



GE Medical Systems

Technical Publications

Direction 2210573-100

Revision 0

***ConnectPro* for CT/i 4.0 Systems Conformance Statement for DICOM v3.0**

Copyright 1998 by General Electric Company



GE Medical Systems

*GE Medical Systems: Telex 3797371
P.O. Box 414, Milwaukee, Wisconsin, 53201 U.S.A.
(Asia, Pacific, Latin America, North America)*

*GE Medical Systems – Europe: Telex 698626
283 rue de la Minière, B.P.34, 78533, Buc Cedex, France*

TABLE OF CONTENTS

1. INTRODUCTION.....	1-1
1.1 OVERVIEW.....	1-1
1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE.....	1-1
1.3 INTENDED AUDIENCE.....	1-3
1.4 SCOPE AND FIELD OF APPLICATION.....	1-3
1.5 IMPORTANT REMARKS.....	1-4
1.6 REFERENCES.....	1-5
1.7 DEFINITIONS.....	1-5
1.8 SYMBOLS AND ABBREVIATIONS.....	1-5
2. NETWORK CONFORMANCE STATEMENT.....	2-1
2.1 INTRODUCTION.....	2-1
2.2 IMPLEMENTATION MODEL.....	2-1
2.3 AE SPECIFICATIONS.....	2-2
2.4 COMMUNICATION PROFILES.....	2-6
2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS.....	2-7
2.6 CONFIGURATION.....	2-7
2.7 SUPPORT OF EXTENDED CHARACTER SETS.....	2-8
3. MODALITY WORKLIST INFORMATION MODEL DEFINITION.....	3-1
3.1 INTRODUCTION.....	3-1
3.2 MODALITY WORKLIST INFORMATION MODEL DESCRIPTION.....	3-1
3.3 MODALITY WORKLIST INFORMATION MODEL ENTITY-RELATIONSHIP MODEL.....	3-1
3.4 INFORMATION MODEL MODULE TABLE.....	3-3
3.5 INFORMATION MODEL KEYS.....	3-4
3.6 PRIVATE DATA DICTIONARY.....	3-10
APPENDIX A: C-FIND REQUEST MESSAGE.....	A-1
APPENDIX B: USE OF SPECIFIC DICOM DATA.....	B-1

LIST OF TABLES

TABLE 3.3-1 MAPPING OF DICOM ENTITIES TO CONNECTPRO ENTITIES	3-3
TABLE 3.4-1 MODALITY WORKLIST INFORMATION MODEL MODULES	3-4
TABLE 3.5-1 SOP COMMON MODULE ATTRIBUTES	3-5
TABLE 3.5-2 SCHEDULED PROCEDURE STEP MODULE ATTRIBUTES	3-5
TABLE 3.5-3 REQUESTED PROCEDURE MODULE ATTRIBUTES	3-6
TABLE 3.5-4 IMAGING SERVICE REQUEST MODULE ATTRIBUTES	3-7
TABLE 3.5-5 VISIT IDENTIFICATION MODULE ATTRIBUTES	3-8
TABLE 3.5-6 VISIT STATUS MODULE ATTRIBUTES.....	3-8
TABLE 3.5-7 VISIT RELATIONSHIP MODULE ATTRIBUTES	3-8
TABLE 3.5-8 PATIENT IDENTIFICATION MODULE ATTRIBUTES.....	3-9
TABLE 3.5-9 PATIENT DEMOGRAPHIC MODULE ATTRIBUTES.....	3-9
TABLE 3.5-10 PATIENT MEDICAL MODULE ATTRIBUTES	3-10
TABLE A-1 C-FIND REQUEST MESSAGE DUMP.....	A-1
TABLE B-1 SPECIFIC DATA USAGE	B-1

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

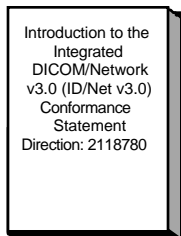
Section 2 (Network Conformance Statement), which specifies the GE Medical Systems (GEMS) equipment compliance to the DICOM requirements for the implementation of Networking features.

Section 3 (Modality Worklist Information Model Definition), which specifies the GEMS equipment compliance to the DICOM requirements for the implementation of Basic Worklist Management Service features.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

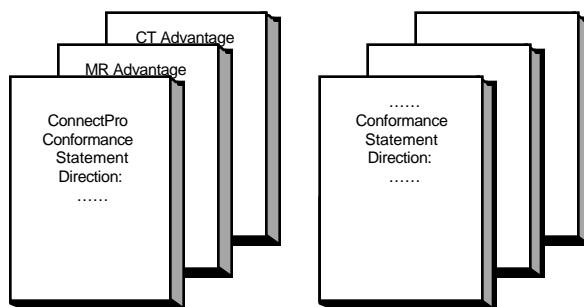
The Documentation Structure of the GEMS Conformance Statements and their relationship with the DICOM v3.0 Conformance Statements is shown in the Illustration below.

ID/Net v3.0



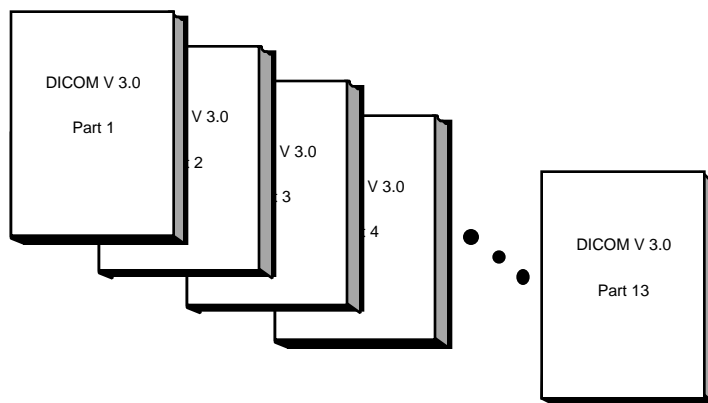
APPLICATION ENTITY SPECIFICATION (SERVICE CLASSES, INFORMATION OBJECTS, MESSAGE EXCHANGES, ETC.)

