middle Name: 1 alpha-numeric displayed.
Patient ID	(0010,0020)	2	User Interface/Worklist Broker, 14 alpha-numeric displayed.
Patient's Birth Date	(0010,0030)	2	User Interface/Worklist Broker, Y2K Compliant
Patient's Sex	(0010,0040)	2	User Interface/Worklist Broker, F-Female M-Male
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
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Machine generated. If patient was received from Worklist broker, then this attribute may be filled from Worklist broker.
Study Date	(0008,0020)	2	Study begin date
Study Time	(0008,0030)	2	Study begin time
Referring Physician's Name	(0008,0090)	2	May be entered from the User Interface
Study ID	(0020,0010)	2	Internal value which is incremented when the User defines a New Patient.
Accession Number	(0008,0050)	2	May be entered through the User Interface or Worklist
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 3.5-3
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 or Worklist.
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	Up to 50 alpha-numeric characters 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 3.5-4
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Defined Term: US = Ultrasound
Series Instance UID	(0020,000E)	1	Machine generated.
Series Number	(0020,0011)	2	Internal number which is always 0
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	Sent as 0 length
Series Description	(0008,103E)	3	Not Used
Operators' Name	(0008,1070)	3	May be entered from User Interface(limited to a 3 character alpha-numeric)
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 Equipment Entity Modules

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

3.5.4.1 General Equipment Module

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

TABLE 3.5-5
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. Default: "G.E. Medical Systems"
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 define string "R2.0"
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	Not Used

3.5.5 Common Image Entity Modules

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

3.5.5.1 General Image Module

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

TABLE 3.5-6
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	Sent as zero length.
Image Date	(0008,0023)	2C	Sent as zero length
Image Time	(0008,0033)	2C	Sent as zero length

Image Type	(0008,0008)	3	See 3.5.5.1.1.1.
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	Not Used
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	Not Used

3.5.5.1.1 General Image Attribute Descriptions

3.5.5.1.1.1 Image Type

Value 1 shall have the following Enumerated Values:

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

Value 2 shall have the following Enumerated Values:

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

See 3.5.7..1.1 for defined terms used for Value 3. Value sent with zero length if image is not created by the LOGIQ 700.

3.5.5.2 Image Pixel Module

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

TABLE 3.5-7
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Value of '1' when Photometric Interpretation element value = 'MONOCHROME2'; 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	Enumerated value 0001H, color-by-plane, is defined by the LOGIQ 700.
Pixel Aspect Ratio	(0028,0034)	1C	Not Used because ratio is 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 is never PALETTE_COLOR or ARGB
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Not used since (0028, 0004) value is never PALETTE_COLOR or ARGB
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Not used since (0028, 0004) value is never PALETTE_COLOR or ARGB
Red Palette Color Lookup Table Data	(0028,1201)	1C	Not used since (0028, 0004) value is never PALETTE_COLOR or ARGB
Green Palette Color Lookup Table Data	(0028,1202)	1C	Not used since (0028, 0004) value is never PALETTE_COLOR or ARGB
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Not used since (0028, 0004) value is never PALETTE_COLOR or ARGB

3.5.6 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

3.5.6.1 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 3.5-8
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	Machine generated.
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

3.5.7 US Modules

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

3.5.7.1 US Region Calibration Module

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

TABLE 3.5-9
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^{-1}) 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 is not used
>Pixel Component Range Start	(0018,6048)	1C	Not used since Pixel Component Organization is not used
>Pixel Component Range Stop	(0018,604A)	1C	Not used since Pixel Component Organization is not used
>Pixel Component Physical Units	(0018,604C)	1C	Not used since Pixel Component Organization is not used
>Pixel Component Data Type	(0018,604E)	1C	Not used since Pixel Component Organization is not used
>Number of Table Break Points	(0018,6050)	1C	Not used since Pixel Component Organization is not used
>Table of X Break Points	(0018,6052)	1C	Not used since Pixel Component Organization is not used
>Table of Y Break Points	(0018,6054)	1C	Not used since Pixel Component Organization is not used
>Number of Table Entries	(0018,6056)	1C	Not used since Pixel Component Organization is not used
>Table of Pixel Values	(0018,6058)	1C	Not used since Pixel Component Organization is not used
>Table of Parameter Values	(0018,605A)	1C	Not used since Pixel Component Organization is 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

3.5.7.2 US Image Module

This section specifies the Attributes that describe ultrasound images.

TABLE 3.5-10
US IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples Per Pixel	(0028,0002)	1	Value of '1' when Photometric Interpretation element value = 'MONOCHROME2'; 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)	1C	Enumerated value 0001H, color-by-plane.
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 3.5.7.2.1.1.
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

3.5.7.2.1 US Image Attribute Descriptions

3.5.7.2.1.1 Image Type

The following Defined Terms for Value 3 are created:

VASCULAR   OBSTETRICAL

SMALL PARTS   PEDIATRIC

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.

ILLUSTRATION 4.3-1
SC IMAGE ENTITY RELATIONSHIP DIAGRAM
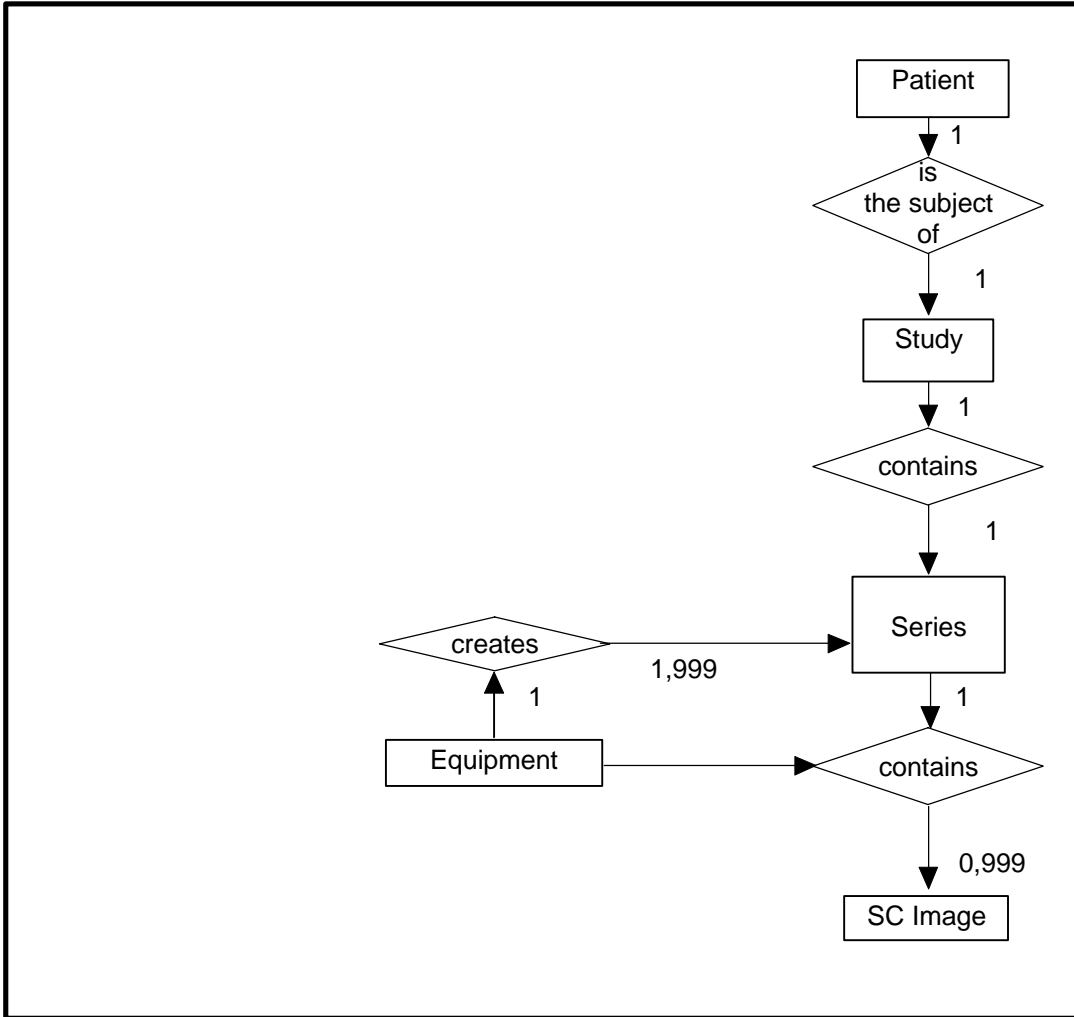
4.3.1 ENTITY DESCRIPTIONS