Product Implementation:



DICOM STANDARD

Standard Specification:



This document specifies the DICOM v3.0 implementation of Basic Worklist Management Service. It is entitled:

*ConnectPro for HiSpeed Advantage CT/i 4.0
Conformance Statement for DICOM v3.0
Direction 000000-100*

Please see the appropriate DICOM conformance statement(s) for implementation information on other DICOM services provided by the HiSpeed Advantage CT/i product.

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

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

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

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

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

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

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

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

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

1.3 INTENDED AUDIENCE

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

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

*Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)
Conformance Statement
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 ID/Net DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM v3.0. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these ID/Net DICOM Conformance Statements.** The **user** should ensure that any non-GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.

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

1.6 REFERENCES

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

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

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*.

This Page Intentionally Left Blank

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.

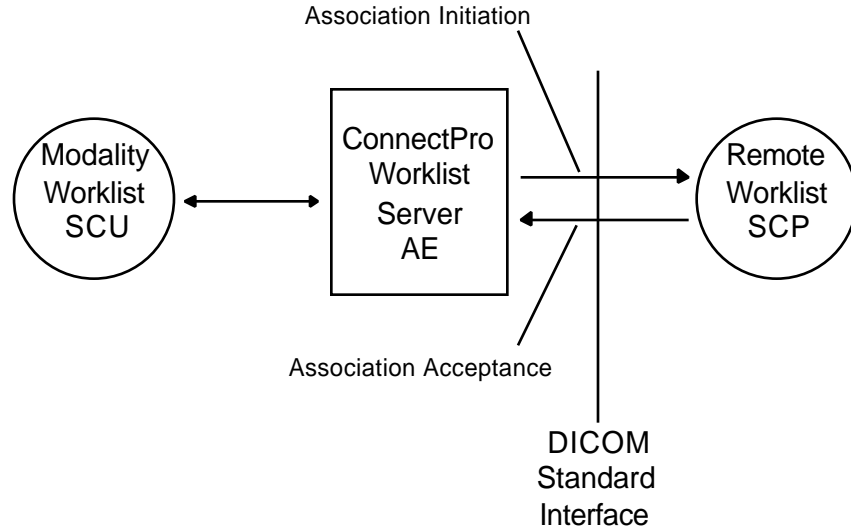
The ConnectPro option for HiSpeed Advantage CT/i allows a user to query for and display DICOM modality worklist information from a remote hospital or radiology department information system computer. For example, a user may wish to query for all procedures scheduled to be performed on the scanner. In this situation, ConnectPro is providing the DICOM C-FIND service as a service class user (SCU).

2.2 IMPLEMENTATION MODEL

All DICOM functionality provided by the ConnectPro feature is logically provided by the Worklist Server DICOM AE. The Worklist Server DICOM AE is commanded to perform DICOM modality worklist query services through the use of the HiSpeed Advantage CT/i user interface.

2.2.1 Application Data Flow Diagram

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



2.2.2 Functional Definition of AE's

The ConnectPro Worklist Server AE is implemented as an application process on the scanner host computer. It runs as a daemon serving requests from the user interface to obtain modality worklists, query remote AE's and return the results to the user interface.

The ConnectPro Worklist Server AE initiates the following functions:

- *Query*: Initiates a DICOM association in order to query a remote AE. If the remote AE accepts a presentation context applicable to modality worklist, the Worklist Server AE will issue a modality worklist query request via the C-FIND service.

2.2.3 Sequencing of Real-World Activities

1. The user or the system initiates a modality worklist query (as a modality worklist SCU) to the modality worklist SCP with a given set of query parameters.
2. The modality worklist SCP returns responses which match the query parameters.
3. Items from the returned worklist responses are presented to the user.
4. A subset of the returned worklist responses are included in acquired DICOM images related to the responses.

2.3 AE SPECIFICATIONS

2.3.1 Worklist Server AE Specification

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

SOP Class Name	SOP Class UID
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31

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 the DICOM Worklist Server is:

Maximum Length PDU	50 Kbytes
--------------------	-----------

The SOP Class Extended Negotiation is not supported.

The maximum number of Presentation Context Items that will be proposed is 1.

The user information Items sent by this product are:

- Maximum PDU Length
- Implementation UID

2.3.1.1.2 Number of Associations

The Worklist Server AE (SCU) will initiate only one DICOM association at a time to perform a modality worklist query of a single remote AE.

2.3.1.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations are performed synchronously.

2.3.1.1.4 Implementation Identifying Information

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

ConnectPro for HiSpeed Advantage CT/i Implementation UID	1.2.840.113619.6.50
--	---------------------

2.3.1.2 Association Initiation Policy

The Worklist Server AE initiates a new association due to an update operation being initiated from the HiSpeed Advantage CT/i user interface.