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 Series Entity Description

4.3.1.2 Equipment Entity Description

4.3.1.3 SC Image Entity Description

4.3.1.4 Overlay Entity Description

4.3.1.5 VOI Lookup Table Entity Description

4.3.2 LOGIQ 700 Mapping of DICOM entities

TABLE 4.3-1
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 4.4-1 identifies the defined modules within the entities which comprise the DICOM v3.0 SC IOD. Modules are identified by Module Name.

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

TABLE 4.4-1
SC IMAGE IOD MODULES

Entity Name	Module Name	Reference
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
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	User Interface/Worklist Broker, Last Name: 17 alpha-numeric displayed, up to 64 retrieved from worklist; First Name: 10 alpha-numeric displayed, up to 64 retrieved from worklist; Middle Name: 1 alpha-numeric displayed, but can store up to 64(retrieved from worklist)
Patient ID	(0010,0020)	2	User Interface/Worklist Broker, 14 alpha-numeric
Patient's Birth Date	(0010,0030)	2	User Interface/Worklist Broker, Y2K Compliant
Patient's Sex	(0010,0040)	2	User Interface/Worklist Broker, F-Female M-Male
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
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Generated using GEMS UID + LOGIQ700 implementation UID + device serial number + study date + study time + study ID
Study Date	(0008,0020)	2	Study begin date
Study Time	(0008,0030)	2	Study begin 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	May be entered from User Interface or Worklist
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 4.5-3
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 or Worklist
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 4.5-4
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Defined term is "US"
Series Instance UID	(0020,000E)	1	Generated using GEMS UID + LOGIQ700 implementation UID + device serial number + study date + study time + study ID + series ID
Series Number	(0020,0011)	2	Internal number which is always 0
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 - 3 characters, alpha-numeric
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 4.5-5
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. Default: "G.E. Medical Systems"
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 define string "R2.0"
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	Not Used

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 4.5-6
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	Sent as zero length.
Image Date	(0008,0023)	2C	Sent as zero length

Image Time	(0008,0033)	2C	Sent as zero length
Image Type	(0008,0008)	3	See 4.5.5.1.1.1.
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	Not Used
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	Not Used

4.5.5.1.1 General Image Attribute Descriptions

4.5.5.1.1.1 Image Type

Value 1 shall have the following Enumerated Values:

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

Value 2 shall have the following Enumerated Values:

– 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.

4.5.5.2 Image Pixel Module

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

TABLE 4.5-7
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	Enumerated value 0001H, color-by-plane, is defined by the LOGIQ 700. Color-by-pixel may 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 is never PALETTE_COLOR or ARGB
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Not used since (0028, 0004) value is never PALETTE_COLOR or ARGB
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Not used since (0028, 0004) value is never PALETTE_COLOR or ARGB
Red Palette Color Lookup Table Data	(0028,1201)	1C	Not used since (0028, 0004) value is never PALETTE_COLOR or ARGB
Green Palette Color Lookup Table Data	(0028,1202)	1C	Not used since (0028, 0004) value is never PALETTE_COLOR or ARGB
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Not used since (0028, 0004) value is 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 4.5-8
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 using GEMS UID + LOGIQ700 implementation UID + device serial number + study date + study time + study ID + series ID + image ID
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 4.5-9
SC IMAGE EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Conversion Type	(0008,0064)	1	Defined term DI = Digital Interface used
Modality	(0008,0060)	3	Defined value "US" used
Secondary Capture Device ID	(0018,1010)	3	Not Used
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 "R2.0"
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 4.5-10
SC IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Date of Secondary Capture	(0018,1012)	3	Study begin date
Time of Secondary Capture	(0018,1014)	3	Study begin 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

SOP Class Name	Usage SCU	Reference
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

DIMSE Service Element	Usage SCU	Reference
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

Not used in this implementation.

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 the number of copies configured by the user to a film of the film session.

5.3.2.1.3 N-DELETE

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

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.

<p align="center">TABLE 5.3.3-2 DIMSE SERVICE GROUP</p>

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 table 5.3.4-1.

5.3.4.1 DIMSE Service Group

<p align="center">TABLE 5.3.4-1 DIMSE SERVICE GROUP</p>

DIMSE Service Element	Usage SCU	Reference
N-EVENT-REPORT	M	see 5.3.4.1.1
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

Module Name	Reference	Module Description
Error! Reference source not found.	**Error! Reference source not found.**	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

Module Name	Reference
Error! Reference source not found.	**Error! Reference source not found.**
Basic Film Box 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

Module Name	Reference
Error! Reference source not found.	**Error! Reference source not found.**
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
Error! Reference source not found.	**Error! Reference source not found.**
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

5.5.2 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. The attributes described in table 5.5.2-1 apply when the N-CREATE DIMSE service is used.

TABLE 5.5.2-1 BASIC FILM SESSION PRESENTATION MODULE ATTRIBUTES

Attribute Name	Tag	USAGE (SCU)	Attribute Description
Number of Copies	(2000,0010)	U	Defined Terms used (user configurable): default is 1, Maximum is 99.
Print Priority	(2000,0020)	U	Defined Terms used (user configurable): HIGH - default MEDIUM LOW
Medium Type	(2000,0030)	U	Defined Terms used (user configurable): PAPER BLUE FILM CLEAR FILM
Film Destination	(2000,0040)	U	Defined Terms used (user configurable): MAGAZINE - default PROCESSOR
Film Session Label	(2000,0050)	U	58 alpha-numeric characters. Entered on a per device basis on the User Interface. Default is 0 length.
Memory Allocation	(2000,0060)	U	Not Used

5.5.2.2 Basic Film Session Relationship Module

TABLE 5.5.2-2 BASIC FILM SESSION RELATIONSHIP MODULE ATTRIBUTES

Attribute Name	Tag	USAGE (SCU)	Attribute Description
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 N-CREATE DIMSE service is used.

TABLE 5.5.2-3 BASIC FILM BOX PRESENTATION MODULE ATTRIBUTES

Attribute Name	Tag	USAGE (SCU)	Attribute Description
Image Display Format	(2010,0010)	U	Enumerated values used (user configurable): STANDARD\1,1 - default STANDARD\2,1 STANDARD\2,2 STANDARD\2,3 STANDARD\2,4 STANDARD\3,2 STANDARD\3,3 STANDARD\3,4 STANDARD\3,5 STANDARD\4,2 STANDARD\4,3 STANDARD\4,4 STANDARD\4,5 STANDARD\5,3 STANDARD\5,4
Annotation Display Format ID	(2010,0030)	U	Sent as zero length.
Film Orientation	(2010,0040)	U	Defined Terms used (user configurable): PORTRAIT - default LANDSCAPE
Film Size ID	(2000,0050)	U	Defined Terms used(user configurable) : 8INX10IN - default 10INX12IN 10INX14IN 11INX14IN 14INX14IN 14INX17IN 24CMX24CM 24CMX30CM
Magnification Type	(2010,0060)	U	Defined Terms Used (user configurable) : REPLICATE - default BILINEAR CUBIC NONE
Smoothing Type	(2010,0080)	U	9 alpha-numeric characters entered on a per device basis on the User Interface

Border Density	(2010,0100)	U	Defined Terms Used (user configurable) : BLACK WHITE FIFTY = 195 (FIFTY is what appears in UI. 195 is the actual Border Density value)
Empty Image Density	(2010,0110)	U	Defined Terms Used (user configurable): BLACK WHITE FIFTY = 195 (FIFTY is what appears in UI. 195 is the actual Border Density value)
Min Density	(2010,0120)	U	0 - 999, entered on a per device basis on the User Interface
Max Density	(2010,0130)	U	0 - 999, entered on a per device basis on the User Interface
Trim	(2010,0140)	U	Enumerated Values Used: YES NO
Configuration Information	(2010,0150)	U	58 alpha-numeric characters. Entered on a per device basis on the User Interface

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

Attribute Name	Tag	USAGE (SCU)	Attribute Description
Image Position	(2020,0010)	M	Based on the image display format.
Polarity	(2020,0020)	U	Defined term, NORMAL