2.3.1.2.1 Real-World Activity: Worklist Query

2.3.1.2.1.1 Associated Real-World Activity

The operator of the system initiates a query for a modality worklist by either opening the Schedule screen or by opening the Schedule screen and pressing the Update button. The choice of which of these two behaviors occurs is user configurable. The Worklist Server will then initiate an association with the remote AE in order to query for the worklist

A user can configure a number of parameters which directly control the worklist query request. The user can request worklist items that are intended for the scanner the user is working at, all items that apply to the modality of the scanner the user is working at or all worklist items available. These selections and their affects on worklist query parameters are given below:

This Scanner:

- Modality, (0008,0060) - set to CT
- Scheduled Station AE Title, (0040,0001) - set to local AE title

This Modality:

- Modality, (0008,0060) - set to CT
- Scheduled Station AE Title, (0040,0001) - zero-length (universal matching)

All Scanners:

- Modality, (0008,0060) - zero-length (universal matching)
- Scheduled Station AE Title, (0040,0001) - zero-length (universal matching)

The scheduled dates of procedures of interest can be specified for query by selecting a specific date range. The date ranges available are Today, Days Before Today, Days After Today and All Days. These selections and their affects on worklist query parameters are given below:

Today:

Scheduled Procedure Step Start Date (0040,0002) - set to YYYYMMDD, where this date is the current date.

Days Before Today and Days After Today:

Scheduled Procedure Step Start Date (0040,0002) - set to YYYYMMDD-YYYYMMDD, where this date range represents the specified number of days before today and/or after today. Note that number of days both before and after can be specified in the same query and that each always includes today.

All Days:

Scheduled Procedure Step Start Date (0040,0002) - zero-length (universal matching)

2.3.1.2.1.2 Proposed Presentation Context Table

The following table shows the proposed presentation contexts for the Worklist Server AE after real-world activity “Worklist Query” has been initiated:

Presentation Context Table - Proposed					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Worklist Information Model - FIND	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 the Worklist SOP Class

If the remote AE does not support the proposed Presentation Context, an appropriate error is logged and the operator is notified.

This implementation can receive multiple C-FIND results over a single association. Only one association is opened at a time.

Each C-FIND response received from the remote AE is parsed to verify the length/type of the items in the response (see section 2.3.1.2.1.2.2 for more information). Upon detecting any error in the response data, the Worklist Server AE will issue a C-FIND-CANCEL and, upon receipt of a C-FIND-RSP (or if an applicable timer expires), will abort the association. Any previously received worklist items are discarded.

On receipt of any error from the remote AE, the Worklist Server will issue a C-FIND-CANCEL and, upon receipt of a C-FIND-RSP (or if an applicable timer expires), will abort the association. Any previously received worklist items are discarded. Warnings received from the remote AE are ignored.

Each C-FIND operation supports a configurable “Association Timer.” This timer starts when the association request is sent or received and stops when the association is established. The default time-out value is 30 seconds.

Each C-FIND operation supports a configurable “Session Timer.” This timer starts when an association is established and stops when the association is ended. The default time-out value is 3600 seconds.

If any of the above timers expires, the association is aborted (A-ABORT) and the operation in progress is considered to be failed. Any previously received worklist items are discarded.

2.3.1.2.1.2.2 Record Acceptance Policy

The HiSpeed Advantage CT/i implementation adheres to strict value checking of incoming query responses from the remote AE. Each response received is examined to verify that all Type 1 attributes are present with non-zero length, that all Type 2 attributes are present (possibly with zero length) and that the data for all attributes is consistent with respect to the attributes’ value representation (VR).

Any inconsistencies in the response data, with respect to the categories described above, are considered errors. Upon detecting any such errors in the response data, the Worklist Server AE will issue a C-FIND-CANCEL and, upon receipt of a C-FIND-RSP (or if an applicable timer expires), will abort the association. Any previously received worklist items are discarded. Note that the absence of requested Type 3 attributes is not considered an error.

Fields considered Type 1 by the Worklist Server include:

- (0010,0010), Patient Name
- (0010,0020), Patient ID
- (0020,000D), Study Instance UID
- (0040,0001), Scheduled Station AE Title
- (0040,0002), Scheduled Procedure Step Start Date ¹
- (0040,0003), Scheduled Procedure Step Start Time ¹
- (0040,0009), Scheduled Procedure Step ID
- (0040,1001), Requested Procedure ID

¹ Start Date must be of the form YYYYMMDD, exactly eight numeric characters, and Start Time must be of the form HHMMSS, exactly six numeric characters.

Fields considered Type 2 by Worklist Server include:

- (0008,0050), Accession Number
- (0008,0060), Modality
- (0008,0090), Referring Physician Name
- (0010,0030), Patient Date of Birth
- (0010,0040), Patient Sex
- (0010,1030), Patient Weight in kg
- (0010,2000), Medical Alerts
- (0010,2110), Contrast Allergies
- (0010,21C0), Pregnancy Status
- (0032,1032), Requesting Physician
- (0032,1070), Requested Contrast Agent
- (0038,0010), Admission ID
- (0038,0050), Special Needs
- (0038,0300), Current Patient Location
- (0038,0500), Patient State
- (0040,0006), Performing Physician
- (0040,0010), Scheduled Station Name
- (0040,0011), Scheduled Procedure Step Location
- (0040,0012), Pre-order Medication
- (0040,1003), Requested Procedure Priority
- (0040,1004), Patient Transport Arrangements
- (0040,3001), Confidentiality Constraint

2.3.1.3 Association Acceptance Policy

The Worklist Server AE does not respond to attempts by a remote AE to open an association.

2.4 COMMUNICATION PROFILES

2.4.1 Supported Communication Stacks (PS 3.8, PS 3.9)

DICOM Upper Layer (PS 3.8) is supported using TCP/IP.

2.4.2 OSI Stack

The OSI Communication Stack is not supported by this implementation.

2.4.3 TCP/IP Stack

The TCP/IP Communication Stack is inherited from the IRIX operating system.

2.4.3.1 API

Not applicable to this product.

2.4.3.2 Physical Media Support

Ethernet 802.3 provides the physical network layer for this product.

2.4.4 Point-to-Point Stack

The Point-to-Point Communication Stack is not supported by this implementation.

2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

2.5.1 Standard Extended /Specialized/Private SOPs

ConnectPro for HiSpeed Advantage CT/i does not implement any private transfer SOP classes.

2.5.2 Private Transfer Syntaxes

ConnectPro for HiSpeed Advantage CT/i does not implement any private transfer syntaxes.

2.6 CONFIGURATION

The ConnectPro feature is configured by GEMS Field Service engineers. The DICOM configuration items below are configurable or re-configurable by a Field Service Engineer and are not accessible by users through the HiSpeed Advantage CT/i user interface.

2.6.1 AE Title/Presentation Address Mapping

ConnectPro allows for the configuration of the following parameters which pertain to the remote AE.

- Remote AE (HIS/RIS) IP address - IP address used to contact the remote AE
- Remote AE (HIS/RIS) IP port - IP port used to contact the remote AE
- Remote AE (HIS/RIS) Title - Title (name) of the remote AE
- Scanner AE (HIS/RIS) Title - Title (name) of the Scanner AE

These parameters define where worklist queries will be directed. Configuration of these parameters is performed by GEMS Field Service engineers using the ConnectPro installation facilities.

2.6.2 Configurable Parameters

The following parameters are configurable for the DICOM Worklist Server AE:

- Local (Worklist Server) AE Title (automatically set to host name of scanner)
- Local IP address
- Local IP netmask
- Local IP gateway

The following parameters are configurable by changing their values in the configuration file **/usr/g/config/WLdcm.cfg**. Note that these parameters typically need not be changed. Furthermore, no support is provided for retaining changed settings: the values will require changing again after a system software upgrade.

- Implementation UID
- PDU size
- Association time-out period
- Session time-out period
- C-FIND time-out period

2.7 SUPPORT OF EXTENDED CHARACTER SETS

ConnectPro will support only the ISO_IR 100 (ISO 8859-1:1987 Latin alphabet N 1. supplementary set) as extended character sets.

3. MODALITY WORKLIST INFORMATION MODEL DEFINITION

3.1 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:

- 3.2 - Information Model Description
- 3.3 - Information Model Entity-Relationship Model
- 3.4 - Information Model Module Table
- 3.5 - Information Model Keys

3.2 MODALITY WORKLIST INFORMATION MODEL DESCRIPTION

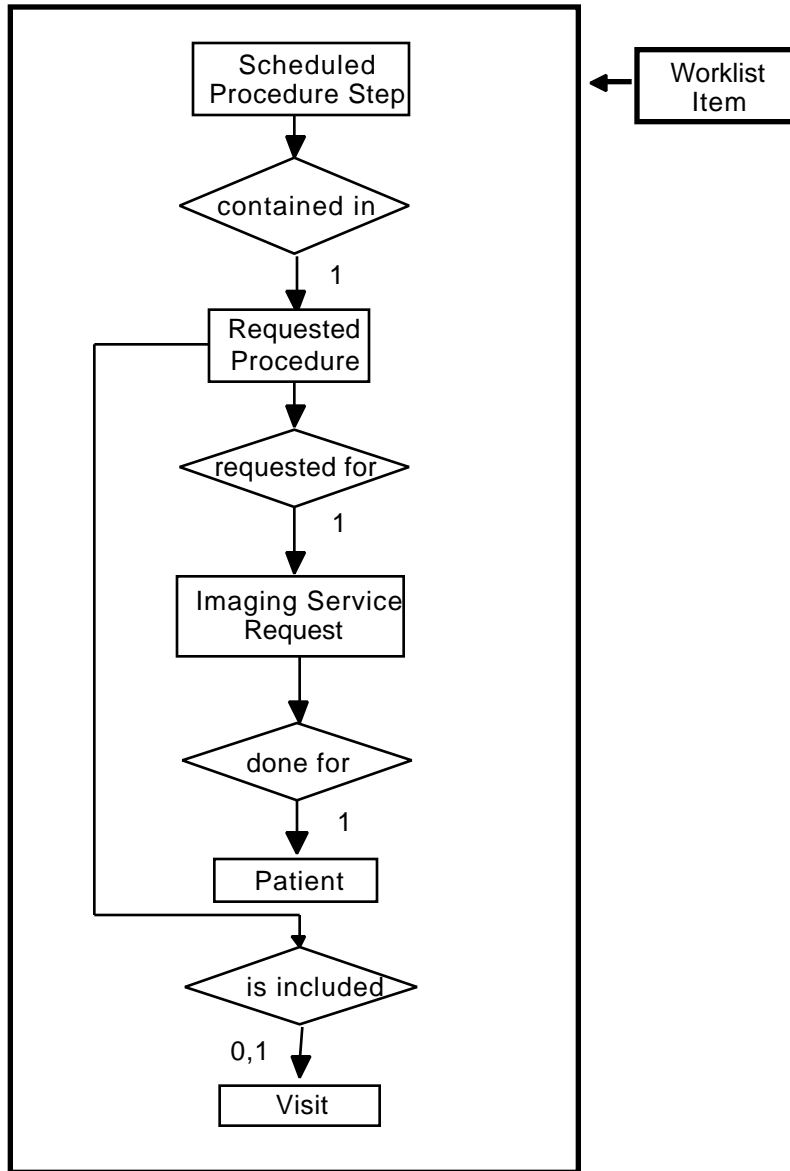
In order to serve as a Service Class Provider (SCP) of the Modality Worklist Service Class, a DICOM Application Entity (AE) possesses information about the attributes of a number of managed worklist items. These items are organized into Modality Worklist Information Modules. In this Service Class, the Information Model plays a role similar to an Information Object Definition of most other DICOM Service Classes.