Magnification Type	(2010,0060)	U	Defined Terms Used (user configurable):
			    REPLICATE
			    BILINEAR
			    CUBIC
			    NONE

Smoothing Type	(2010,0080)	U	User defined 9 alpha-numeric
Requested Image Size	(2020,0030)	U	Not sent
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	Not sent
>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	

| Planar Configuration | (0028, 0006) | M | 0001H |

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

Attribute Name	Tag	USAGE (SCU)	Attribute Description
Printer Status	(2110,0010)	U	Used on DICOM Status menu to display the status for a chosen printer.
Printer Status Info	(2110,0020)	U	Used on DICOM Status menu to display information for a chosen printer.
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

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.

- In the event that a duplicate Study Instance UID is received, only the last record of the duplicate will be displayed.

ILLUSTRATION 6.3-2
MODALITY WORKLIST INFORMATION MODEL E/R DIAGRAM
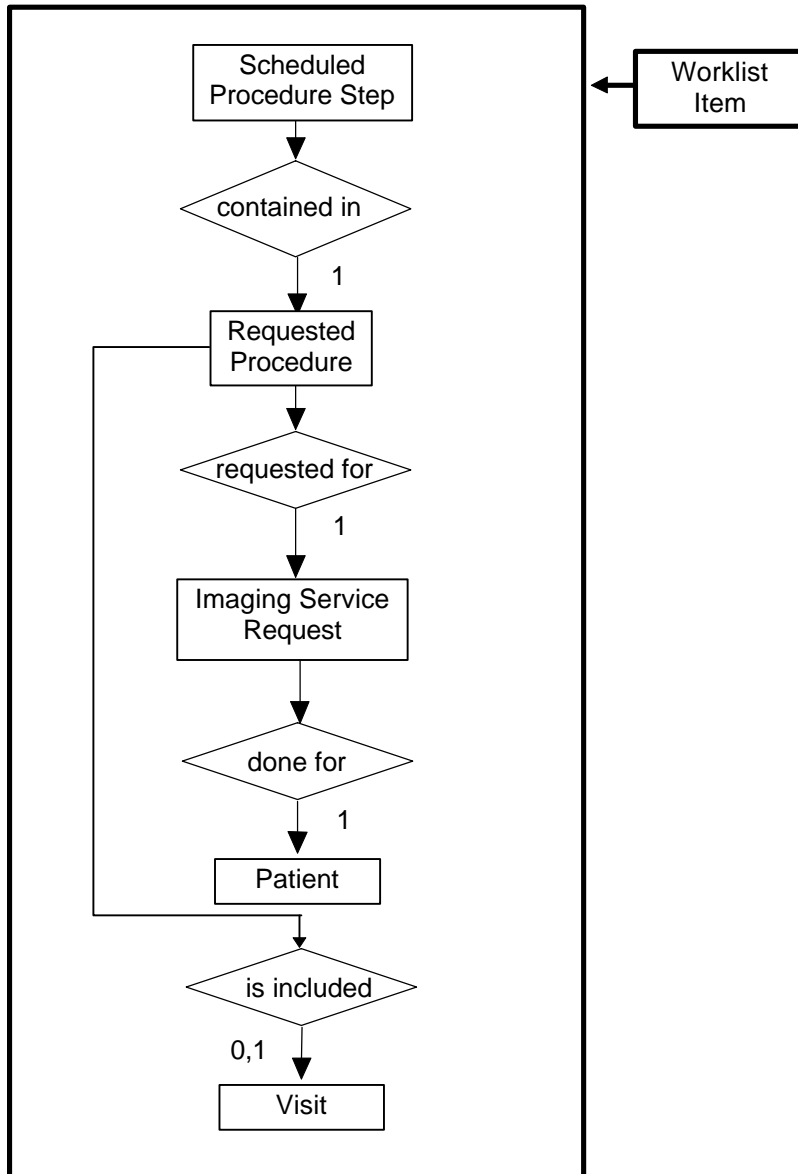
6.3.1 ENTITY DESCRIPTIONS

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 a basic form to allow for the user to retrieve a subset of attributes.

6.3.1.2 Requested Procedure Entity Description

Requested Procedure Step is implemented in a basic form to allow for the user to retrieve a subset of attributes.