3.3 MODALITY WORKLIST INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Modality Worklist Information Model schema is shown in Illustration 3.3-1. It represents the information that composes a Worklist Item. In this figure, the following diagrammatic convention is established to represent the information organization :

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

ILLUSTRATION 3.3-1
MODALITY WORKLIST INFORMATION MODEL E/R DIAGRAM



3.3.1 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.

3.3.1.1 Scheduled Procedure Step

A Scheduled Procedure Step is an arbitrarily defined scheduled unit of service that is specified by the Procedure Plan for a Requested Procedure. It specifies one or more Action Items (events) involving equipment (i.e. imaging modality equipment), human resources, location and time (i.e. start time, stop time, duration).

3.3.1.2 Requested Procedure Entity Description

A Requested Procedure is an instance of a Procedure of a given Procedure Type. An instance of a Requested Procedure includes all of the items of information that are specified by an instance of a Procedure Plan that is selected for the Requested Procedure by the imaging service provider.

3.3.1.3 Imaging Service Request Entity Description

An Imaging Service Request is a set of one or more Requested Procedures selected from a list of Procedure Types. An Imaging Service Request is submitted by one authorized imaging service requester to one authorized imaging service provider in the context of one Service Episode.

3.3.1.4 Visit Entity Description

A Visit is the context in which the treatment or management of an arbitrary subset of a Patient’s medical conditions occurs. A Visit is limited to the description of a Patient’s activities at a single facility.

3.3.1.5 Patient Entity Description

A Patient is a person receiving, or registered to receive, healthcare services.

3.3.2 ConnectPro Mapping of DICOM Entities

TABLE 3.3-1
MAPPING OF DICOM ENTITIES TO CONNECTPRO ENTITIES

DICOM	ConnectPro Entity
Scheduled Procedure Step	Exam
Requested Procedure	Exam
Imaging Service Request	Exam
Visit	Exam
Patient	Patient

3.4 INFORMATION MODEL MODULE TABLE

Within an entity of the DICOM v3.0 Modality Worklist Information Model, attributes are grouped together into related set of attributes called modules. A module facilitates the understanding of the semantics concerning the attributes and how the attributes relate to one another. 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 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 3.4-1
MODALITY WORKLIST INFORMATION MODEL MODULES

Entity Name	Module Name	Reference
Scheduled Procedure Step	SOP Common	3.5.2.1
	Scheduled Procedure Step	3.5.2.2
Requested Procedure	Requested Procedure	3.5.3.1
Imaging Service Request	Imaging Service Request	3.5.4.1
Visit	Visit Identification	3.5.5.1
	Visit Status	3.5.5.2
	Visit Relationship	3.5.5.3
	Visit Admission	3.5.5.4
Patient	Patient Relationship	3.5.6.1
	Patient Identification	3.5.6.2
	Patient Demographic	3.5.6.3
	Patient Medical	3.5.6.4

3.5 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 contain the attributes which are present in a C-FIND request message sent by the Worklist Server AE to a remote AE. It should be noted that they are the same as those defined in the DICOM v3.0 Standard, PS 3.4 (Service Class Specifications) and include:

- Name
- Tag group and element numbers
- Expected Matching Key Type: R-required, O-optional
- Expected Return Key Type:
 - 1 - non-zero value required
 - 1C - conditionally of type 1
 - 2 - required to be present, possibly with zero-length value
 - 3 - optional
- Mapped into The Image - whether this data is mapped into subsequently acquired images
- Notes - clarification of this implementation’s use/treatment of this attribute

All data elements in the following Module descriptions are requested by the Worklist Server AE. Values of data elements that are not mapped into images, and are not otherwise dealt with (displayed on the user interface, etc.), are not used and are, thus, discarded upon receipt. See Table B-1 for further information.

Data elements for which values can be sent for matching purposes are described as such. Data elements for which values are not sent are sent with zero length and universal

matching will apply. This is the default case if no other description to the contrary is provided.

3.5.1 Supported Matching

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

- Single Value matching
- Universal Matching
- Range of date/time

3.5.2 Scheduled Procedure Step Entity

3.5.2.1 SOP Common Module

TABLE 3.5-1
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Specific Character Set	(0008,0005)	O	1C	No	Matching for this item is supported only for the character set ISO_IR 100. This value is always sent and therefore, must be returned.

3.5.2.2 Scheduled Procedure Step Module

TABLE 3.5-2
SCHEDULED PROCEDURE STEP MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Scheduled Procedure Step Sequence	(0040,0100)	R	1	No	
>Scheduled Station AE Title	(0040,0001)	R	1	No	Matching is supported as follows: either no AE title is supplied (universal matching), or the scanner's Worklist Server AE title is supplied for matching; this is user selectable.

>Scheduled Procedure Step Start Date	(0040,0002)	R	1	No	Matching is supported as one of the following; this is user selectable: <ul style="list-style-type: none"> · all days, · today only, · today and a number of days before today, · today and a number of days after today, · today and a number of days before today and a number of days after today. Number of days before/after is specified by the user. Returned values must be exactly 8 numeric characters in YYYYMMDD format.
>Scheduled Procedure Step Start Time	(0040,0003)	R	1	No	This attribute is sent with zero-length. Returned values must be exactly 6 numeric characters in HHMMSS format.
>Modality	(0008,0060)	R	1	Yes	Matching is supported as follows: either no Modality is supplied (universal matching), or the scanner's Modality is supplied for matching; this is user selectable.
>Scheduled Performing Physician's Name	(0040,0006)	R	2	No	This attribute is sent with zero-length.
>Scheduled Procedure Step Description	(0040,0007)	O	1C	No	
>Scheduled Station Name	(0040,0010)	O	2	No	
>Scheduled Procedure Step Location	(0040,0011)	O	2	No	
>Scheduled Action Item Code Sequence	(0040,0008)	O	1C	No	
>>Code Value	(0008,0100)	O	1C	No	
>>Coding Scheme Designator	(0008,0102)	O	1C	No	
>>Code Meaning	(0008,0104)	O	3	No	
>Pre-Medication	(0040,0012)	O	2C	No	
>Scheduled Procedure Step ID	(0040,0009)	O	1	No	
>Requested Contrast Agent	(0032,1070)	O	2C	No	Displayed on "More Info..." screen.

3.5.3 Requested Procedure Entity

3.5.3.1 Requested Procedure Module

**TABLE 3.5-3
REQUESTED PROCEDURE MODULE ATTRIBUTES**

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Requested Procedure ID	(0040,1001)	O	1	No	

Requested Procedure Description	(0032,1060)	O	1C	Yes	Truncated to 22 characters.
Requested Procedure Code Sequence	(0032,1064)	O	1C	No	
>Code Value	(0008,0100)	O	1C	No	
>Coding Scheme Designator	(0008,0102)	O	1C	No	
>Code Meaning	(0008,0104)	O	3	No	
Study Instance UID	(0020,000D)	O	1	No	This value is not used. The Study Instance UIDs associated with all images acquired by the scanner are generated locally by the scanner itself .
Referenced Study Sequence	(0008,1110)	O	2	No	
>Referenced SOP Class UID	(0008,1150)	O	1C	No	
>Referenced SOP Instance UID	(0008,1155)	O	1C	No	
Requested Procedure Priority	(0040,1003)	O	2	No	
Patient Transport Arrangements	(0040,1004)	O	2	No	
Requested Procedure Location	(0040,1005)	O	3	No	
Confidentiality Code	(0040,1008)	O	3	No	

3.5.4 Imaging Service Request Entity

3.5.4.1 Imaging Service Request Module

TABLE 3.5-4
IMAGING SERVICE REQUEST MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Accession Number	(0008,0050)	O	2	Yes	Truncated to 12 characters.
Requesting Physician	(0032,1032)	O	2	No	
Referring Physician's Name	(0008,0090)	O	2	Yes	Truncated to 32 characters
Requesting Service	(0032,1033)	O	3	No	

3.5.5 Visit Entity

3.5.5.1 Visit Identification

TABLE 3.5-5
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	
Institution Name	(0008.0080)	O	3	No	

3.5.5.2 Visit Status

TABLE 3.5-6
VISIT STATUS MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Current Patient Location	(0038,0300)	O	2	No	Displayed on “More Info...” screen.

3.5.5.3 Visit Relationship

TABLE 3.5-7
VISIT RELATIONSHIP MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Referenced Patient Sequence	(0008,1120)	O	2	No	
>Referenced SOP Class UID	(0008,1150)	O	2	No	
>Referenced SOP Instance UID	(0008,1155)	O	2	No	

3.5.5.4 Visit Admission

No data elements are requested from the Visit Admission Module.

3.5.6 Patient Entity

3.5.6.1 Patient Relationship

No data elements are requested from the Patient Relationship Module.

3.5.6.2 Patient Identification

TABLE 3.5-8
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	This attribute is sent with zero-length. Truncated to 24 characters.
Patient ID	(0010,0020)	R	1	Yes	This attribute is sent with zero-length. Truncated to 12 characters.

3.5.6.3 Patient Demographic

TABLE 3.5-9
PATIENT DEMOGRAPHIC MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Patient's Birth Date	(0010,0030)	O	2	Yes	Note that the value actually mapped into the image is the age of the patient, which is computed based on the value of this attribute.
Patient's Sex	(0010,0040)	O	2	Yes	
Patient's Weight	(0010,1030)	O	2	Yes	Limited to maximum value of 999 kg.
Confidentiality constraint on patient data	(0040,3001)	O	2	No	
Patient's Size	(0010,1020)	O	3	No	
Patient's Address	(0010,1040)	O	3	No	
Patient's Telephone Numbers	(0010,2154)	O	3	No	

3.5.6.4 Patient Medical

TABLE 3.5-10
PATIENT MEDICAL MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image	Note
Patient State	(0038,0500)	O	2	No	
Pregnancy Status	(0010,21C0)	O	2	No	Displayed on “More Info...” screen.
Medical Alerts	(0010,2000)	O	2	No	Displayed on “More Info...” screen.
Contrast Allergies	(0010,2110)	O	2	No	Displayed on “More Info...” screen.
Special Needs	(0038,0050)	O	2	No	Displayed on “More Info...” screen.
Additional Patient History	(0010,21B0)	O	3	No	Displayed on “More Info...” screen.

3.6 PRIVATE DATA DICTIONARY

The ConnectPro implementation does not define any Private Attributes within the Modality Worklist Information Model.