6.3.1.3 Imaging Service Request Entity Description

Image Service is implemented in a basic form to allow for the user to retrieve a subset of attributes.

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 Description is implemented in a basic form to allow for the user to retrieve a subset of attributes.

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	Exam
Imaging Service Request	Exam
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

Entity Name	Module Name	Reference
Scheduled Procedure Step	SOP Common	Not Used
	Scheduled Procedure Step	6.5.2.1
Requested Procedure	Requested Procedure	6.5.3.1
Imaging Service Request	Imaging Service Request	6.5.4.1
Visit	Visit Identification	6.5.5.1
	Visit Status	Not Used
	Visit Relationship	Not Used
	Visit Admission	Not Used
Patient	Patient Relationship	Not Used
	Patient Identification	6.5.6.1
	Patient Demographic	6.5.6.2
	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 Supported Matching

Following are the types of matching that can be request by the implementation :

- Single Value matching
- Wild Card Matching
- Range of date

For any field selected for matching, if the user enters data for defined wild card fields, a wild card is automatically appended. For any field selected for matching, if the user does not enter data then the matching key will be sent as 0 length, thereby asking for all information according to the DICOM standard.

6.5.2 Scheduled Procedure Step Entity

6.5.2.1 Scheduled Procedure Step Module

TABLE 6.5-2
SCHEDULED PROCEDURE STEP MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Matching
Scheduled Procedure Step Sequence	(0040,0100)	R	1	No	
>Scheduled Station AE Title	(0040,0001)	R	1	No	Matching is supported. This field is dynamically configurable by the user. A "Wild Card" (*) is appended to this field.
>Scheduled Procedure Step Start Date	(0040,0002)	R	1	No	Matching is supported. This field is dynamically configurable by the user. Range is supported through the user interface. Maximum range is +/- 9 days.
>Modality	(0008,0060)	R	1	No	Matching is supported. This field is dynamically configurable by the user.
>Scheduled Procedure Step Description	(0040,0005)	O	1C	No	Matching is supported. This field is dynamically configurable by the user. A "Wild Card" (*) is appended to this field.
>Scheduled Station Name	(0040,0010)	O	2	No	Matching is supported. This field is dynamically configurable by the user. A wild card('*') is appended to this field.
>Scheduled Procedure Step Location	(0040,0011)	O	2	No	Matching is supported. This field is dynamically configurable by the user. A wild card('*') is appended to this field.

6.5.3 Requested Procedure Entity

6.5.3.1 Requested Procedure Module

TABLE 6.5-3
REQUESTED PROCEDURE MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Matching
Requested Procedure ID	(0040,1001)	O	1	No	Matching is supported. This field is dynamically configurable by the user. A wild card('*') is appended to this field.
Requested Procedure Description	(0032,1060)	O	1C	No	Matching is supported. This field is dynamically configurable by the user. A "Wild Card" (*) is appended to this field.

Study Instance UID	(0020,000D)	O	1	Yes	This attribute is always requested, and is the only attribute not listed on the user interface.

6.5.4 Imaging Service Request Entity

6.5.4.1 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	Matching is supported. This field is dynamically configurable by the user. A wild card('*') is appended to this field. No truncation

6.5.5 Visit Entity

6.5.5.1 Visit Identification

TABLE 6.5-5
VISIT IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Admission ID	(0038,0010)	O	2	No	Matching is supported. This field is dynamically configurable by the user. A wild card('*') is appended to this field.

6.5.6 Patient Entity

6.5.6.1 Patient Identification

TABLE 6.5-6
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 | Matching is supported. This field is dynamically configurable by the user. A wild card('*') is appended to this field. Truncation only for patient middle name. The middle name is truncated to first initial. |
| Patient ID | (0010,0020) | R | 1 | Yes | Matching is supported. This field is dynamically configurable by the user. A wild card('*') is appended to this field. Truncation occurs after 14 characters. |

6.5.6.2 Patient Demographic

TABLE 6.5-7
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	Matching is supported. This field is dynamically configurable by the user.
Patient's Sex	(0010,0040)	O	2	Yes	Matching is supported. This field is dynamically configurable by the user. Supported values to be saved on the image are: 'M' - male and 'F' - female