APPENDIX A: C-FIND REQUEST MESSAGE

This section provides a detailed description of the C-FIND request message data that is provided to the remote AE during a worklist query operation. The dump in Table A-1 below lists, in exact message order, the fields transferred as part of the C-FIND request message for a typical query.

In this particular dump, no values are specified for the Scheduled Procedure Step Start and End Dates (the attributes are sent with zero length). In DICOM this is interpreted as meaning all dates (i.e. universal matching). The Modality is also not specified in this particular dump, meaning all modalities. Note that the user, through the use of the HiSpeed Advantage CT/i user interface, can submit a worklist query that will cause non-zero values to be sent for these attributes.

TABLE A-1
C-FIND REQUEST MESSAGE DUMP

```

(0008,0000) UL      108          #      4, 1  IdentifyingGroupLength
(0008,0005) CS      [ISO_IR 100] #     12, 1  SpecificCharacterSet
(0008,0050) SH      (no value available) #      0, 0  AccessionNumber
(0008,0080) LO      (no value available) #      0, 0  InstitutionName
(0008,0090) PN      (no value available) #      0, 0  ReferringPhysicianName
(0008,1110) SQ      (Sequence with explicit Length #=1) #     24, 1  ReferencedStudySequence
(fffe,e000) na      (Item with explicit Length #=2) #     16, 1  Item
(0008,1150) UI      (no value available) #      0, 0  ReferencedSOPClassUID
(0008,1155) UI      (no value available) #      0, 0  ReferencedSOPInstanceUID
(fffe,e00d) na      (ItemDelimitationItem for re-encoding) #      0, 1  ItemDelimitationItem
(fffe,e0dd) na      (SequenceDelimitationItem for re-enc.) #      0, 1  SequenceDelimitationItem
(0008,1120) SQ      (Sequence with explicit Length #=1) #     24, 1  ReferencedPatientSequence
(fffe,e000) na      (Item with explicit Length #=2) #     16, 1  Item
(0008,1150) UI      (no value available) #      0, 0  ReferencedSOPClassUID
(0008,1155) UI      (no value available) #      0, 0  ReferencedSOPInstanceUID
(fffe,e00d) na      (ItemDelimitationItem for re-encoding) #      0, 1  ItemDelimitationItem
(fffe,e0dd) na      (SequenceDelimitationItem for re-enc.) #      0, 1  SequenceDelimitationItem
(0010,0000) UL      96          #      4, 1  PatientGroupLength
(0010,0010) PN      (no value available) #      0, 0  PatientName
(0010,0020) LO      (no value available) #      0, 0  PatientID
(0010,0030) DA      (no value available) #      0, 0  PatientBirthDate
(0010,0040) CS      (no value available) #      0, 0  PatientSex
(0010,1020) DS      (no value available) #      0, 0  PatientSize
(0010,1030) DS      (no value available) #      0, 0  PatientWeight
(0010,1040) LO      (no value available) #      0, 0  PatientAddress
(0010,2000) LO      (no value available) #      0, 0  MedicalAlerts
(0010,2110) LO      (no value available) #      0, 0  ContrastAllergies
(0010,2154) SH      (no value available) #      0, 0  PatientTelephoneNumber
(0010,21b0) LT      (no value available) #      0, 1  AdditionalPatientHistory
(0010,21c0) US      (no value available) #      0, 0  PregnancyStatus
(0020,0000) UL      8          #      4, 1  ImageGroupLength
(0020,000d) UI      (no value available) #      0, 0  StudyInstanceUID
(0032,0000) UL      64          #      4, 1  StudyGroupLength
(0032,1032) PN      (no value available) #      0, 0  RequestingPhysician
(0032,1033) LO      (no value available) #      0, 0  RequestingService
(0032,1060) LO      (no value available) #      0, 0  RequestedProcedureDescription
(0032,1064) SQ      (Sequence with explicit Length #=1) #     32, 1  RequestedProcedureCodeSequence
(fffe,e000) na      (Item with explicit Length #=3) #     24, 1  Item
(0008,0100) SH      (no value available) #      0, 0  CodeValue
(0008,0102) SH      (no value available) #      0, 0  CodingSchemeDesignator
(0008,0104) LO      (no value available) #      0, 0  CodeMeaning
(fffe,e00d) na      (ItemDelimitationItem for re-encoding) #      0, 1  ItemDelimitationItem
(fffe,e0dd) na      (SequenceDelimitationItem for re-enc.) #      0, 1  SequenceDelimitationItem
(0038,0000) UL      32          #      4, 1  VisitGroupLength
(0038,0010) LO      (no value available) #      0, 0  AdmissionID
(0038,0050) LO      (no value available) #      0, 0  SpecialNeeds

```

```
(0038,0300) LO (no value available) # 0, 0 CurrentPatientLocation
(0038,0500) LO (no value available) # 0, 0 PatientState
(0040,0000) UL 192 # 4, 1 ModalityWorklistGroupLength
(0040,0100) SQ (Sequence with explicit Length #=1) # 136, 1 ScheduledProcedureStepSequence
(fffe,e000) na (Item with explicit Length #=12) # 128, 1 Item
(0008,0060) CS (no value available) # 0, 0 Modality
(0032,1070) LO (no value available) # 0, 0 RequestedContrastAgent
(0040,0001) AE (no value available) # 0, 0 ScheduledStationAETitle
(0040,0002) DA (no value available) # 0, 0 ScheduledProcedureStepStartDate
(0040,0003) TM (no value available) # 0, 0 ScheduledProcedureStepStartTime
(0040,0006) PN (no value available) # 0, 0 ScheduledPerformingPhysiciansName
(0040,0007) LO (no value available) # 0, 0 ScheduledProcedureStepDescription
(0040,0008) SQ (Seq with explicit Length #=1) # 32, 1 ScheduledActionCodeSequence
(fffe,e000) na (Item with explicit Length #=3) # 24, 1 Item
(0008,0100) SH (no value available) # 0, 0 CodeValue
(0008,0102) SH (no value available) # 0, 0 CodingSchemeDesignator
(0008,0104) LO (no value available) # 0, 0 CodeMeaning
(fffe,e00d) na (ItemDelimitationItem for re-encoding) # 0, 1 ItemDelimitationItem
(fffe,e0dd) na (SequenceDelimitationItem for re-enc.) # 0, 1 SequenceDelimitationItem
(0040,0009) SH (no value available) # 0, 0 ScheduledProcedureStepID
(0040,0010) SH (no value available) # 0, 0 ScheduledStationName
(0040,0011) SH (no value available) # 0, 0 ScheduledProcedureStepLocation
(0040,0012) LO (no value available) # 0, 0 PreMedication
(fffe,e00d) na (ItemDelimitationItem for re-encoding) # 0, 1 ItemDelimitationItem
(fffe,e0dd) na (SequenceDelimitationItem for re-enc.) # 0, 1 SequenceDelimitationItem
(0040,1001) SH (no value available) # 0, 0 RequestedProcedureID
(0040,1003) SH (no value available) # 0, 0 RequestedProcedurePriority
(0040,1004) LO (no value available) # 0, 0 PatientTransportArrangements
(0040,1005) LO (no value available) # 0, 0 RequestedProcedureLocation
(0040,1008) LO (no value available) # 0, 0 ConfidentialityCode
(0040,3001) LO (no value available) # 0, 0 ConfidentialityConstraintOnPatientData
```

If the query is for a particular date range, the ScheduledProcedureStepStartDate will be filled with a valid date range. If either the start or end date are left blank by the user, they will simply be blank in the query.

Below is an example of a date range for August 30, 1997 through October 12, 1997.

```
(0040,0002) DA [19970830-19971012] # 18, 1 ScheduledProcedureStepStartDate
```

Below is an example of a date range for August 30, 1997 through the end of time.

```
(0040,0002) DA [19970830-] # 18, 1 ScheduledProcedureStepStartDate
```

Below is an example of a date range from the beginning of time through August 30, 1997.

```
(0040,0002) DA [-19970830] # 18, 1 ScheduledProcedureStepStartDate
```

If the query is for records for this modality, the Modality will be filled in as follows:

```
(0008,0060) CS [CT] # 2, 1 Modality
```

If the query is for records for this Scanner, the Modality will be filled in with CT as above and the Scheduled Station AE Title will be filled in with the value configured for this system. For example, this station was configured as CTRoom1.

```
(0040,0001) AE [CTRoom1] # 8, 1 ScheduledStationAETitle
```

APPENDIX B: USE OF SPECIFIC DICOM DATA

This section details the use of the DICOM data returned by remote AEs during worklist queries. The HiSpeed Advantage CT/i user interface fields which display the data, along with the data's mapping into resulting acquired and transferred DICOM images, is presented in Table B-1.

TABLE B-1
SPECIFIC DATA USAGE

DICOM Worklist Data Element	Patient Schedule Screen Field	HiSpeed Advantage CT/i DICOM Image Data Element
Accession Number (0008,0050)	Req Number	Accession Number Truncated to 12 characters.
Patient ID (0010,0020)	Patient ID	Patient ID Truncated to 12 characters.
Patient Name (0010,0010)	Patient Name	Patient Name Truncated to 24 characters.
Patient's Birth Date (0010,0030)	Patient Age (Patient Birth Date used to calculate age)	Not available.
Patient's Sex (0010,0040)	Sex	Patient's Sex
Patient's Weight (0010,1030)	Weight in Kg	Patient's Weight
Referring Physician's Name (0008,0090)	Referring Physician	Referring Physician's Name
Requested Procedure Description (0032,1060)	Exam Description	Study Description.
Scheduled Procedure Step Start Date (0040,0002)	Date	Not available.
Scheduled Procedure Step Start Time (0040,0003)	Time	Not available.
Pregnancy Status (0010,21C0)	Pregnancy Status (only displayed on the "More Info..." screen)	Not available.
Medical Alerts (0010,2000)	Medical Alerts (only displayed on the "More Info..." screen)	Not available.
Contrast Allergies (0010,2110)	Contrast Allergies (only displayed on the "More Info..." screen)	Not available.
Special Needs (0038,0050)	Special Needs (only displayed on the "More Info..." screen)	Not available.
Requested Contrast Agent (0032,1070)	Requested Contrast Agent (only displayed on the "More Info..." screen)	Not available.
Current Patient Location (0038,0300)	Current Patient Location (only displayed on the "More Info..." screen)	Not available.

Additional Patient History (0010,21B0)	Additional Patient History (only displayed on the "More Info..." screen)	Not available.
---	--	----------------

This Page Intentionally Left Blank



GE Medical Systems

GE Medical Systems: Telex 3797371
P.O. Box 414, Milwaukee, Wisconsin, 53201 U.S.A.
(Asia, Pacific, Latin America, North America)

GE Medical Systems – Europe: Telex 698626
283 rue de la Minière, B.P.34, 78533, Buc Cedex, France

